WITHAM FIELD

Airport Master Plan

Final Report | August 2023

Prepared for:
Martin County
2011 SE Airport Road
Stuart, FL 34996

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Final Report

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Background and Airport Setting

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CHAPTER 1
Background and Airport Setting

In 2019, Martin County began the process to develop a new airport master plan for Witham Field (SUA). The overall goal was to prepare a comprehensive planning document meeting the needs of airport management, Martin County Board of County Commissioners, surrounding communities, Federal Aviation Administration (FAA), and Florida Department of Transportation (FDOT). As such, this study was conducted in accordance with FAA Advisory Circular (AC) 150/5070-6B *Airport Master Plans* and FDOT's *2019 Guidebook for Airport Master Planning*. It is also consistent with Chapter 14-60 of the Florida Administrative Code and other applicable FAA or FDOT guidance, including FAA AC 150/5300-13A, Change 1, *Airport Design*.

1.1 Need for a New Master Plan

The existing facilities at the airport are primarily concentrated on the south side of the airfield, including the two full service fixed base operators, a number of hangar buildings, aircraft parking aprons, U.S. Customs and Border Protection facility, the airport administration building, and other facilities. The aviation related facilities on the south side is approaching full buildout, requiring the airport to evaluate the next developable areas to support demand. While there are some aviation related facilities on the north side of the airfield, it has been restricted due to the absence of airfield and landside access, utilities, and other infrastructure required for aviation uses. As such, this study creates informed decisions in order to determine the highest and best use of the available areas, as well as the potential for redevelopment of some existing facilities. The study will also enable the airport to ensure it remains proactive in its efforts to address newer airport design standards and airport land use guidance that have occurred since 2010.

Since the last airport master plan was completed in 2010, aircraft activity has increased and the types of aircraft operations have changed. However, at the time of this writing, the COVID-19 pandemic has had an unprecedented impact on aviation throughout the world, including the general aviation operations at SUA which began a steep decline during the second half of March 2020. This current event and other influential factors on the general aviation industry have been considered during the development of this master plan.

1.2 Study Goals and Objectives

Airports face many challenges in their day to day operation. At a minimum they must maintain a safe facility, comply with a myriad of regulations, manage numerous leaseholds, preserve compatibility with the community, be good stewards of the environment, encourage economic growth, and compete for limited funds, all while providing essential community services with a positive public image. The master plan process serves as a tool for an airport to address these issues in an organized approach. The overall objective of a new master plan is to accurately assess existing airport conditions, project aviation activity, define future needs, develop cost effective options, and provide a realistic capital improvement program. In doing so, the 20-year plan also needs to be flexible by including appropriate activity triggers or benchmarks, as well as potential scenarios to respond to the ever changing aviation industry. Such flexibility provides options for airport management to react to fluctuating market conditions, shifts in aviation priorities, take advantage of unexpected opportunities, and/or react to unforeseen impacts.

This study serves as a guide for realistic and required improvements in order to achieve airport and community objectives. Since the previous 2010 study is out of date and no longer accurately reflects the current conditions at the airport or the community for that matter, this master plan will be a “from scratch” effort as defined by FDOT in their guidance. The primary goal will be to create a 20-year capital improvement program to maintain a safe, efficient, economical, and environmentally acceptable airport facility for Martin County. By achieving this goal, the document provides the guidance to satisfy the aviation demand in a financially feasible and responsible manner, while at the same time addressing the aviation, environmental, and socioeconomic issues of the community. In support of this goal, the following objectives were achieved:

- ✈ Ensure orderly progress: consider short-term needs and long-term plans;
- ✈ Ensure compliance with latest FAA/FDOT design criteria, grant assurances, and policies;
- ✈ Provide flexibility to allow the airport to respond to changes in the aviation industry;
- ✈ Meet FAA Airport Geographic Information System (AGIS) mandate;
- ✈ Incorporate environmental elements such as noise, sustainability, and resiliency;
- ✈ Create a new Airport Layout Plan (ALP) drawing set; and
- ✈ Create a new Exhibit “A” Airport Property Inventory Map.

While some of these objectives fulfill the broader goals of a comprehensive planning document, others are much more unique to the airfield’s setting and surrounding environment. For example, it was critical to include a resiliency element given the relatively low elevation of airfield facilities in proximity to both the St. Lucie River and Atlantic Ocean.

1.3 Planning Process

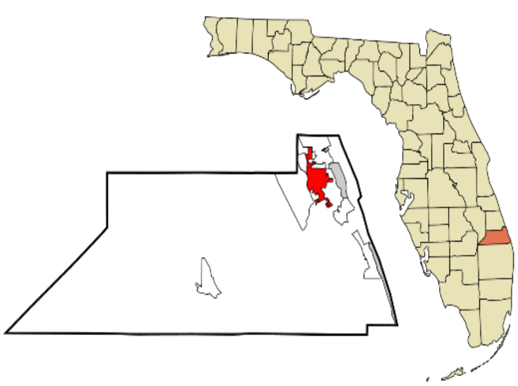
This master plan provides a systematic outline of the actions required to maintain and further improve the airfield and landside facilities. This process provides those officials responsible for the scheduling, budgeting, and funding of airport improvement projects with advance notice of the airport's needs. Phasing airport improvements allow the capital program to be conducted in an orderly fashion.

Throughout this process, reviews will be conducted to insure input is received from key stakeholders, including the surrounding community, airport management, Martin County staff, airport traffic control management, FAA, FDOT, airport tenants, airport customers, and the public. Individual steps in the master plan process are built upon information and decisions made during previous steps to address the objectives identified above.

Airport Master Planning Process

1.4 Airport Setting

Approximately 40 miles north of West Palm Beach and just four miles from the Atlantic Ocean, SUA is accessible via SE Federal Highway (US 1) and SE Dixie Highway (SR A1A). While owned and operated by Martin County, the Airport is partially located within the City of Stuart's jurisdiction.



Location of the City of Stuart and Martin County within Florida (both highlighted)

1.4.1 History

Before it was known as Witham Field, there existed a small private grass strip on the site of the existing airport. Originally called MacArthur Field, the airport was later renamed in honor of Paul "Homer" Witham, the first naval aviator from Stuart to die during World War II. The land was deeded to Martin County in the 1930s so that a public-use airport could be built. To support the war effort, the airport was leased to the federal government and operated under the name Naval Auxiliary Air Station (NAAS) Witham, an auxiliary field to Naval Air Station Vero Beach. The primary mission of NAAS Witham was to train Navy pilots and crews in fighter and light bomber aircraft.

In 1947, the lease was terminated and control of the airport was returned to the County for operation as a public facility again. During the 1950s and 1960s, the airport was leased to Northup Grumman who used it for the assembly and testing of military aircraft until 1994. At that point, Martin County hired a manager to oversee the day-to day operation of the airport.

1.4.2 System Planning Roles

Airport planning occurs at local, statewide, and national levels, each with its own particular emphasis. Airport master plans provide planning at the local level, while statewide matters are addressed by FDOT, and national issues by the FAA.

Florida Aviation System Plan

The Florida Aviation System Plan (FASP) facilitates FDOT's strategic planning for the state's public-use airports. This plan is updated annually through the Continuing Florida Aviation Systems Planning Process (CFASPP) and divides the state's public-use airports into nine regions. SUA is one of seven public-use airports in the Treasure Coast region serving the role of general aviation airport.

The Treasure Coast CFASPP region encompasses Indian River, St. Lucie, Martin, and Okeechobee Counties. The area offers a warm climate and uncrowded beaches. This includes Hutchinson Island, the 23 mile long barrier island stretching along the Atlantic coast of St. Lucie and Martin Counties, which offers an abundance of wildlife, natural beaches, and a variety of outdoor activities. The area also offers numerous golf courses including the Professional Golfers' Association (PGA) Village.

National Plan of Integrated Airport Systems

A National Plan of Integrated Airport Systems (NPIAS) is presented every two years to Congress by the Secretary of Transportation for the improvement of public-use airports which are significant to the national air transportation system. Specifically, this plan documents the federal aid required for infrastructure development at the nation's commercial service, reliever (high capacity general aviation airports), and other select general aviation airports. The categorization of these needs guides FAA management in their administration of the Airport Improvement Program.

The most recent NPIAS (2019-2023) groups airports into two major categories: primary (commercial service) and non-primary (mostly general aviation). General aviation airports are then subdivided into either national, regional, local, basic, or unclassified facilities depending on activity measures (number/type of based aircraft and operations). In the 2019-2023 NPIAS, SUA is designated as a national general aviation facility with $5.1 million in planned improvements eligible for federal funding over the system's five-year planning period.

1.4.3 Climate and Weather Data

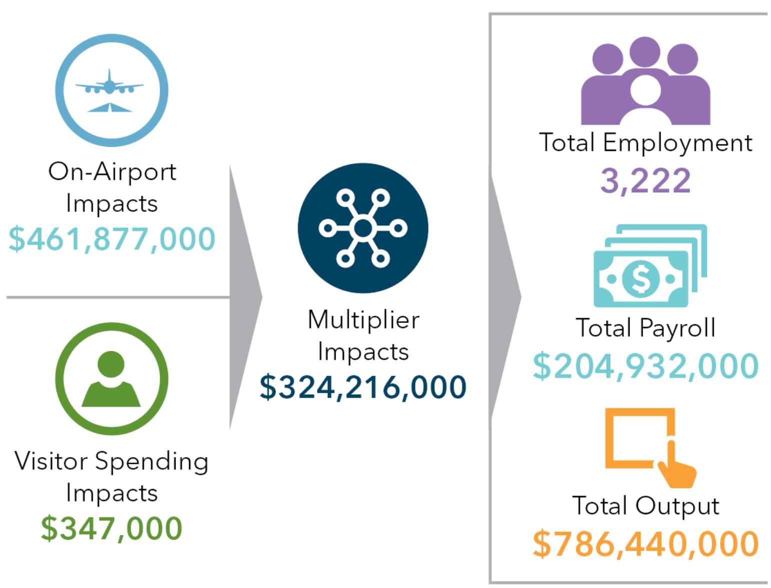
As with much of the southeastern Florida coast, Martin County is relatively flat. This coupled with prevailing sea breezes significantly influence the climate and prevailing winds in the area. Although the airport is located in the warmer southeastern portion of the nation, annual temperatures are considered moderate due to the influence of the sea breeze.

Temperatures during the summer months rarely reach 100 degrees Fahrenheit, with an average maximum temperature of 90 degrees Fahrenheit in August. The average minimum winter temperature is 57 degrees Fahrenheit in January. Rainfall in this area occurs during all seasons; however, it is more abundant during the summer when daily showers are common. Martin County has averaged approximately 51 inches of rainfall on an annual basis over the last 10 years

Historic wind and weather conditions are key considerations for an airport's runway system since aircraft takeoff and land into the wind. As recommended in FAA AC 150/5300-13A, Change 1, ten consecutive years of wind data was collected for SUA from the FAA's online Windrose File Generator website. This information was analyzed and used to develop a number of sections in this study.

1.5 Local Economic Impact

In March 2019, FDOT completed an update of the Florida Statewide Aviation Economic Impact Study. The report provides the estimated annual impact created by the 129 public-use airports that participated in the study. The study documents the economic benefits generated by the various on-airport and off-airport aviation related activities. For each airport included in the study, the economic benefits are expressed as direct (on-airport), indirect (off-airport), and induced (multiplier) impacts. These measures are then expressed in terms of total annual employment, payroll (labor income), and activity (business sales). The diagram below illustrates the annual contribution that SUA creates for the Martin County economy.



Annual Impact of SUA on the Martin County Economy

SOURCE: Florida Statewide Aviation Economic Impact Study, FDOT 2019.

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CHAPTER 2
Existing Conditions

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CHAPTER 2
Existing Conditions

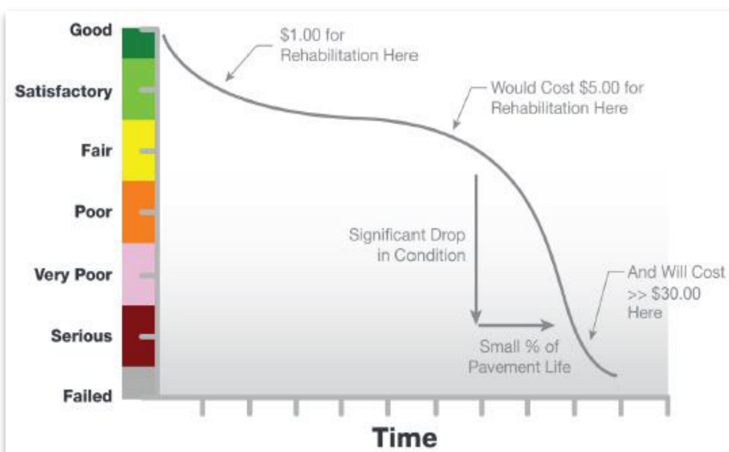
Information about the existing conditions of Witham Field (SUA) is provided as a foundation for subsequent analyses throughout the study. This includes an examination of the existing airfield, general aviation, landside, and other airport support facilities.

2.1 Airfield Environment

The current airfield is divided into different areas by the three paved runways with the majority of existing facilities located on the south side of the airport (see **Figure 2-1**). While not all are labelled or depicted, these include the runway and taxiway system; the available instrument approaches; airfield lighting; takeoff and landing aids; pavement markings; and airfield signage. Each of these are dedscribed in the following sections.

2.1.1 Aircraft Operation Areas

The aircraft operation areas include the runways as well as any other paved surface that enable aircraft to move between the runways and the different airport facilities. In addition to the physical characteristics of the runway and taxiway environment, there are other safety-related criteria. The specific criteria for each of these protective surfaces will be discussed in the facility requirements chapter.



Typical Pavement Condition Life Cycle

SOURCE: FDOT Statewide Airfield Pavement Management Program.

In June 2021, the Florida Department of Transportation (FDOT) published their most recent pavement report for SUA as part of the ongoing Statewide Airfield Pavement Management Program. This report provides an objective basis for determining maintenance and repair needs, as well as priorities, by assigning a Pavement Condition Index (PCI) value to each section of paved surface. The results of the 2021 report indicated that the airport's airfield pavement facilities had an overall area weighted average

PCI of 78, resulting in a rating of satisfactory. This included an area weighted average PCI of 87 (good) for the runways, 75 (satisfactory) for the taxiways, 69 (fair) for the apron surfaces, and 69 (fair) for the taxilanes.

Runway 12-30

The primary runway, Runway 12-30, has a published length of 5,828 feet and width of 100 feet. Constructed of grooved asphalt, the runway was assigned a PCI of 92 (good) in the 2021 pavement report due to a mill and overlay project conducted in 2016. Runway 12 has a 460 foot displaced threshold and both ends have Engineered Materials Arresting System (EMAS) installed. At the departure end of Runway 12 the EMAS bed is 502 feet long and 109 feet wide, while the EMAS bed at the departure end of Runway 30 is 413 feet long and 109 feet wide. The need for the EMAS beds is addressed in the facility requirements chapter. **Table 2-1** provides technical data for all three paved runways, including the current weight bearing capacity published for each.

Runway 16-34

As part of this study a detailed survey of the runways was conducted in November 2019 that complies with the Federal Aviation Administration (FAA) Airport Geographic Information System (AGIS) guidance. Historically, Runway 16-34 has had a published length of 4,998 feet; however, the AGIS survey shows an overall length of 5,000 feet. With a width of 100 feet, Runway 16-34 is designated as the crosswind runway. Constructed of grooved asphalt, the runway was also assigned a PCI of 92 (good) in 2021 due to a mill and overlay project in 2016. The runway has displaced thresholds on both ends, with the Runway 16 end displaced 336 feet and the Runway 32 end by 900 feet.

Runway 7-25

Runway 7-25 is an additional runway with a length of 4,653 feet and width of 100 feet. Prior to the AGIS runway survey, Runway 7-25 has been published as 4,652 feet. Constructed of grooved asphalt, the runway was given a PCI rating of 77 (satisfactory) in the 2021 report.

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C:\Users\jhalisky\Documents\Aviation Planning\Airports\SUA\05 Graphics-GIS-Modeling\Drawings\Figures\SUA MP Figure 2-1.dwg

Source: ESA, 2021.

FIGURE 2-1

EXISTING AIRPORT FACILITIES

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TABLE 2-1
RUNWAY CHARACTERISTICS

	Runway 12-30	Runway 16-34	Runway 7-25
Runway Length	5,828’	5,000’	4,653’
Runway Width	100’	100’	100’
Runway Markings	Non-Precision	Visual	Non-precision
Pavement Strength (pounds)			
Single (S)	65,000	55,000	58,000
Dual (D)	105,000	90,000	65,000
Dual Tandem (2D)	190,000	160,000	170,000
Pavement Surface	Asphalt – Grooved	Asphalt - Grooved	Asphalt – Grooved
Runway Lighting	Medium Intensity	none	Medium Intensity
Displaced Threshold	Runway 12 – 460’	Runway 16 - 336’	n/a
		Runway 34– 900’	

SOURCE: 2020 FAA aeronautical publications and 2021 FDOT Airfield Pavement Management Program.

Taxiways and Taxilanes

Aircraft ground movements between runways, aprons, hangars, and other facilities is conducted via an airfield’s taxiway and taxilane system. For SUA this consists of a network of major taxiways, connector taxiways, apron edge taxilanes, and hangar taxilanes. Taxilanes typically provide the final link to aircraft hangars and parking positions, and in most cases are outside of the aircraft movement area managed by the airport traffic control tower (ATCT). The designated taxiways at SUA are identified on **Figure 2-1**, described below, and listed in **Table 2-2.**

Taxiway A

Taxiway A is the full-length parallel taxiway along the south side of Runway 12-30. In between the ends of Taxiway A, which connect directly into the physical ends of Runway 12 and Runway 30, there are three named connector taxiways which also provide access onto Runway 12-30. From the west to the east, these include Taxiways A1, A2, and A3. The west half of Taxiway A maintains a centerline to centerline offset with Runway 12-30 of 300 feet while the east half has an offset of 450 feet.

Taxiway A provides a minimum width of 35 feet between the Runway 12 physical end and the intersection with Taxiway C, while the portion between Taxiway C and the physical end of Runway 30 provides a minimum width of 50 feet. Taxiway A connectors provide a marked width of 40 feet; however, at the Taxiway A2 and Taxiway A3 intersections, additional width is provided due to the required pavement edge fillets. Taxiway A had an overall area weighted average PCI of 59 (fair) in the 2021 pavement report.

Taxiway B

Taxiway B used to exist from the south side of Runway 12-30, across Taxiway A, and into the aircraft facilities on the south side of the airport. It was removed as it provided direct access onto the runway from the aircraft parking apron area south of Taxiway A. However, while not a designated taxiway south of Taxiway A, the pavement does continue to the south between the various aircraft hangar facilities as non-movement area taxilane. This portion of the taxilane system had a PCI rating of 28 (very poor) in the 2021 pavement report.

Taxiway C

Taxiway C serves as a midfield taxiway providing an integral connection between Runways 16-34 and 7-25 with the facilities on the south side of the airfield. It begins at an intersection with Taxiway A, crosses Runway 12-30 and continues across the airfield to intersect with Taxiway D. From Taxiway D it changes direction to become a partial parallel taxiway for Runway 7-25, tying into the approach end of Runway 25. This portion of Taxiway C is offset 500 feet from the Runway 7-25 centerline. There is also Taxiway C1 which serves as a long connector taxiway in the middle of the airfield between Taxiway C and the west end of Runway 7-25. Both Taxiways C and C1 provide a minimum width of 35 feet. The only exception being the portion of Taxiway C between Runway 12-30 and Taxiway A, which provides a width of 50 feet. Taxiway C was given an overall area weighted PCI of 88 (good) while Taxiway C1 was given a 70 (fair) rating in the 2021 pavement report.

While not designated as Taxiway C south of Taxiway A, the pavement does continue south between the various aircraft hangar facilities as non-movement area taxilane. This portion of the taxilane system was rehabilitated in 2019 and is considered to be in good condition with a PCI of 100.

Taxiway D

Taxiway D is a full-length parallel taxiway offset 500 feet on the southwest side of Runway 16-34. It runs from the physical end of Runway 16 to Taxiway A, which connects into the physical end of Runway 34. Taxiway D crosses both Runways 12-30 and 7-25 as well as Taxiway C. There is one connector, Taxiway D1, which ties into the south half of Runway 16-34 between Runway 12-30 and Taxiway C. Taxiway D provides a minimum width of 35 feet while Taxiway D1 is somewhat wider due to the required pavement edge fillets. Taxiways D and D1 were assigned an overall PCI of 85 (good) in the 2021 pavement evaluation.

TABLE 2-2
TAXIWAY CHARACTERISTICS

Designation	Width	Primary Role
Taxiway A	35’ – 50’	Full-length parallel to Runway 12-30
Taxiway C	35’ – 50’	Midfield connector and partial parallel to Runway 25 end
Taxiway D	35’	Full-length parallel to Runway 16-34

SOURCE: 2020 FAA aeronautical publications and 2021 FDOT Airfield Pavement Management Program.

Run-up Areas and Bypass Capability

Currently there are five paved areas on the airfield which provide dedicated space to either perform an engine run-up or to provide taxiway bypass capability. Approximately 600 square yards (SY) of run-up space is provided off Taxiway A just before it connects to Runway 34 the end. This pavement was rated as having a PCI of 74 (satisfactory). At the other end of Runway 12-30, approximately 800 SY of space is provided off Taxiway A before it ties into the physical end of Runway 12. This area received a PCI rating of 84 (good).

There is another run-up area providing approximately 900 SY adjacent to Taxiway A1 which is utilized by aircraft departing from Runway 7. This area was given a PCI of 67 (fair). At the Runway 25 end, there is approximately 550 SY of run-up space with a PCI of 75 (satisfactory) for use by aircraft departing from Runway 25. This run-up area holds water after significant rain events.

The fifth engine run-up area is located at the north end of the airfield off Taxiway D. It provides 1,250 SY of space with direct access to the physical end of Runway 16 and was given a PCI of 56 (fair) in the 2021 pavement report. It has been noted that the pavement in this area holds water after significant rain events. This run-up area also shares pavement with an airport security perimeter road and is adjacent to an automatic vehicle access gate off SE Flying Fortress Lane which is used primarily by airport maintenance personnel.

2.1.2 Airspace and Airport Traffic Control

Controlled airspace is referred to as Class A, B, C, D, or E and uncontrolled airspace as Class G. Generally speaking, Class A airspace begins at 18,000 feet above mean sea level (AMSL), continues upward, and is used to manage en route aircraft traffic. Class B airspace surrounds the nation’s busiest airports including the Miami International (MIA) and Orlando International (MCO) Airports. Class C surrounds airports with high traffic levels, but not as high as Class B airports. Both the Fort Lauderdale International (FLL) and Palm Beach International (PBI) Airports have Class C airspace. Class D surrounds those airports with an ATCT not located in or designated as having Class B or C airspace. Class E airspace is any other controlled airspace where pilots are in radio contact with some portion of the FAA Air Traffic Control (ATC) network. Class G refers to airspace without positive control where the pilot is responsible for maintaining separation standards.

SUA has Class D airspace from the surface up to 2,500 feet AMSL. Surrounding the Class D is an area of Class E airspace from 700 feet above ground level (AGL) up to 17,999 feet AMSL. The area below the Class E, from the surface up to 700 feet AGL, is Class G airspace. The ATCT facility is operated from 7:00 a.m. to 10:00 p.m. local time. When the tower is closed, the airspace surrounding SUA is designated as Class G. The tower is located on the north side of the airfield, off of SE Flying Fortress Lane (**Figure 2-1**). For SUA, the approach and departure flow is managed by Palm Beach Approach/Departure Control out of the ATC facilities at PBI.

Arrival Procedures

A Standard Terminal Arrival (STAR) is an ATC procedure published for arriving aircraft in order to transition from the en route phase of flight to the approach phase. STARs provide guidance to either a published instrument approach procedure or to a point from which ATC might provide the aircraft with radar vectors to their destination. There are three STARs (FEBAD ONE, SHRVY ONE, and TTYLR ONE) published for aircraft en route to SUA.

In addition, there are voluntary arrival routes published in the Special Notices of the FAA's Chart Supplement document. These illustrate and provide information on the preferred arrival routes during visual flight rules (VFR) conditions for aircraft approaching either Runway 12 or Runway 30 for landing.

Instrument Approach Procedures

During times of inclement weather, and/or reduced visibility, instrument approaches enable pilots to safely descend into the airport environment for landing. There are a number of different instrument approaches that can be established, each with specific limitations. When the cloud ceiling is greater than 1,000 feet AGL and the visibility is greater than three statute miles, the conditions are considered visual and pilots can operate under VFR. In VFR conditions, no published approaches are required for an aircraft to safely land at an airport. However, once the cloud ceiling is less than 1,000 feet AGL and/or the visibility is less than three statute miles, pilots must operate under instrument flight rules (IFR). Additional air traffic control services are provided to pilots during IFR conditions. During the arrival phase, instrument approaches are what allow a pilot to safely navigate to and land on a runway.

There are three categories for instrument approaches: precision approaches, approach procedures with vertical guidance, and non-precision approaches. All provide course guidance to the runway centerline they serve. The degree of horizontal guidance increases with the sophistication of the instrument approach established, which is reflected through the specific minimum operating parameters for each. The primary difference between the three is that non-precision approaches do not provide any vertical guidance to the runway end. For both precision approaches and approach procedures with vertical guidance, the vertical course allows an aircraft to descend safely on a fixed glideslope signal, even when the runway environment is not yet in sight.

All instrument approaches have heights published that dictate how low a pilot can descend without the runway environment in sight before having to abandon the approach and try again. For most precision approaches this is called the decision height which is indicated in feet above the ground level or the decision altitude (DA) in feet AMSL. DA is also used in approach procedures with vertical guidance. For non-precision approaches, it is referred to as the minimum descent altitude (MDA) with heights published in the number of feet AMSL. In addition, every instrument approach has minimum visibility requirements, measured in feet or miles. If visual identification of the runway environment cannot be made before the published minimums, then the aircraft must execute a missed approach and either try again or go to an alternate airport.

Precision Approaches

Precision approaches are further defined as any approach that has visibility minimums lower than 3/4 of a mile and the capability of safely guiding aircraft down to heights less than 250 feet above the threshold. There are no precision approaches established to the runways at SUA.

Approach Procedures with Vertical Guidance

Approach procedures with vertical guidance are defined as any approach that has visibility minimums not lower than 3/4 of a mile and the capability of safely guiding aircraft down to heights greater than or equal to 250 feet above the threshold. Precision area navigation (RNAV) procedures based on Global Positioning System (GPS) and the Wide Area Augmentation System (WAAS) have been established to Runways 12 and 30. The WAAS receivers improve the GPS capability to the point where the approaches published have visibility minimums of 3/4 mile and a DA of 268 feet for Runway 12 and visibility minimums of 7/8 mile and a DA of 266 feet for Runway 30. These are referred to as LPV approaches (localizer performance with vertical guidance). There are also LNAV/VNAV approaches, which stands for lateral navigation/vertical navigation, established to both ends of Runway 12-30. For Runway 12 the LNAV/VNAV approach provides visibility minimums of 1 3/8 mile and a DA of 466 feet, while the one to Runway 30 provides 1 3/8 mile and a DA of 404 feet. There are no approach procedures with vertical guidance established to either Runway 16-34 or Runway 7-25.

Non-Precision Approaches

Runway 12-30 also has LNAV non-precision approaches established to both ends. For the smaller aircraft these approaches provide visibility minimums of one mile with MDAs of 420 and 400 feet respectively. The visibility minimums and MDAs are slightly higher for the larger aircraft using these approaches.

For Runways 12 and 30, the RNAV/GPS approaches also provide non-precision approaches with circling minimums. Circling approaches allow an aircraft to approach and establish visual contact with the airport environment in less than VFR conditions. Once in the vicinity, the pilot can then maneuver the aircraft to set up a final approach to any runway end at SUA and land with visibility minimums of one mile and a MDA of 480 feet for the smaller aircraft. The visibility minimums and MDAs are slightly higher for the larger aircraft using these approaches. It should be noted that the FAA classifies runways with only circling approach minimums as visual runways.

Departure Procedures

Departure procedures provide obstacle clearance as aircraft transition from takeoff to the en route phase of flight. Procedures designed for obstacle avoidance are referred to as obstacle departure procedures (ODP) and are described using text only. Other standard instrument departure procedures (SID) are named and published graphically to regulate traffic flows, ensure aircraft separation, enhance capacity, and reduce both pilot/controller workload. There is one departure procedure (SNDLR TWO) published for SUA which provides a SID for aircraft departing from any of the six active runway ends. There are also specific ODPs published for each of the six runway ends at SUA. These simply establish the preferred departure heading and minimum altitude before a turn can be made.

In addition, there are voluntary departure routes published in the Special Notices of the FAA's Chart Supplement document. These illustrate and provide information on the preferred departure routes during VFR conditions for aircraft taking off of Runway 12 or Runway 30.

2.1.3 Airfield Lighting

Proper airfield lighting is required at all airports that are utilized for nighttime or IFR operations. With the exception of the airport rotating beacon, the lighting systems at the airport are supported by equipment in the airfield electrical vault, with primary control routed to the ATCT.

Identification Lighting

Rotating beacons universally indicate the location and presence of an airport at night or in adverse weather conditions. The rotating beacon is located on the south side of the airfield adjacent to the U.S. Customs and Border Protection (CBP) facility. It is equipped with an optical rotating system that projects two beams of light, one green and one white, 180 degrees apart. The beacon, which is considered to be in fair condition, is continuously operated during nighttime hours or when the airfield is under instrument meteorological conditions.

Runway Lighting

Runway lights allow pilots to identify the edges of the runway and assists them in determining the length remaining during periods of darkness or restricted visibility. These lighting systems are classified according to their intensity or brightness. Runways 12-30 and 7-25 are equipped with Medium Intensity Runway Lights (MIRL). The runway edge lights emit white light except in the caution zone which includes the lights in the last 2,000 feet of both runways. In the caution zone, yellow lights are substituted for white lights (split lens) to emit yellow light in the direction with 2,000 feet or less to the runway end and white light for the opposite direction. The MIRLs for Runways 12-30 and 7-25 both consist of base mounted light emitting diode (LED) fixtures on concrete cans with the cables in conduit. Runway 16-34 does not have a runway lighting system.

As part of the runway lighting systems, the identification of the runway ends and thresholds are critical to a pilot during landing and takeoff. This is especially important when a runway end has a displaced threshold. Therefore, the runway ends are equipped with special lighting configurations to aid in their identification. At the physical ends of Runways 12-30 and 7-25, sets of four inboard threshold lights are installed which display red from both directions. For the Runway 12 displaced threshold there are four outboard threshold lights which have split lenses. The half of the lens which faces the approaching aircraft are green, indicating the beginning of usable runway. From the opposite direction, only the innermost light, the light that is in line with the runway edge lighting emits light. For aircraft using Runway 30, these are yellow, since they are part of the runway edge lighting's caution zone. The outside three on each side are shielded from emitting any light to aircraft using Runway 30 for landing or takeoff.

The two MIRL systems are considered to be in good condition. Additionally, the runway lighting, as well as the taxiway lighting described in the following section, can be activated by pilots through the common traffic advisory frequency (CTAF) when the ATCT is closed. When activated, the lighting systems for both runways and all taxiways come on and then turn off automatically after a set period of time.

Taxiway Lighting

All of the taxiways have blue Medium Intensity Taxiway Lights (MITL) along the edge of their pavement. The circuits on Taxiways A2 and A3 have incandescent light fixtures while all of the others have LED fixtures. The MITLs have been installed using base mounted light fixtures on concrete cans with the cables in conduit. All of the taxiway lighting circuits are considered to be in good condition.

Airfield Signage

As part of the airfield lighting system, the airport has a number of internally illuminated airfield signs. These include mandatory instruction, location, direction, and destination signs. The mandatory signs include the holding position signs which delineate to a pilot the limits of the runway environment. These critical signs are typically located on the left side of each connector taxiway, adjacent to the runway holding position markers. The current airfield signage is considered to be in good condition. The signage on Taxiways A2 and A3 as well as those around the sterile CBP aircraft parking apron area are incandescent fixtures, while the others are LED. As there is no lighting for Runway 16-34, the signage approaching and along the runway is not internally illuminated. Additionally, the noise abatement signage and the signs approaching southwest end of Taxiway A from the aircraft parking apron areas are not internally illuminated.

2.1.4 Pavement Markings

Pavement markings delineate the various movement areas of the airfield. The following sections describe those markings used at SUA which establish the various boundaries and paths along the paved surfaces.

Runway Markings

Both Runways 12-30 and 7-25 have non-precision markings which include landing designators, centerline striping, threshold, aiming point, and edge markings. Runway 16-34 is considered to have visual markings since there are no threshold markings. The Runway 16-34 markings are interrupted at the intersections with Runway 12-30 and Runway 7-25, due to the order of precedence for runway marking schemes. While Runway 16-34 is designated as the crosswind runway, Runway 7-25 is utilized more. Threshold bars and the appropriate arrows and arrow tails have been included to denote the displaced thresholds for Runways 12, 16, and 34. All of these markings are white. The EMAS beds on both ends of Runway 12-30, as well as the various paved blast pads are marked with the appropriate yellow chevrons. The various runway markings appeared to be in good condition during the visual inspection conducted in the early part of 2020, which matches the condition noted in the most recent FAA Airport Master Record (Form 5010) for SUA in May of 2020.

Taxiway Markings

All of the taxiways have centerline stripes, edge markings, and holding position markings at each intersection with a runway. The hangar taxilanes also have yellow centerline stripes while the various aircraft parking aprons have the appropriate non-movement area boundary markings and the run-up areas have intermediate holding position markings.

Many of the taxiway markings are painted yellow with a black background. Most of the taxiway markings appeared to be in good condition during the visual inspection conducted in the early part of 2020; however, some were faded.

2.1.5 Takeoff and Landing Aids

A number of different systems on the airfield facilitate the arrival and departure of aircraft. The primary ones are described in the following sections.

Runway End Identifier Lights

Runway End Identifier Lights (REIL) consist of a pair of synchronized white flashing lights which are situated on each side of and abeam the runway end threshold lights. They provide pilots with a rapid and positive visual identification of the approach end of the runway during night, instrument, and marginal weather conditions. REILs also aid in identification of the runway end in areas having a high concentration of lighting or areas that lack contrast with the surrounding terrain. Both ends of Runway 12-30 are equipped unidirectional REILs.

Visual Glide Slope Indicators

Visual glide slope indicators are systems installed to provide an indication of the aircraft's relation to the proper glideslope. Precision Approach Path Indicator (PAPI) systems have been installed for landings to both ends of Runway 12-30 and Runway 7-25. The lights of a PAPI system provide pilots with visual descent information during an approach to a runway. These lights are typically visible from five miles during the day and up to 20 miles or more at night. PAPIs use a light bar unit that is installed in a single row perpendicular to the runway edge. The lights project a beam of white light in the upper segment and red light in the lower segment. Depending on the aircraft's angle in relation to these lights, the pilot will receive a combination that indicates his position relative to the desired glideslope.

Each of the PAPIs at SUA are a 4-light unit system located on the left side of the runway they serve (PAPI-4L). All of the PAPI systems are considered to be in good condition and each is owned and maintained by the airport.

Runway Distance Remaining Signs

Runway distance remaining signs provide pilots with a quick reference on the length available (in 1,000 foot increments) for takeoff or landing operations. While preferred on the left side of any runway, the most economical option is to utilize double-faced signs on one side of the runway. This is the case at SUA where double-faced distance remaining signs are located along the north edges of both Runway 12-30 and Runway 7-25; providing information to pilots operating to/from either end of the runway. The runway distance remaining signs are lighted and considered to be in good condition.

Automated Weather Observing System

The airport has an Automated Weather Observing System (AWOS) located in the middle of the airfield, just north of Runway 12-30 (see **Figure 2-1**). The AWOS is a combination of instruments which observe, report, and record the airfield altimeter setting, wind data, temperature, precipitation, dew point, visibility, and cloud/ceiling data. Pilots can receive this information via the Automatic Terminal Information Service (ATIS) or through a dedicated telephone number. The AWOS equipment is owned by the airport and maintained on a regular basis; however, the various sensors are getting old and only considered to be in fair condition.

Wind and Traffic Indicators

Perhaps the most basic takeoff and landing aid is the wind cone, which indicates wind direction and speed. There are a number of lighted wind cones on the airfield. The primary wind cone is collocated with the segmented circle in the middle of the airfield, just east of the AWOS. Together, these provide pilots with a visual indication of the current surface wind conditions, established traffic patterns for the airfield, and if the ATCT is closed, the preferred landing direction. For SUA, while the primary wind cone is lighted, the segmented circle is not, which renders it impractical for use since the ATCT is open during all daylight hours. Regardless, the primary wind cone and segmented circle are considered to be in good condition.

There are also four supplemental wind cones located on the airfield. The one on the right side Runway 7 and the ones on the left side of Runways 34 and 25 are lighted. The fourth is unlit and located on the left side of Runway 16, just north of Runway 7-25. All of the supplemental wind cones are considered to be in good condition.

Compass Calibration Pad

A compass calibration pad, often called a compass rose, used for calibration of a compass relative to the heading of an aircraft. The compass calibration pad markings consist of 12 radials painted on the pavement with non-metallic paint. The radials extend toward the determined magnetic headings every 30 degrees beginning with magnetic north. There is a compass rose located near the middle of the airfield, with access off of Taxiway D (see **Figure 2-1**). While the pavement and markings are considered to be in good condition, there is quite a bit of erosion around the pavement edges of the compass rose.

2.2 General Aviation Facilities

A majority of the facilities at SUA directly support the general aviation tenants and customers of the airfield. While not every facility or tenant is described in the following sections, the primary facilities providing services to support nearly every form of general aviation activity at SUA are described.

2.2.1 Aeronautical Businesses and Services

A number of aeronautical businesses at the airport provide aircraft storage, maintenance, management, sales, flight training, charter, rental, and other aviation services. Many of these are tenants within the two full service fixed base operator (FBO) leaseholds at SUA.

APP Jet Center

APP Jet Center is one of the two full service FBOs at SUA. The facilities managed and operated by APP Jet Center are located to the southwest of the intersection of Taxiways A and C. Their facilities include a 6,500 square foot (SF) general aviation terminal; eight clearspan hangars providing approximately 116,300 SF of hangar and office space; three shade hangars for 21 small aircraft; approximately 9,000 SY of aircraft apron space; and aviation fuel facilities (described in a subsequent section). Only the primary portion of the aircraft parking apron to the north and side of the APP Jet Center terminal was included in the 2021 pavement report. This area received an average PCI rating of 58 (fair) and experiences significant flooding at the northernmost end when the stormwater area between the apron and Taxiway A fills up.

Atlantic Aviation

Atlantic Aviation is the other full service FBO at SUA. The facilities managed and operated by Atlantic Aviation are located primarily in the southeast portion of the airfield off Taxiway A. Their facilities include a 9,000 SF general aviation terminal; 17 clearspan hangars providing approximately 249,700 SF of hangar and office space; T-hangar and box hangar space for 74 aircraft; approximately 62,500 SY of aircraft apron space; and aviation fuel facilities (described in a subsequent section). A majority of the aircraft parking apron on the east half ranged from a PCI of 75 to 84 (satisfactory) in the 2021 pavement report. The area in the middle had a PCIs of 63 and 66 (fair) while the smallest one in the southeast corner of the FBO leasehold was rated as 64 (fair).

Precision Jet Service

Precision Jet Service provides maintenance and avionics technical support, as well as aircraft management services for primarily turbine aircraft. Located to the west of the CBP facility, Precision Jet Service operates out of an 18,000 SF hangar and has approximately 8,500 SY aircraft apron space. The apron was reported as having a PCI of 33 (very poor) in the 2021 pavement report.

Daher Aerospace

Daher Aerospace is a division of Daher Group, which designs, engineers, manufactures, repairs, and overhauls aircraft and various aircraft structures. The facility at SUA primarily provides metallic and composite aerostructure assemblies. While certainly an aviation related business, Daher does not have, nor does it need airside access since their supplies and products utilize trucks and rail cars. A rail spur off the Florida East Coast Railway line crosses SE Dixie Highway (SR A1A) to directly serve the Daher facilities.

2.2.2 Public Operators

In addition to the FBO and other private businesses, SUA also supports two public agencies that utilize aviation for the vital services they provide to the surrounding community.

Martin County Sheriff's Office Aviation Unit

The Martin County Sheriff's Office Aviation Unit operates out of a facility on the north side of the airfield, adjacent to the ATCT. The Aviation Unit operates surplus military Bell OH-58 Kiowa helicopters to support law enforcement activity throughout Martin County. Their facilities include a 5,600 SF hangar, 2,400 SF office space, and approximately 1,500 SY of apron space. The apron, which was not included in the 2021 pavement report includes a lighted heliport and a Jet A fuel tank.

Martin County Fire Rescue

Martin County Fire Rescue operates a medevac helicopter, through a contract with Lifestar, out of a facility on the north side of the airfield, also adjacent to the ATCT. They currently utilize a Eurocopter EC-135 helicopter for their emergency services. The facilities include a 4,800 SF hangar, 3,200 SF office space, and approximately 1,300 SY of apron space. The apron, which was not included in the 2021 pavement report includes a lighted heliport as well as space for the operation and parking of a Jet A fuel truck.

On the other side of Runway 16-34, just north of the abandoned runway pavement, is the Martin County Fire Rescue Training Facility. Currently this facility is very limited with only temporary structures; however, plans for a permanent facility in the same location are currently being developed.

2.2.3 Aviation Organizations

SUA is home to local chapters of two national aviation organizations, as well as a local pilots' association.

Civil Air Patrol

The Civil Air Patrol (CAP) is the official United States Air Force Auxiliary. Nationwide, the CAP operates approximately 560 single-engine piston aircraft, flying about 100,000 hours annually in support of search and rescue, disaster relief, air defense, cadet orientation flights, and Air Force assigned missions. The Stuart Composite Squadron of the CAP operates out of a facility that is a part of the Atlantic Aviation leasehold and has approximately 50 members.

Experimental Aircraft Association

Headquartered in Oshkosh, WI, the Experimental Aircraft Association (EAA) fulfills a mission of supporting and encouraging recreational aviation throughout the nation. The local EAA chapter at SUA meets regularly in a facility leased from Atlantic Aviation. This EAA chapter performs and supports a number of activities at SUA including airport tours and events related to their "Young Eagles" program, which has the sole mission of inspiring and exposing youth to aviation.

Witham Aero Club

The Witham Aero Club is a not for profit, members only group of aircraft owners who collectively occupy a number of T-hangar facilities on the south side of the airport. The leasehold for their facilities is adjacent to both of the full service FBOs.

2.2.4 Support and Service Facilities

There are a number of facilities around the airfield which provide support and/or different services to the airfield and its operation, as well as the tenants and customers. The key facilities are described in the following sections.

Airport Administration Building

The main offices for airport management staff are currently located in a one-story structure south of the approximate midpoint of Taxiway A. The current 1,700 SF building also accommodates airport operations and badging functions, as well as the electrical vault for the airfield. At the time of this writing, a two story administration building is being designed to provide a total of 8,600 SF of space. The new facility will be located just south of the existing facility and will continue to house all of the airport administrative services as well as the airfield electrical vault.

Airfield Electrical Vault

The airfield electrical vault (located within the airport administration building) houses all of the airfield lighting regulators, meters, main disconnect, breaker panels, airfield lighting control panel, and radio equipment to facilitate pilot control of the airfield lighting. The vault also has a backup generator for the airfield lighting circuits. When the current vault is relocated with the new airport administration building, all of the equipment will be replaced, tested, and brought online before the old vault is decommissioned.

Airport Maintenance Building

The airport has various pieces of equipment to maintain the airport facilities, which vary from simple hand tools to larger vehicles, mowers, and construction equipment. A 7,500 SF airport maintenance building with four service bays is located on the north side of the airfield, adjacent to the Martin County Sheriff's hangar. This facility provides the maintenance, storage, supplies, shop, and office space needed to maintain the airport's equipment, as well as a community room. A 3,000 SF covered large equipment storage area was constructed just north of the maintenance building at the beginning of 2020.

Fuel Farms

The airport has three fuel farms which are managed by the two FBOs and provide storage for both aviation fuels and diesel fuel for ground equipment. One of the fuel farms is managed by APP Jet Center and two by Atlantic Aviation. The farm managed by APP is located on the west side of their leasehold with landside access via Witham Field Drive. One of Atlantic's farms is located to the south of their T-hangar and box hangar area with access off of SE Aviation Way. The other is located on the west half of the Atlantic leasehold with access off SE Airport Road. The fuel type, ownership, and storage capacity for each tank is included in **Table 2-3** below.

TABLE 2-3
FUEL FARM TANKS

Fuel Type	Ownership	Capacity (gallons)
Jet A	APP Jet Center	20,000
Jet A	APP Jet Center	15,000
Jet A	APP Jet Center	12,000
100LL	APP Jet Center	12,000
Jet A	Atlantic Aviation	20,000
Jet A	Atlantic Aviation	15,000
Jet A	Atlantic Aviation	15,000
100LL	Atlantic Aviation	15,000
Mogas	Atlantic Aviation	1,000
Diesel	Atlantic Aviation	5,000

SOURCE: Atlantic Aviation and APP Jet Center, 2023.

The FBOs also utilizes a number of fuel trucks to conduct aircraft fueling operations. APP Jet Center operates two 5,000 gallon Jet A trucks, two 3,000 gallon Jet A trucks, one 1,000 gallon 100LL truck, and one 750 gallon 100LL truck. Atlantic Aviation operates three 5,000 gallon Jet A trucks, one 3,000 gallon Jet A truck, one 2,000 gallon Jet A truck, and one 1,000 gallon 100LL truck.

U.S. Customs and Border Protection

U.S. Customs and Border Protection (CBP) maintains a facility just off Taxiway A and west of the airport administration building. This facility allows CBP officers to screen visitors and returning U.S. citizens, as well as any cargo, arriving at the airport from a foreign country. The facility is unique in that it also serves as a port of entry for boaters. This makes it the first intermodal clearance facility of its kind built in the state of Florida. As a user fee facility, the processing of aircraft, their passengers, and cargo entering the U.S. is paid for by those receiving the service. Directly in front of the CBP building there is a 900 SY aircraft parking apron. This sterile area is a 90 foot by 90 foot box outlined with a red border and signs on the pavement surface. The apron was reported as having a PCI of 33 (very poor) in the 2021 pavement report.

2.3 Martin County Public Works

In the south corner of the airport, between the Atlantic Aviation and Witham Aero Club leaseholds is the Martin County Public Works facilities. This approximate 15 acre area has no airside access, but two vehicle entrances off of SE Aviation Way. A number of services for Martin County are conducted from this site including field maintenance (roadways), mosquito control, sign/signal shop, building maintenance, and fleet maintenance.

2.4 Landside Access

Landside access to the south side of the airfield, where a majority of the airport facilities are located, is provided off of SE Dixie Highway (SR A1A). SE Airport Road, Witham Field Drive, and SE Aviation Way all provide access to the different facilities along SE Dixie Highway. The exception is SE Flying Fortress Lane, which provides access via SE Monterey Road (SR 714) to the north side of the airfield (see **Figure 2-1**).

CHAPTER 3

Aviation Activity Forecasts

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CHAPTER 3
Aviation Activity Forecasts

3.1 Introduction

This chapter presents projections of aviation activity that form the basis of future development needs for Witham Field (SUA). Previous activity forecasts, industry trends, socioeconomic conditions, and historic data were also analyzed and applied to methodologies accepted by both the Federal Aviation Administration (FAA) and Florida Department of Transportation (FDOT) to develop these forecasts.s

The standard planning period for an airport master plan is 20 years and the key planning periods include the five, ten, and 20-year horizons. Since this study was largely conducted in 2020, the forecasts are presented for 2025, 2030, and 2040. The forecasts primarily use data obtained through calendar year 2019. For a complete picture of operational activities and emerging opportunities at SUA, interviews were also conducted with the airport tenants, customers of the airfield's facilities, airport businesses, and industry groups, as well as airport and air traffic control management.

The preparation of these forecasts began just as the COVID-19 pandemic was starting to shut down many industries. Since that time, the overall activity levels at most airports have decreased significantly. For SUA, both the months of April and May 2020 had significant decreases; however, activity since has shown signs of a rebound. In addition to the historic activity used for the development of these forecasts, the annual operations section also includes an overview of the monthly activity that has occurred at SUA during the first half of 2020. While it is uncertain how long the pandemic will last and what the long term impacts to aviation will be, it has been estimated that it will take two to four years for most segments of the aviation industry to recover. As noted above, the base year primarily uses data from 2019; therefore, 2020 is considered the study year of this master plan. The resulting 20-year forecasts for 2021 through 2040 may be moved out or adjusted based on the actual recovery that occurs. In fact, for the purposes of this study, the forecasts will also be utilized to develop planning activity levels for different facility requirements.

3.2 Recent Projections of Aircraft Activity

The most recent local, state, and national forecasts for SUA include those prepared for the 2010 Airport Master Plan Update, FDOT's Florida Aviation System Plan (FASP), and the FAA's 2019 Terminal Area Forecast (TAF). Each forecast projects different levels of based aircraft and annual operations for the airport as summarized in the following sections. As required by the FAA, a direct comparison of the recommended forecasts must be made relative to the FAA TAF. This comparison is included at the end of this chapter.

3.2.1 2010 Airport Master Plan Update

The 2010 Airport Master Plan Update included forecasts which were projected over a 20-year planning period using 2009 as the base year. The expected number of based aircraft and annual operations for the key planning horizons of that study are included in **Table 3-1** below. In 2019 there were 333 based aircraft and 120,644 annual operations conducted at SUA. These figures surpass the 2030 projection from the previous master plan.

TABLE 3-1
2010 AIRPORT MASTER PLAN UPDATE

	Based Aircraft	Annual Operations
Base Year		
2009	233	61,228
Forecast		
2015	252	67,387
2020	271	73,543
2030	314	85,145
Average Annual Change (2009 – 2030)	1.4%	1.6%

SOURCE: 2010 Airport Master Plan Update.

3.2.2 Florida Aviation System Plan

The Florida Aviation System Plan (FASP) provides a comprehensive planning and development guide for the state's public airports. The FASP ensures that Florida has an effective statewide aviation transportation system which provides a link to the global air transportation network and effectively interfaces with regional surface transportation systems. In support of these goals, FDOT's Aviation Office provides regular updates of the historic aviation data and prepares forecasts of the based aircraft and annual operations for each public airport in the state. The FASP information is included as part of the Florida Aviation Database with the most recent update providing historic data based aircraft data through 2018 with projections out to 2037 and historic annual operations data through 2015 with projections out to 2035. FASP data for the key forecast horizons of this study, including an extrapolation to 2040, are shown in **Table 3-2**. While the current level of based aircraft is slightly ahead of the FASP projection, the actual annual operations exceed those projected in the FASP for 2036.

TABLE 3-2
FLORIDA AVIATION SYSTEM PLAN

		Based Aircraft		Annual Operations
Base Year				
2015		-		86,511
2018		308		-
Forecast				
2020		330		93,565
2025		348		101,194
2030		366		109,445
Average Annual Change	(2018 – 2037)	1.1%	(2015 – 2035)	1.6%
Extrapolated				
2040		407		128,019

SOURCE: Florida Aviation Database, January 2020 and ESA analysis, 2020.

3.2.3 FAA Terminal Area Forecast

The Terminal Area Forecast (TAF) is prepared annually by the FAA to meet the budget and planning needs of the agency, as well as to provide information for use by state agencies, local authorities, the aviation industry, and the public. Projections in the FAA TAF are prepared for each airport in the National Plan of Integrated Airport Systems (NPIAS). The TAF projections detailed in **Table 3-3** are based on the federal fiscal year, which ends on September 30th. The 2019 TAF (issued in January 2020) utilizes 2018 as the base year for based aircraft and 2019 for annual operations.

TABLE 3-3
FAA 2019 TERMINAL AREA FORECAST

		Based Aircraft		Annual Operations
Base Year				
2018		313		-
2019		-		118,247
Forecast				
2020		317		121,571
2025		332		123,750
2030		344		125,975
2040		364		130,565
Average Annual Change	(2018 – 2040)	0.7%	(2019 – 2040)	0.5%

NOTE: Annual operations based on FAA fiscal year ending September 30th.

SOURCE: 2019 FAA Terminal Area Forecast, issued January 2020.

3.3 Factors Influencing Forecast Approach

To guide the forecasting effort, an understanding of the relationship between industry trends and the airport operating environment is essential. Using historic information and data, it is possible to compare how changes in the general aviation industry and local area economics may have impacted activity at SUA. The analysis of recent trends also allows educated assumptions to be made as to how the airport's service area and activity will be affected in the future.

National, regional, and local trends with the potential to impact existing, expanded, or even create new general aviation activity were identified from several sources. In addition to the historic data and recent activity forecasts, information was collected from a number of industry reports and studies including, but not limited to:

- 2020 FAA Aerospace Forecast (2019– 2040)
- FAA Annual Business Jet Reports (2009 – 2019)
- General Aviation Manufacturers Association (GAMA) Annual Aircraft Shipment Reports (2001 – 2019)
- Florida Statewide Aviation Economic Impact Study Update and Individual Airport Summary Reports (March 2019)

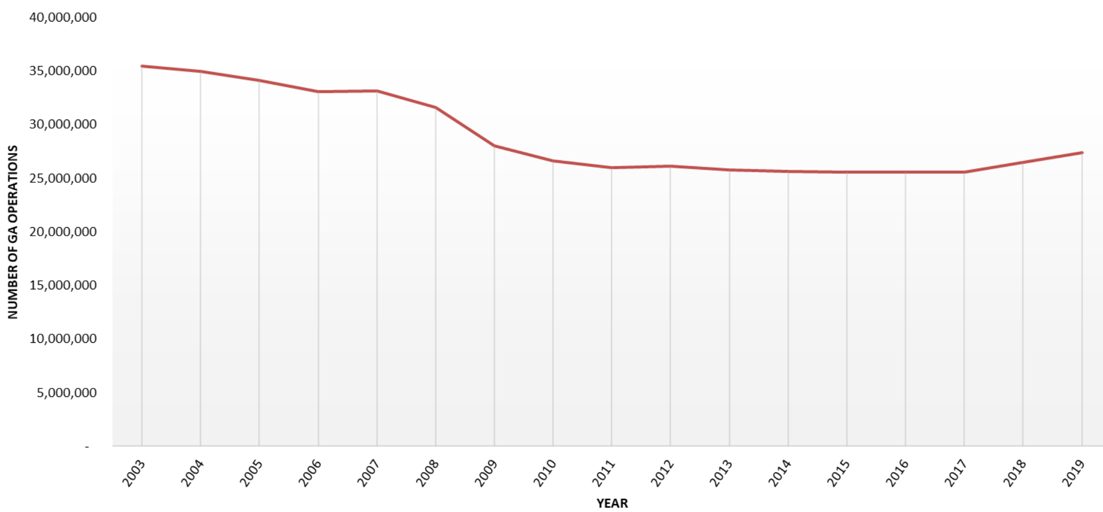
The information gathered helps frame SUA's role in the national air transportation network and provides insight into how activity at the airport may change over time.

3.3.1 State of the General Aviation Industry

Since the airport has returned from a military operated airfield, the activity has been predominantly general aviation. In fact, over the past 20 years, there has only been an average of 340 military operations each year. General aviation encompasses all segments of the aviation industry except for the activity that is conducted by commercial airlines and the military. Examples include pilot training, law enforcement flights, medical transportation, aerial surveys, aerial photography, agricultural spraying, advertising, and various forms of recreation, not to mention business, corporate, and personal travel.

Between 2003 and 2007, the industry experienced major advances in aircraft and navigation technologies, which created new product offerings and services during a period with an overall good economy. These included widespread use of Global Positioning Satellite (GPS) technology, the emergence of very light jet aircraft, and the introduction of an entirely new category; the light sport aircraft. These new product offerings and services bolstered most every segment of the general aviation industry. In spite of this, the only growth in general aviation activity for this period was between 2006 and 2007 (see **Figure 3-1**).

Figure 3-1
Nation's General Aviation Operations (All Towers)
2020 FAA Aerospace Forecast



By the end of 2008, most segments of the industry experienced losses as the overall national economy declined during the Great Recession. The very light jet industry was hit hardest as many manufacturers delayed development plans and/or went bankrupt. Data from the General Aviation Manufacturer's Association (GAMA) showed that general aviation aircraft manufactured in the U.S. fell from a high of 3,279 aircraft in 2007 to 1,334 in 2010. It was not until 2011 that GAMA reported the first increase in new general aviation shipments since 2007. While manufacturing has increased most every year since 2011, 2017 levels were still less than half of those before the Great Recession. Compounding this issue, the 2020 FAA Aerospace Forecast documents the decline in the number of aircraft in the nation's overall active general aviation fleet between 2007 and 2013. It is interesting to note that the greatest decline between 2011 and 2013 was attributed to the 2010 Rule for Re-Registration and Renewal of Aircraft Registration. According to the FAA, implementation of this rule removed cancelled, expired, or revoked records from the national database.

Overall, the 2020 FAA Aerospace Forecast projects general aviation growth over the next 20 years, despite the industry fluctuations that are likely to continue. While the number of active general aviation aircraft is only expected to increase slightly (less than a tenth of a percent annually) through 2040, this growth is not consistent across all segments of activity. The most common single-engine piston aircraft are expected to decline 1.0 percent annually for the period while jet aircraft are forecast to grow 2.2 percent each year. The number of hours flown by all general aviation aircraft is projected to increase at a rate of 0.7 percent each year. Similar to the fleet projections, the hours flown by turbine aircraft are forecast to grow 2.6 percent annually while the single-engine piston aircraft show a decline in activity of 1.0 percent each year. These turbine aircraft projections are supported by figures in the FAA's monthly Business Jet Reports which shows that operations conducted by general aviation jet aircraft have consistently increased since the low in 2009. They are however, still just below the level recorded for 2007, prior to the negative press during the 2008 and 2009 corporate bailouts which resulted in a 20 percent decrease in total business jet activity by the end of 2009.

3.3.2 Service Area and Other Airports

A number of different elements define the region or service area of an airport's customers. Geographical features, surface access, services offered, and competing facilities are primary factors in determining the service area. This is especially true in Florida where there are a numerous airports capable of supporting significant general aviation operations. In addition to specific airport features, most general aviation customers place a significant value on convenience.

There are two other airports in the surrounding area that accommodate similar general aviation operations as SUA. These are Treasure Coast International Airport (FPR) to the north and North Palm Beach County Airport (F45) to the south. Both are approximately 23 miles from SUA and while they are each located in different counties, they both lie within the service area for SUA. The service area for SUA is estimated to be within 25 miles of the airfield; encompassing most of Martin County and portions of St. Lucie County to the north and Palm Beach County to the south. In addition to the information shown in **Table 3-4**, all three of the airports provide Jet A and 100LL (AvGas) fuel, as well as both major airframe and major powerplant repairs. Both FPR and SUA have U.S. Customs and Boarder Protection (CBP) services, but F45 does not.

TABLE 3-4
OTHER AREA AIRPORTS

	Longest Runway	Best Instrument Approach	Airport Traffic Control Tower	Based Aircraft	Annual Operations
Treasure Coast International (FPR)	6,492’	Precision	Yes	271	188,317
Witham Field (SUA)	**5,828’**	**Non-Precision**	**Yes**	**333**	**120,644**
North Palm Beach County (F45)	4,300’	Precision	No	275	97,400

SOURCE: FAA Chart Supplements, FAA Terminal Procedures, and 2019 FAA Terminal Area Forecasts (issued January 2020).

It should be noted that while F45 is intended to serve as a reliever for Palm Beach International Airport (PBI), the current runway lengths at F45 limit its ability to effectively perform that role. More recently, F45 has not been able to serve as a reliever to PBI during the frequent presidential Temporary Flight Restrictions (TFRs). During the presidential TFRs, business aircraft often shift their activity to SUA or Boca Raton Airport since both airports are outside of the 10 nautical mile TFR inner core, have longer runways, and CBP services.

3.3.3 Local Socioeconomic Factors

A number of socioeconomic indicators were evaluated that typically have a direct relationship to the use of aviation and therefore to airport activity. Overall growth and average annual growth rates for Martin County, the State of Florida, and the U.S. are presented based on data obtained from Woods & Poole Economics, Inc. The Woods & Poole projections are updated annually, utilizing models which take into account specific local conditions based on historic data back to 1969 in order to develop projections through 2050. While the current historic data sets from Woods & Poole cover the period from 1969 to 2017, only data back to 2008 are shown in the tables that follow; reflecting the general trends over the past 10 years. Historic socioeconomic data prior to 2008 was utilized in the various analyses of aviation activity, especially as part of the regression models evaluated.

Population

Historically, Martin County has had overall growth rates and annual population growth rates consistent with those for Florida (**Table 3-5**). In the future, this relationship is expected to remain the same with both Martin County and the state having similar growth rates in population over the course of the planning period.

TABLE 3-5
TOTAL POPULATION

	Martin County	State of Florida	United States
Historic Data			
2008	144,369	18,527,305	304,093,926
2009	145,506	18,652,644	306,771,489
2010	146,916	18,846,461	309,338,364
2011	147,876	19,097,369	311,644,211
2012	149,028	19,341,327	313,993,213
2013	151,219	19,584,927	316,234,439
2014	153,246	19,897,747	318,622,035
2015	155,721	20,268,567	321,041,857
2016	158,484	20,656,589	323,410,728
2017	159,923	20,984,400	325,719,178
Overall Growth (2008 – 2017)	10.8%	13.3%	7.1%
Average Annual Change (2008 – 2017)	1.1%	1.4%	0.8%
Forecast			
2025	175,513	23,083,532	344,322,470
2030	186,019	24,434,878	355,709,246
2040	208,955	27,134,053	376,678,931
Average Annual Change (2017 – 2040)	1.2%	1.1%	0.6%

SOURCE: Woods & Poole Economics, Inc., 2019.

Employment

Employment data can provide one indication of the economic stability of a geographic area. As shown in **Table 3-6**, Martin County employment has grown at a rate similar to that of the rest of the state. The employment base for Martin County is expected to increase at a similar rate over the course of the planning period.

TABLE 3-6
TOTAL EMPLOYMENT (NUMBER OF JOBS)

	Martin County	State of Florida	United States
Historic Data			
2008	83,496	10,269,501	179,213,862
2009	80,335	9,841,872	173,636,689
2010	81,437	9,805,155	172,901,697
2011	81,639	10,036,628	176,091,699
2012	82,590	10,249,021	178,979,671
2013	84,569	10,539,254	182,325,137
2014	88,777	10,937,681	186,235,838
2015	92,824	11,366,549	190,317,817
2016	96,445	11,673,434	193,368,859
2017	98,462	11,912,882	196,132,182
Overall Growth (2008 – 2017)	17.9%	16.0%	9.4%
Average Annual Change (2008 – 2017)	1.8%	1.7%	1.0%
Forecast			
2025	116,765	13,652,343	217,624,631
2030	129,159	14,755,429	230,537,864
2040	154,990	16,907,688	254,118,415
Average Annual Change (2017 – 2040)	2.0%	1.5%	1.1%

SOURCE: Woods & Poole Economics, Inc., 2019.

Income

Personal income per capita represents the ratio of total personal income, before income taxes, to the total resident population. Adjustments are also made if the income was earned in a different area than where the person resides. Martin County has significantly outpaced the state in personal per capita income growth over the last ten years (**Table 3-7**). Over the course of the planning period, Martin County's personal income per capita is expected to continue to have a higher average annual growth rate than the state.

TABLE 3-7
TOTAL PERSONAL INCOME PER CAPITA (IN 2019 DOLLARS)

	Martin County	State of Florida	United States
Historic Data			
2008	$ 60,790	$ 39,240	$ 40,904
2009	$ 52,495	$ 36,580	$ 39,284
2010	$ 54,335	$ 38,511	$ 40,545
2011	$ 57,901	$ 40,120	$ 42,727
2012	$ 66,044	$ 40,944	$ 44,582
2013	$ 61,976	$ 40,582	$ 44,826
2014	$ 69,607	$ 43,146	$ 47,025
2015	$ 73,189	$ 45,352	$ 48,940
2016	$ 76,211	$ 46,148	$ 49,830
2017	$ 79,104	$ 47,684	$ 51,640
Overall Growth (2008 – 2017)	30.1%	21.5%	26.2%
Average Annual Change (2008 – 2017)	3.0%	2.2%	2.6%
Forecast			
2025	$114,176	$ 67,683	$ 72,250
2030	$147,804	$ 87,034	$ 92,306
2040	$246,324	$142,609	$149,894
Average Annual Change (2017 – 2040)	5.1%	4.9%	4.7%

SOURCE: Woods & Poole Economics, Inc., 2019.

Households

Households represent the number of occupied housing units, which include homes, apartments, a group of rooms, or single rooms occupied as separate living quarters. The number of households does not include facilities such as retirement homes, college dormitories, military barracks, or prisons. The overall growth in the number of households for Martin County has been consistent with the state (**Table 3-8**). The projection over the next 20 years is that Martin County will continue to experience similar growth in the number of households.

TABLE 3-8
TOTAL NUMBER OF HOUSEHOLDS

	Martin County	State of Florida	United States
Historic Data			
2008	63,229	7,408,025	116,538,673
2009	63,272	7,393,209	116,761,870
2010	63,977	7,435,801	116,938,345
2011	65,218	7,617,373	119,315,163
2012	66,177	7,724,395	120,466,242
2013	67,247	7,845,644	121,834,231
2014	68,069	7,926,134	122,600,297
2015	69,307	8,047,925	123,951,411
2016	70,581	8,168,607	125,177,125
2017	71,423	8,236,835	125,580,062
Overall Growth (2008 – 2017)	13.0%	11.2%	7.8%
Average Annual Change (2008 – 2017)	1.4%	1.2%	0.8%
Forecast			
2025	80,361	9,278,900	136,296,722
2030	84,453	9,731,936	139,725,473
2040	92,161	10,480,067	143,927,370
Average Annual Change (2017 – 2040)	1.1%	1.1%	0.6%

SOURCE: Woods & Poole Economics, Inc., 2019.

Gross Regional Product

Gross Regional Product (GRP) is based on the U.S. Bureau of Economic Analysis gross domestic product data for each state. The nation's figures represent a total for all states while the individual county data has been estimated by Woods & Poole. For the county data, this is done by allocating the state GRP to the counties based on the proportion of total state earnings by employees originating from a particular county. It is interesting to note that unlike employment, the GRP for Martin County has had a much slower trend over the past ten years. As shown by the figures in **Table 3-9**, Martin County and the state were impacted by the Great Recession and have recovered since. For Martin County, the full recovery did not occur until 2016; however, that trend is projected to change over the course of the planning period, with GRP for the county expected to increase.

TABLE 3-9
GROSS REGIONAL PRODUCT (IN MILLIONS OF 2012 DOLLARS)

	Martin County	State of Florida	United States
Historic Data			
2008	$ 6,007	$ 796,880	$ 15,525,015
2009	$ 5,858	$ 770,062	$ 15,251,545
2010	$ 5,798	$ 770,901	$ 15,556,281
2011	$ 5,392	$ 761,011	$ 15,725,298
2012	$ 5,360	$ 769,309	$ 16,083,776
2013	$ 5,366	$ 790,070	$ 16,450,116
2014	$ 5,537	$ 816,295	$ 16,922,535
2015	$ 5,975	$ 867,874	$ 17,558,494
2016	$ 6,139	$ 899,972	$ 17,838,842
2017	$ 6,274	$ 920,484	$ 18,263,108
Overall Growth (2008 – 2017)	4.4%	15.5%	17.6%
Average Annual Change (2008 – 2017)	0.5%	1.6%	1.8%
Forecast			
2025	$ 8,011	$1,112,310	$ 21,231,360
2030	$ 9,151	$1,237,957	$ 23,160,956
2040	$11,715	$1,501,950	$ 27,079,361
Average Annual Change (2017 – 2040)	2.8%	2.2%	1.7%

SOURCE: Woods & Poole Economics, Inc., 2019.

3.3.4 Aviation Fuel Prices

The last master plan was completed just as the industry was beginning to recover from the Great Recession. Since that time aviation fuel prices have fluctuated and overall, the general aviation industry has enjoyed lower Jet A fuel costs since a peak in 2012. For 100LL the lowest prices were prior to 2012, but have increased at much lower rates than in the past. IHS Markit documented that the average crude oil price in 2019 was down 6.3 percent from the year before to about $60 per barrel and are projecting a continued moderation in prices through 2021 due to the slowing demand and a modest growth in supply. Using data from IHS Markit, the 2020 FAA Aerospace Forecast documents that the acquisition costs (dollars per barrel) for the crude oil required for aviation fuels will increase at an average annual rate of 2.7 percent through 2040.

In addition, the eventual phasing out of 100LL fuel will have an undetermined impact on every aircraft engine built from the 1920s until today that uses leaded gasoline. The FAA's figures for 2019 show that 69 percent of the 212,335 active general aviation aircraft use 100LL. While the costs to retrofit piston aircraft could be substantial, the ultimate cost of an unleaded aviation fuel option has the potential to be much less than the current 100LL cost.

3.4 Forecast of Based Aircraft

Based aircraft are those aircraft that are operational, airworthy, and kept at the airport for a majority of the year (more than six months). Therefore, the number of aircraft owners projected to base their aircraft at SUA is an important consideration for airfield planning since it is a key indicator of the demand for facilities. Projections of based aircraft also provide an indication of the anticipated growth in general aviation activity.

Information on the aircraft based at general aviation airports is uploaded to the FAA's National Based Aircraft Inventory Program. The FAA determines if all of the aircraft reported have a current registration, then a check is made to see if the aircraft have been reported by another airport. This creates a validated number of based aircraft for a given airport. At SUA, this validated count goes back to 2009 and includes a break out of the single-engine, multi-engine, jet, and rotorcraft models. As shown in **Table 3-10**, the FAA's National Based Aircraft Inventory Program documents 333 aircraft were based at SUA in 2019.

It is worth noting that the National Based Aircraft Inventory Program does not count glider, military, or ultralight aircraft since these may not always have a tail number for registration. Additionally, some of the data in **Table 3-10** does not align very well with the historic numbers in other studies; nonetheless, because of the validation process, the historic level of based aircraft from the National Based Aircraft Inventory Program will be utilized to project future levels of based aircraft.

TABLE 3-10
HISTORIC BASED AIRCRAFT

	Single-Engine	Multi-Engine	Jet	Rotorcraft	Total
2009	112	62	21	8	203
2010	114	43	30	8	195
2011	116	48	27	8	199
2012	111	50	26	8	195
2013	114	52	24	10	200
2014	110	52	26	9	197
2015	109	51	24	8	192
2016	172	75	38	10	295
2017	170	72	33	9	284
2018	192	56	57	10	315
2019	195	68	61	9	333

SOURCE: FAA's National Based Aircraft Inventory Program, 2020.

3.4.1 Historic Growth

Given the cyclical nature of the general aviation industry, it is important to analyze the overall changes that have occurred at the airport. Despite the challenges the industry has faced over the last decade, there has been a significant increase in the number of based aircraft since 2009. For any aviation forecast, such historic data should be considered when analyzing potential growth. However, in this case the average annual growth since 2009 (5.1 percent) is considered overly optimistic and not sustainable, especially given the cyclical nature of the industry. Therefore, the historic growth was not considered as a forecast option for based aircraft.

3.4.2 Previous Growth Projections

As shown in **Table 3-1**, the 2010 Airport Master Plan Update projected 314 based aircraft by 2030, which has been surpassed by the current 2019 count of 333. While the FAA's national inventory program does not have data prior to 2009, historic data in the 2019 FAA TAF shows there were more than 200 based aircraft each year prior. The decrease in total based aircraft after 2009 is primarily attributed to the Great Recession. Regardless, even though the number of based aircraft have been higher than what was projected in the previous master plan, that study's expected average annual growth rate (1.4 percent) was applied to the current based aircraft figure to create an updated projection. This results in an estimate of 446 based aircraft at SUA by the end of the 20-year planning period (**Table 3-11**).

As mentioned, the FASP is updated regularly and therefore incorporates changes in the industry that can ultimately affect the level of based aircraft. The most recent data for the system plan projects an average annual growth of 1.1 percent for the based aircraft at SUA. Applied to the 2019 count, this results in 419 based aircraft by 2040 (**Table 3-11**).

The current TAF projects an average growth rate of 0.7 percent for the based aircraft at SUA. When applied to the current 2019 level, this results in a projection of 386 based aircraft by 2040 (**Table 3-11**).

3.4.3 National Active Fleet Forecasts

Each year the FAA provides a long-term projection for the active general aviation fleet as part of their Aerospace Forecast. Decreases in the nation's total active fleet occurred between 2007 and 2013. Since that period, there has been an overall increase which is currently projected to continue through 2020. Afterwards, the 2020 FAA Aerospace Forecast projects a slow decline in the active general aviation fleet through 2040. Given that one of the fixed base operators (FBO) alone currently has a 2020 hangar wait list for 24 aircraft (not currently based at SUA), the FAA's projection for an overall decline in the national general aviation active fleet was not utilized to create a based aircraft forecast.

3.4.4 Regression Analysis

Regression forecasting methodologies were employed to estimate the number of based aircraft for the planning period. The regression models developed incorporated three types of independent variables to identify correlations with historic based aircraft counts. The first included the socioeconomic datasets previously summarized. These were applied based on initial assumptions made for each as to their potential correlation to based aircraft. For example, it was assumed that the tendency for aircraft to be based at SUA is directly related to the number of people in the surrounding area. The FAA's data on fuel costs was also included as an independent variable, since this is such an important element of owning and operating any general aviation aircraft. In addition, an indicator variable was introduced to take into consideration the impacts associated with the Great Recession on the level of based aircraft at SUA. Indicator variables are used in regression models for events such as the recession that cannot be easily quantified.

A variety of models were evaluated using the different independent variables against the historic based aircraft data for SUA. Initially, simple regression analyses were conducted using the individual datasets. While none of the individual variables had a significant correlation, most did demonstrate the expected relationship with historic based aircraft data. Multiple regression models were then evaluated using different combinations of the independent variables. The regression model selected utilized the independent variables of employment, number of households, and the cost of aviation fuels. While the selected model did not have the highest coefficient of determination of those evaluated, it did result in the best significance for the independent variables and had the lowest standard error. While the final regression equation results in somewhat variable growth (selected model included as part of **Appendix B**), the overall average annual growth rate of 1.5 percent for the 20-year planning period was applied. The result is that the number of based aircraft at SUA are forecasted to increase from 333 in 2019 to 455 by 2040 (**Table 3-11**).

TABLE 3-11
COMPARISON OF BASED AIRCRAFT PROJECTIONS

	Previous Master Plan[a]	State System Plan[a]	2019 FAA TAF[a]	Regression Analysis (recommended)
Base Year				
2019	333	333	333	333
Forecast				
2025	362	356	347	364
2030	388	376	360	392
2040	446	419	386	455
Average Annual Change (2019 – 2040)	1.4%	1.1%	0.7%	1.5%

[a] Applies growth projection to current annual operations count.

SOURCE: ESA, 2020.

3.4.5 Selected Based Aircraft Forecast

For the recommended based aircraft projection, the forecast generated using the multiple regression equation was adopted. With the application of current socioeconomic and fuel costs, this projection provides the most realistic scenario for growth. The selected forecasts projects that the number of based aircraft by 2025 will increase by 31 aircraft. This growth is supported by airport's 100 percent occupancy rate for its general aviation hangar facilities and the fact that one of the FBOs has 24 aircraft not currently based at SUA on its hangar wait list (as of January 2020).

3.5 Forecast of Based Aircraft Fleet Mix

Projecting the types of based aircraft is necessary since different aircraft require different facilities. Overall, the future based aircraft fleet mix was determined by studying the projections of the national fleet, then comparing those to the current aircraft types at SUA. While the overall growth in the nation's active fleet was not utilized to forecast based aircraft, the individual projections of aircraft types are useful in predicting the future based aircraft fleet mix. Information obtained from interviews with the various airport tenants was also used to determine the future mix of based aircraft.

3.5.1 The Nation's Active General Aviation Fleet

Every year, the nation's active general aviation fleet is published as part of the FAA Aerospace Forecast. In 2019 there were 212,335 active general aviation aircraft. As noted previously, this figure was on a decline between 2010 and 2013; however, has recovered some since. Even though the 2020 FAA Aerospace Forecast does not project any growth in the overall active aircraft through 2040, their forecast provides detail on how the individual aircraft categories are expected to evolve over the next 20 years.

While the FAA provides counts for a number of aircraft categories, they have been simplified into the five major categories shown in **Table 3-12**. Within the single-engine grouping are the single-engine piston, single-engine turboprop, experimental, and light sport aircraft categories. The multi-engine group contains both piston and turboprop models, as the rotorcraft group contains both piston and turbine models. The jet category covers all ranges of turbojet general aviation aircraft, from the very light jets to the heaviest business jets.

The FAA projects considerable growth in the jet category. While the use of business aircraft fell after 2010, jet aircraft usage by smaller companies continues to increase as various charter, lease, time-share, partnership, and fractional ownership agreements provide more cost effective options for these aircraft users resulting in higher utilization rates. This is reasonable considering that the FAA has predicted that turbojet technology is at the point where it is truly feasible as a replacement to the more traditional piston powered fleet.

TABLE 3-12
FAA FORECAST OF NATIONAL ACTIVE GENERAL AVIATION FLEET

	2019 Fleet Mix	2040 Fleet Mix	Change in the Overall Share
Single-Engine	159,960	143,240	-0.5%
Multi-Engine (piston & turboprop)	22,765	24,230	0.3%
Jet	15,035	24,000	2.3%
Rotorcraft	10,165	14,295	1.6%
Other (gliders, balloons, etc.)	4,410	4,615	0.2%

SOURCE: 2020 FAA Aerospace Forecast.

3.5.2 Existing and Future Based Aircraft Fleet Mix

The 2019 based aircraft fleet mix at SUA is comprised of 58.6 percent single-engine, 20.4 percent multi-engine, 18.3 percent jet, and 2.7 percent rotorcraft. Throughout the planning period, the mix of aircraft is expected to remain predominately single-engine; however, they will account for a lower overall percentage of based aircraft. The more significant changes are expected to occur in the number of jets based at the airport. The expected future based aircraft types shown in **Table 3-13** have been based on the national trends and tenant interviews, as well as the 16 single-engine and 8 multi-engine aircraft currently on one of the FBO's hangar wait list.

While approximately 2.1 percent of the nation's active fleet fall within the "Other" category (gliders, balloons, and ultralights), none were documented at SUA in 2019. Likewise, no aircraft in this category are expected to be based at the airport over the course of the planning period. Therefore, this category was not included in **Table 3-13**.

TABLE 3-13
FORECAST OF BASED AIRCRAFT FLEET MIX

	Base Year	Forecast		
	2019	**2025**	**2030**	**2040**
Single-Engine	195	206	214	232
Multi-Engine (piston & turboprop)	68	75	82	96
Jet	61	72	84	112
Rotorcraft	9	11	12	15
Total	**333**	**364**	**392**	**455**

SOURCE: FAA's National Based Aircraft Inventory Program and ESA analysis, 2020.

As with most airports, the single-engine category is predominantly comprised of Beech, Cessna, Mooney, and Piper models. Multi-engine aircraft tend to include the Beech King Air series; Cessna models, such as the 414 Chancellor; or Piper Seminole aircraft. While many of the additional single-engine aircraft are expected to be similar to those currently at SUA, additional aircraft in the multi-engine category are expected to be mostly turboprops.

Based jets will continue to include the entire range of business jet aircraft flying today. For the small to medium-sized business jet aircraft, these include popular models from the Embraer, Bombardier Learjet, Cessna Citation, and Dassault Falcon series. Larger jet aircraft models include those from the Beechcraft Hawker, Bombardier Challenger, Dassault Falcon, Bombardier Global, and Gulfstream series.

Rotorcraft will continue to include both piston and turbine powered models, such as the popular Bell, Eurocopter, and Robinson models. The current based helicopters include the Bell OH-58 Kiowas operated by Martin County Sheriff's Office Aviation Unit, the Eurocopter EC-135 utilized by Martin County Fire Rescue, two Bell 206B Jet Rangers, and a number of Robinson series.

3.6 Forecast of Annual Operations

The FAA defines an aircraft operation as either a single aircraft landing or takeoff. Further, a touch and go operation is counted as two operations, since the aircraft technically lands and immediately takes off. The FAA's Operations Network (OPSNET) data provides the official activity counts based on the airport traffic control tower (ATCT) activity logs. The FAA classifies aircraft operations into four different categories for OPSNET as well as for their other datasets, airport traffic control tower logs, and Aerospace Forecast. These categories, which include air carrier, air taxi, general aviation, and military, are defined by the FAA as:

- Air Carrier - an aircraft with seating capacity of more than 60 seats or a maximum payload capacity of more than 18,000 pounds carrying passengers or cargo for hire or compensation.

- Air Taxi - an aircraft designed to have a maximum seating capacity of 60 seats or less or a maximum payload capacity of 18,000 pounds or less carrying passengers or cargo for hire or compensation.
- General Aviation - all civil aircraft, except those classified as air carriers or air taxis.
- Military - all classes of military aircraft.

It was stated previously that general aviation encompasses all segments of the aviation industry except for the activity that is conducted by commercial airlines or the military. Given there are no commercial airlines and very limited military operations at SUA, the historic (see **Table 3-14**) and future annual operations for SUA have been analyzed as a whole, since the activity that is not truly general aviation is relatively insignificant.

TABLE 3-14
PAST 20 YEARS OF AIRCRAFT OPERATIONS

	Air Carrier	Air Taxi	General Aviation	Military	Annual Operations	Change over Prior Year
2000	1	3,593	111,831	901	116,326	-1.9%
2001	0	4,956	116,535	1,129	122,620	5.4%
2002	0	6,452	116,734	1,188	124,374	1.4%
2003	0	7,063	106,862	1,121	115,046	-7.5%
2004	0	7,240	102,548	960	110,748	-3.7%
2005	176	6,410	81,857	870	89,313	-19.4%
2006	0	6,381	76,622	818	83,821	-6.1%
2007	0	6,453	69,318	290	76,061	-9.3%
2008	1	5,075	59,071	518	64,665	-15.0%
2009	0	4,049	55,288	431	59,768	-7.6%
2010	0	4,808	58,133	260	63,201	5.7%
2011	0	4,055	49,322	159	53,536	-15.3%
2012	0	4,248	51,856	165	56,269	5.1%
2013	0	4,907	63,813	90	68,810	22.3%
2014	9	4,682	77,246	157	82,094	19.3%
2015	4	4,638	81,430	439	86,511	5.4%
2016	0	5,895	83,972	290	90,157	4.2%
2017	0	7,409	97,639	311	105,359	16.9%
2018	0	9,232	97,008	461	106,701	1.3%
2019	1	10,018	110,271	354	120,644	13.1%
		Average Annual Change (2000 – 2019)			0.2%	n/a

SOURCE: FAA OPSNET database, 2020.

3.6.1 Historic Activity

As shown in **Table 3-14**, the level of annual operations at SUA has fluctuated over the past 20 years. When reviewing the historic data, these changes are quite dynamic and have increased or decreased significantly in a short period of time. While general aviation activity is certainly linked to the local area economy, major impacts to the overall industry have had the most significant impact.

Following the impacts of September 11th, 2001, SUA experienced only slight growth the following year, which was then followed by seven years of decline in annual operations. Afterwards, operations increased in 2010 before dropping in 2011 to the lowest activity in recent years with just over 53,000 operations. While activity has increased every year since, the current level of activity is only slightly higher than what it was 20 years ago, resulting in a very low average annual historic growth. Conversely, over the past 10 years the average annual growth has been 7.4 percent and 10.7 percent since the operational low in 2011. Due to these extreme rates, historic levels could not be used to develop a projection of the annual operations expected through 2040.

3.6.2 Previous Growth Projections

Overall annual operations in the 2010 Airport Master Plan Update were projected to have an average growth rate of 1.6 percent through 2030 (**Table 3-1**); however, as indicated previously, the long-term projection for 2030 was exceeded in six years. Regardless, the average annual growth was applied to develop a new forecast. Not only is it still considered a reasonable rate, it is also the same average annual growth projected by the most recent FASP.

As noted, the FASP projections benefit from being updated on a regular basis, which tempers industry fluctuations and allows adjustments to be made to accommodate any local or regional system changes. **Table 3-15** show that applying the 1.6 percent average annual growth to the 2019 level of annual operations results in just over 168,000 annual operations by the end of the planning period.

The general aviation operations in the 2019 TAF utilize data from the FAA's 2019 fiscal year as the base level of activity. While the 2019 TAF also documents overall growth since the recent low in 2011, it only projects an average annual growth rate of 0.5 percent through 2040. This rate has been applied to the 2019 calendar year operations in order to provide a comparable projection using the TAF's relatively flat forecast (**Table 3-15**).

3.6.3 Utilization of the General Aviation Fleet

Each year as part of their Aerospace Forecast, the FAA provides historic data and projections on the number of hours flown by general aviation aircraft. In the 2020 Aerospace Forecast, the FAA anticipates the utilization of the fleet to increase at an average annual rate of 0.7 percent between 2019 and 2040. This fairly limited growth is partly related to the long-term costs associated with aviation fuels, which the FAA documents as increasing 2.7 percent each year through 2040. As noted before, the most active aircraft types (and therefore higher utilization rates) will be those in the turbine fleet (both aircraft and rotorcraft) versus a number of piston aircraft which are not expected to be utilized as much.

The FAA's overall expectation on the general aviation hours to be flown have been applied to the operations for SUA to create another forecast scenario. As shown in **Table 3-15**, this results in just under 140,000 annual operations by the end of the planning period.

3.6.4 Market Share

A common methodology for forecasting aviation activity is the use of market share analysis. This approach allows a comparison to be made of the annual operations SUA has supported against a defined data set. In the Aerospace Forecast, the FAA documents and projects the operations conducted at all of the towered airports in the nation. A separate count and forecast for the general aviation operations are included within this data set. It is important to note that just like SUA's historic data, the nation's level of general aviation operations also experienced significant losses after the Great Recession. However, unlike the nation, SUA has recorded increases for all but one year since 2010. At the national level, general aviation operations have been down for six of the ten years since 2010.

Annual operations at SUA over the past 10 years were evaluated against the same data for the nation. Since the lowest point in 2011, all but two years through 2019 reflected an increase in SUA's share of the nation's general aviation activity. In fact, the airport has recorded an overall increase in its market share since 2003. When historic increases in the annual market share were applied to estimate the future potential, the result is that by the end of the 20-year planning period, SUA will continue to exceed historic levels. For the nation, the FAA expects aircraft activity to increase every year through 2040. When SUA's anticipated market share is combined with the FAA's overall projected general aviation activity, approximately 286,000 of the nation's operations in 2040 would be accommodated at SUA (**Table 3-15**).

3.6.5 Regression Analysis

Regression modeling was used in an attempt to forecast activity at SUA. However, no significant correlations could be derived using different combinations of the independent variables. Essentially, none of the local socioeconomic or industry data available would generate a model that could reliable explain the past activity, particularly the four years of double digit growth since the operational low recorded in 2011. Therefore, this method could not be utilized to project future annual operations.

3.6.6 Forecasts to Update Noise Exposure Maps

In 2019, forecasts of annual operations were prepared and submitted to the FAA for use in the update of the Noise Exposure Maps (NEMs) for SUA. These forecasts were based on the 12-month period between July 2018 and June 2019; resulted in an average annual growth rate of 2.75 percent through 2025; and approved by the FAA on August 26, 2019. The projections recognized the ongoing and expected improvements at SUA such as the Dassault Aircraft Service Center and CBP facility which were completed in the early part of 2019 and not reflected in any previous forecast. Additionally, SUA based Treasure Coast Flight Training doubled its training fleet from 15 to 30 aircraft in 2018. The NEM Update Forecast noted that it would take some time before the Treasure Coast Flight Training's program would reach its full potential in utilizing their expanded fleet. The NEM Update Forecast also documented the ongoing improvements at both FBOs in response to the demand they are experiencing. The forecasts were an appendix to the Title 14 Code of Federal Regulations (CFR) Part 150 Noise Exposure Map Update report. When the 2.75 percent average annual growth rate between 2019 and 2025 is applied to the longer master plan horizon, the result is just over 202,000 annual operations by 2040 (**Table 3-15**). A copy of the NEM Update Forecast and the FAA approval are included as part of **Appendix B**.

TABLE 3-15
COMPARISON OF PROJECTIONS FOR GENERAL AVIATION OPERATIONS

	Previous Master Plan and State System Plan[a]	2019 FAA TAF[a]	Utilization of National Fleet	Market Share Analysis	2019 NEM Update
Base Year					
2019	120,644	120,644	120,644	120,644	114,391[b]
Forecast					
2025	132,699	124,309	125,801	154,423	134,591[b]
2030	143,660	127,448	130,266	189,693	154,124
2040	168,373	133,966	139,677	286,238	202,105
Average Annual Change (2019 – 2040)	1.6%	0.5%	0.7%	4.2%	2.75%

[a] Applies growth projection to current annual operations count.
[b] FAA approved 2019 NEM Update Forecast. Figure for 2019 based on the 12-month period between July 2018 and June 2019.

SOURCE: ESA 2020.

3.6.7 Recommended Forecast of Aircraft Operations

Between 2000 and 2019, general aviation operations at the nation's towered airports decreased an average of 2.0 percent each year. Activity for Florida's towered general aviation airports over the same period had virtually no growth. Even more significant is that since 2010 (after the Great Recession) the nation's total general aviation activity at towered airports only increased annually at an average of 0.3 percent while Florida's have increased 2.6 percent. However, SUA averaged 7.4 percent over the same period. This demonstrates that Florida's general aviation industry has been recovering each year since 2010 and SUA is one of the state's general aviation airports leading that growth.

For SUA's future annual operations, a combination of two projections was selected as the recommended forecast. Over the short-term the average annual growth rate of 2.75 percent from the NEM update was utilized given it was generated, approved, and utilized to develop the updated noise models just prior to this study. However, the NEM Update Forecast was only approved through 2025 and even in an unconstrained scenario, it is not expected that annual operations will consistently grow at the same level through the 20-year master plan horizon. Therefore, for the intermediate- and long-term planning periods, the more conservative 1.6 percent average annual growth from the state's system plan was applied to generate the recommended forecast. The resulting projection of annual operations is shown in **Table 3-16**.

TABLE 3-16
RECOMMENDED FORECAST OF ANNUAL OPERATIONS

	2019 NEM Update and State System Plan
Base Year	
2019	114,391[a]
Forecast	
2025	134,591[a]
2030	145,708
2040	170,774
Average Annual Change (2019 – 2025)	2.75%
(2025 – 2040)	1.6%
(2019 – 2040)	2.1%

[a] FAA approved 2019 NEM Update Forecast. Figure for 2019 based on the 12-month period between July 2018 and June 2019.

SOURCE: ESA 2020.

3.6.8 Aircraft Operations During COVID-19 Pandemic

As noted previously, the preparation of these forecasts began just as the COVID-19 pandemic was beginning to impact the aviation industry. While it has been estimated that it will take two to four years for most segments of the aviation industry to recover; a number of the general aviation airports in Florida, including SUA, have already experienced signs of recovery. **Table 3-17** compares the monthly activity that has occurred at SUA during the first half of 2020, with the activity for the same months over the last three years.

TABLE 3-17
COMPARISON OF MONTHLY OPERATIONS THRU JUNE

	2017	2018	2019	2020	Comparison of 2020 to 2019
January	9,312	9,377	11,260	11,904	5.7%
February	8,762	10,195	10,149	11,695	15.2%
March	11,033	10,721	10,662	12,627	18.4%
April	9,338	8,813	12,191	6,091	-50.0%
May	10,242	7,974	11,174	8,357	-25.2%
June	8,767	9,026	8,360	9,584	14.6%
Total Operations thru June	**57,454**	**56,106**	**63,796**	**60,258**	**-5.5%**

SOURCE: FAA OPSNET database and ESA analysis, 2020.

3.7 Categories of Aircraft Operations

The following sections present different categories or types of activity that will make up the forecasted operations. This includes a break out of the local, itinerant, and instrument operations. Further analyses include determining the operational aircraft fleet mix and estimates of activity peaks. For each section, the total recommended annual operations from **Table 3-16** have been rounded to the nearest hundred.

3.7.1 Local versus Itinerant Operations

The FAA also categorizes aircraft operations as either local or itinerant. Local operations are those arrivals or departures performed by aircraft that remain in the airport traffic pattern or are within sight of the ATCT. Local operations are most often associated with training activity and flight instruction. Itinerant operations are arrivals or departures other than local operations, performed by either based or transient aircraft. Itinerant operations are generated by a wide range of recreational, business/corporate, and air charter/taxi flights.

The historic split between operations has averaged 35 percent local and 65 percent itinerant since the Great Recession (2010). However, the shift has been towards an increase in itinerant activity over the last five years. This is attributed to the increased utilization of jet aircraft and turboprops, and is also likely related to the presidential TFRs and for 2019, the availability of CBP services. Regardless, for the short-term, it is anticipated that the local and itinerant split will be similar to the average. While the itinerant operations created predominantly by the business/corporate aviation is expected to increase, so too is flight training activity. Over the planning period, an increase in the itinerant activity is ultimately expected to occur and has been estimated to peak at 75 percent as shown in **Table 3-18**.

TABLE 3-18
FORECAST OF LOCAL VERSUS ITINERANT OPERATIONS

	Local		Itinerant		Total
Base Year					
2019	38,853	34%	75,538	66%	114,391[a]
Forecast					
2025	47,100	35%	87,500	65%	134,600
2030	43,700	30%	102,000	70%	145,700
2040	42,700	25%	128,100	75%	170,800

[a] Based on the 12-month period between July 2018 and June 2019 (FAA approved 2019 NEM Update Forecast).

SOURCE: FAA OPSNET database and ESA analysis, 2020.

3.7.2 Instrument Operations

A separate estimate of instrument operations conducted at SUA is important when evaluating future facility requirements. The OPSNET data includes the number of instrument flight rule (IFR) operations conducted. Over the past 20 years, instrument operations have averaged 19 percent of the total operations conducted with the highest level of 24 percent recorded during three different years. More recently the instrument activity has been around 21 percent.

Similar to the increase in itinerant traffic described previously, the number of operations conducted under IFR at SUA likely has a lot to do with the growth in business/corporate aviation. It is also related to the fact that even the smallest of general aviation aircraft now have fairly sophisticated instrument capability and conduct more IFR operations than in the past. It is anticipated that the number of IFR operations will increase over the course of the planning period. However, its growth has been limited to 30 percent by the end of the planning period. The resulting estimate of future instrument operations are shown in **Table 3-19**.

TABLE 3-19
ESTIMATE OF INSTRUMENT OPERATIONS

	Instrument Operations
Base Year	
2019	23,999[a]
Forecast	
2025	31,000
2030	36,400
2040	51,200

[a] Based on the 12-month period between July 2018 and June 2019 (FAA approved 2019 NEM Update Forecast).

SOURCE: FAA OPSNET database and ESA analysis, 2020.

It should be noted that the percent of instrument operations is different from the actual percentage of the year that the airport experiences IFR conditions. Unlike the weather observations addressed later in this chapter, the count and subsequent estimate of instrument operations include those conducted during actual instrument meteorological conditions as well as the ones simply under an IFR flight plan.

3.7.3 Operational Fleet Mix

Operational fleet mix is an important factor in determining the needs for airfield improvements. However, even at airports with an ATCT, it is difficult to estimate the type of aircraft conducting operations since this information is not recorded by tower staff. Instead, the current operational fleet mix percentages were estimated based on the airport's available Vector Noise and Operations Management System (VNOMS) and the 2019 data recorded by FlightAware. Information from the 2020 FAA Aerospace Forecast as well as that obtained during the various interviews with airport tenants and customers was then utilized to predict how the operational fleet mix would change over the next 20 years.

TABLE 3-20
PROJECTED OPERATIONAL FLEET MIX

	Base Year	Forecast		
	2019	**2025**	**2030**	**2040**
Single-Engine	78,587	88,800	90,300	93,900
Multi-Engine (piston & turboprop)	12,583	14,100	14,600	15,400
Jet	20,819	28,300	36,400	56,400
Rotorcraft	2,402	3,400	4,400	5,100
Total	**114,391**[a]	**134,600**	**145,700**	**170,800**

[a] Based on the 12-month period between July 2018 and June 2019 (FAA approved 2019 NEM Update Forecast).

SOURCE: SUA Vector Noise and Operations Management System (VNOMS) data, 2019 SUA FlightAware data, 2020 FAA Aerospace Forecast, and ESA analysis, 2020.

The FAA anticipates growth and increased utilization for every aircraft category with the exception of the single-engine piston and multi-engine piston types. As described previously, the most significant growth and utilization is expected to occur in the jet and rotorcraft categories. Activity by single- and multi-engine aircraft at SUA is expected to increase given the large number of these aircraft at the airport and in Florida overall.

General aviation jet activity will continue to include nearly every type of business jet aircraft flying in the nation. In the light to medium-sized business jets (maximum allowable takeoff weight between 10,000 and 60,000 pounds) this activity includes the Embraer Phenom and Legacy aircraft, Beechcraft Hawker, Bombardier Learjet, Cessna Citation, and Dassault Falcon type jet aircraft. For the larger and heavier business jet fleet over 60,000 pounds, typical examples include the Bombardier Global, larger Dassault Falcon, and Gulfstream series aircraft.

3.7.4 Peak Activity Projections

Annual projections provide a good overview of the activity at an airport, but may not reflect certain operational characteristics of the facility. In many cases, facility requirements are not driven by annual demand, but rather by the capacity shortfalls and delays experienced during peak times. Therefore, estimates of the peak month, the average day in the peak month, and the peak hour demand for aircraft operations are needed.

Review of the monthly OPSNET data reveals that for five of the past ten years, operations have peaked in March. November had the most operations in three of the years, while other peaks were documented in January and May. Regardless, the peak months all reflected similar percentages with respect to the overall activity. On average the peak months represent 10.0 percent of the annual operations. For the average number of days in the peak month, 31 was applied since most of the peak months had that many days. No historical data was available to determine the peak hour operations. Therefore, a typical industry average of 15 percent of the peak month average day was applied to represent the number of peak hour operations. With the exception of the peak hour, the resulting estimates in **Table 3-21** have been rounded to the nearest ten for the forecast years.

TABLE 3-21
PEAKS IN TOTAL AIRCRAFT OPERATIONS

	Total Annual Operations	Peak Month	Average Day of Peak Month	Peak Hour of Average Day
Base Year				
2019	114,391[a]	12,191[a]	390	59
Forecast				
2025	134,600	13,590	440	66
2030	145,700	14,720	470	71
2040	170,800	17,250	560	83

[a] Based on the 12-month period between July 2018 and June 2019 (FAA approved 2019 NEM Update Forecast).

SOURCE: FAA OPSNET database and ESA analysis, 2020.

3.8 Critical Aircraft

The airport planning criteria and design standards for various airfield elements are based on the critical aircraft that make regular use of the airport. Regular use is defined as 500 annual operations, including both itinerant and local operations, but excluding touch and go operations. These aircraft classify airport facilities based on Approach Reference Codes (APRC), Departure Reference Codes (DPRC), Runway Design Codes (RDC), and Taxiway Design Groups defined in FAA Advisory Circular (AC) 150/5300-13A, Change 1, *Airport Design*.

3.8.1 Runway Reference and Design Codes

Approach and departure codes identify the existing operational capabilities for each runway with a parallel taxiway, where no special procedures are required for landing or takeoff operations. As such, runways can have more than one APRC or DPRC code for different aircraft groups and these codes may change as airfield improvements are made. Conversely, while the APRC and DPRC designations identify existing operational limitations for each runway, the RDC is utilized to plan future runway requirements.

For all three codes, the first component is the Aircraft Approach Category (AAC) which is depicted by a letter and relates to the aircraft's landing approach speed (operational characteristic). The second component is the Airplane Design Group (ADG) which uses Roman numerals to identify the critical aircraft wingspan or tail height (physical characteristics). For APRC and RDC, a third component relates to the visibility minimums associated with the runway, or group of runways, expressed in the Runway Visual Range (RVR) values. For runways with only existing and future visual approaches, the third component should be "VIS" in lieu of the visibility minimums. The ranges for these three components are included in **Table 3-22**. An Airport Reference Code (ARC) is the overall airport designation, signifying the highest RDC for the facility, minus the third (visibility) code.

TABLE 3-22
RUNWAY REFERENCE AND DESIGN CODE COMPONENTS

Aircraft Approach Categories

Category	Approach Speeds
A	Less the 91 Knots
B	91 knots or more but less than 121 knots
C	121 knots or more but less than 141 knots
D	141 knots or more but less than 166 knots
E	166 knots or more

Airplane Design Groups

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

Visibility Minimums

Runway Visual Range (feet)	Instrument Flight Visibility Category (statute mile)
5000	Not lower than 1 mile
4000	Lower than 1 mile but not lower than ¾ 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
VIS	Visual

SOURCE: FAA Advisory Circular 150/5300-13A, Change 1, *Airport Design*

Runway 12-30 Critical Aircraft

The most demanding aircraft operating on Runway 12-30 on a regular basis include the runway design components of C-III and D-III. These have included the Gulfstream GV (C-III), Global Express 5000 (C-III), Global Express 6000 (C-III), Gulfstream G500 (D-III), Gulfstream G600 (D-III), and Gulfstream G650 (D-III). As shown in **Table 3-23**, this grouping of aircraft made regular use of the airport, conducting 800 operations in 2019. Based on the 2019 operational data from FlightAware data, these C-III and D-III aircraft operations represented 3.8 percent of the total jet operations recorded for 2019. Using this percentage with the forecast of jet operations, a conservative projection of the C-III and D-III aircraft over the planning period was made.

TABLE 3-23
OPERATIONS BY C-III AND D-III AIRCRAFT

	Jet Aircraft Operations	C-III and D-III Operations	Percent of Jet Operations
Base Year			
2019	20,819	800	3.8%
Forecast			
2025	28,300	1,075	3.8%
2030	36,400	1,383	3.8%
2040	56,400	2,143	3.8%

SOURCE: 2019 SUA FlightAware data and ESA analysis, 2020.

For the master planning effort, the Gulfstream G650 (D-III) has been selected as the existing and future critical aircraft, given there is one currently based at SUA and it represents the group of aircraft which currently use Runway 12-30 on a regular basis. The Gulfstream G650 also characterizes the larger business jet aircraft being manufactured today and that will continue to increase activity at SUA as projected in the recommended forecast. In fact, some of the newest business jets currently being manufactured are slightly physically larger than the Gulfstream G650 in both wingspan and tail height, but still within ADG III. These include the newer Bombardier Global 7500/8000s which were not selected as the future critical aircraft since their slightly lower approach speeds categorize them as C-III aircraft. Finally, unless the current instrument minimums established to either end of Runway 12-30 change (addressed in the facility requirements chapter and evaluated in the alternatives chapter), the RDC for Runway 12-30 is D-III-4000.

When combined with the existing visibility minimums and the 300 foot centerline offset for the west end of parallel Taxiway A, the existing APRCs for the Runway 12-30 are B-III-4000 and D-II-4000. Similarly, the 300 foot offset of Taxiway A results in DPRCs of B-III and D-II for the runway. These specific APRC and DPRC designations mean that there cannot be simultaneous ADG III aircraft with an AAC higher than B on both Runway 12-30 and Taxiway A at the same time. This limitation is documented in the FAA Chart Supplement for SUA so that pilots are aware that the ATCT must manage simultaneous C-III or D-III movements on Runway 12-30 and the west half of parallel Taxiway A.

Runway 16-34 Critical Aircraft

A crosswind runway is recommended by the FAA when the primary runway orientation cannot provide 95 percent wind coverage. Therefore, historic wind conditions were evaluated to determine the wind coverage of the airport's current runway system. Wind coverage is based on a crosswind not exceeding 10.5 knots for aircraft with reference codes of A-I and B-I; 13 knots for reference codes A-II and B-II; and 16 knots for reference codes A-III, B-III and C-I through D-III.

FAA AC 150/5300-13A, Change 1 recommends that ten consecutive years of wind data be examined when carrying out the evaluation. Wind coverage calculations also need to take into account the different ceiling and visibility minimums associated with aircraft operations. The most recent data (January 1, 2010 through December 31, 2019) for all weather, visual flight rules (VFR), and IFR conditions were obtained for SUA from the FAA's online Windrose File Generator website. The data was used to calculate the 10.5, 13, and 16 knot crosswind components shown in **Table 3-24** using the FAA's online Standard Wind Analysis tool. The wind rose analysis shows that during IFR conditions a crosswind runway is needed for the 10.5 knot category for reference codes A-I and B-I.

TABLE 3-24
WIND COVERAGE ANALYSIS

	Crosswind Component (knots)		
Runway	**10.5**	**13**	**16**
All-Weather			
12-30	96.26%	98.30%	99.70%
16-34	91.66%	95.80%	99.17%
7-25	95.77%	98.24%	99.75%
Combined	99.81%	99.97%	99.99%
VFR			
12-30	96.27%	98.33%	99.73%
16-34	91.38%	95.68%	99.17%
7-25	95.76%	98.26%	99.77%
Combined	99.82%	99.97%	99.99%
IFR			
12-30	92.28%	96.00%	99.05%
16-34	92.32%	95.33%	98.22%
7-25	92.03%	95.64%	98.95%
Combined	99.54%	99.91%	100.00%

SOURCE: FAA Windrose File Generator and Standard Wind Analysis Tool, 2020.

With an overall length of 5,000 feet, Runway 16-34 is capable of supporting a large portion of the general aviation fleet; yet, the larger aircraft (over 60,000 pounds) rarely use this runway since it does not have any straight-in instrument approach procedures and is unlit. However, based on the available VNOMS data and aircraft recorded at SUA in the 2019 FlightAware dataset, aircraft within the B-II category regularly use Runway 16-34. These primarily include both the Cessna Citation and Dassault Falcon jet aircraft within the B-II category. A review of FlightAware data indicates that the existing critical aircraft is the Cessna 560 Citation XLS (B-II), which conducted 1,566 operations in 2017. When combined with the existing visibility minimums and the 500 foot offset of parallel Taxiway D, the existing APRC for the Runway 16-34 is D-VI-5000 and the DPRC is D-VI.

While Runway 16-34 is occasionally used by larger aircraft, it is not anticipated that the existing critical aircraft group will change. Therefore, unless lower instrument minimums are established to either end of runway (addressed in the facility requirements chapter and evaluated in the alternatives chapter), the RDC for Runway 16-34 is B-II-5000. Also, the Dassault Falcon 900 has been selected as the representative future critical aircraft expected to use the runway on a regular basis. Not only is it one of the largest aircraft within the B-II category, it is representative of the newer business jet aircraft that will continue to increase activity at SUA over the planning period.

Runway 7-25 Critical Aircraft

With an overall length of 4,653 feet, Runway 7-25 is capable of supporting a large portion of the general aviation fleet, including a number of the larger business jets. A review of the available VNOMS data showed that the business jets with the runway design components of B-II and C-II utilize Runway 7-25. This grouping of aircraft includes the Cessna Citation XLS (B-II), Cessna Citation Excel (B-II), Gulfstream II (C-II), and Gulfstream III (C-II). While, presently, there are aircraft with design components of C-II utilizing Runway 7-25, they fall well below the threshold of 500 annual operations and that trend is expected to continue throughout the planning period. As with Runway 16-34, the Cessna Citation XLS (B-II) has been selected as the existing critical aircraft and the Dassault Falcon 900 as the representative future critical aircraft for Runway 7-25. When combined with the existing visibility minimums and the 500 foot offset of partial parallel Taxiway C, the existing APRC for the Runway 7-25 is D-VI-5000 and the DPRC is D-VI. Assuming the instrument minimums established to either end of the runway are not changed, the RDC for Runway 7-25 is B-II-5000.

TABLE 3-25
EXISTING AND FUTURE RUNWAY CODES

Runway	Critical Aircraft	Approach Reference Code (APRC)	Departure Reference Code (DPRC)	Runway Design Code (RDC)
12-30	D-III (Gulfstream G650)	B-III-4000 D-II-4000	B-III D-II	D-III-4000 (Gulfstream G650)
16-34	B-II (Cessna Citation XLS)	D-VI-5000	D-VI	B-II-5000 (Dassault Falcon 900)
7-25	B-II (Cessna Citation XLS)	D-VI-5000	D-VI	B-II-5000 (Dassault Falcon 900)

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

3.8.2 Taxiway Design Groups

When the 2010 Airport Master Plan Update was prepared, taxiways were designed solely based on the ADG (wingspan) of the critical aircraft they served. Now some of the taxiway design standards utilize a Taxiway Design Group (TDG) which is based on the overall width of the aircraft's main gear as well as the distance between the main gear and the cockpit. Each aircraft's TDG is determined through the use of a chart in FAA AC 150/5300-13A, Change 1.

This newer approach combines identification of proper taxiway width and separation dimensions with a better method for determining the required turning radii and edge fillets. The intent is to provide the appropriate taxiway geometry while minimizing excess pavement and limiting the potential for confusing layouts. The existing and future TDGs for each of the runways are shown in **Table 3-26**.

TABLE 3-26
TAXIWAY DESIGN GROUPS

Runway	Existing	Future
12-30	2	2
16-34	1B	2
7-25	1B	2

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

3.9 FAA Terminal Area Forecast Comparison

If an airport is included in the FAA TAF, any new forecasts need to be reviewed and approved by the agency before they can be applied to further analyses. During this review for general aviation airports, the FAA looks to see if the annual operations or based aircraft forecasts differ from the TAF by any more than ten percent in the five year and/or 15 percent in the ten year planning periods.

Regarding the review, the FAA Airport Planning and Programming division published a guidance paper entitled, *Review and Approval of Aviation Forecasts*. This guidance states: "If the forecast is not consistent with the TAF, differences must be resolved if the forecast is to be used in FAA decision-making. This may involve revisions to the airport sponsor's submitted forecasts, adjustments to the TAF, or both. FAA decision-making includes key environmental issues (e.g. purpose and need, air quality, noise, land use), noise compatibility planning (14 CFR Part 150), approval of development on an airport layout plan, and initial financial decisions including issuance of LOI's and calculation of BCA's."

As shown in **Table 3-27**, the recommended forecasts for based aircraft are within the FAA's review criteria for consistency with the TAF. For annual operations, the five year is within the criteria while the 10 year is just slightly higher. Even though the ten year annual operations exceed the FAA review criteria, it is only by 0.7 percent and the projection is considered reasonable given the significant growth in activity at SUA over the last 10 years and the fact that the year-end data for 2019 was two percent higher than the TAF's fiscal year data.

TABLE 3-27
COMPARISON OF FORECAST TO 2019 FAA TAF

	Recommended Baseline Forecast	2019 FAA TAF[a]	Difference
Based Aircraft			
Base Year (2019)	333	315	5.7%
5 Year (2025)	364	334	9.0%
10 Year (2030)	392	344	14.0%
Annual Operations			
Base Year (2019)	114,391[b]	118,247	-3.3%
5 Year (2025)	134,600	123,750	8.8%
10 Year (2030)	145,700	125,975	15.7%

[a] Issued January 2020 with data based on FAA fiscal year which ends September 30th.
[b] Based on the 12-month period between July 2018 and June 2019 (FAA approved 2019 NEM Update Forecast).

SOURCE: 2019 FAA TAF and ESA Analysis, 2020.

3.10 Aviation Activity Forecast Summary

Table 3-28 presents an overview of the recommended forecasts. The data and methods used to forecast aviation demand for the airport are consistent with those used by the FAA, FDOT, and other airports around the nation. These forecasts are considered to reasonably reflect the activity anticipated at SUA through 2040 given the information available during this study.

TABLE 3-28
SUMMARY OF AVIATION ACTIVITY FORECASTS

	Base Year	Forecast		
	2019	**2025**	**2030**	**2040**
Based Aircraft				
Single-Engine	195	206	214	232
Multi-Engine (piston & turboprop)	68	75	82	96
Jet	61	72	84	112
Rotorcraft	9	11	12	15
Total	**333**	**364**	**392**	**455**
Categories of Operations				
Local Operations	38,853	47,100	43,700	42,700
Itinerant Operations	75,538	87,500	102,000	128,100
Total	**114,391**[a]	**134,600**	**145,700**	**170,800**
Instrument Operations	23,999	31,000	36,400	51,200
Operational Fleet Mix				
Single-Engine	78,587	88,800	90,300	93,900
Multi-Engine (piston & turboprop)	12,583	14,100	14,600	15,400
Jet	20,819	28,300	36,400	56,400
Rotorcraft	2,402	3,400	4,400	5,100
Peaks in Total Aircraft Operations				
Peak Month	12,191	13,590	14,720	17,250
Average Day of Peak Month	390	440	470	560
Peak Hour of Average Day	59	66	71	83

[a] Based on the 12-month period between July 2018 and June 2019 (FAA approved 2019 NEM Update Forecast).

SOURCE: FAA's National Based Aircraft Inventory Program, FAA OPSNET database, and ESA analyses, 2020.

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CHAPTER 4

Facility Assessment and Requirements

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CHAPTER 4
Facility Assessment and Requirements

4.1 Introduction

This chapter evaluates and establishes the improvements necessary at Witham Field (SUA) to maintain a safe and efficient facility while also accommodating the expected demand. The following sections use the appropriate design criteria to identify and define necessary facility requirements over the 20-year planning horizon.

4.2 Airport Capacity

Airport capacity is defined by the Federal Aviation Administration (FAA) as a measure of the maximum number of aircraft operations that an airfield can support with reasonable levels of delay. Estimates of airfield capacity at SUA were developed in accordance with FAA Advisory Circular (AC) 150/5060-5, Change 2, *Airport Capacity and Delay*. Methodologies from this AC were used to calculate the hourly capacity of the runway system and annual service volume (ASV) of the airfield based upon specific airfield, operational, and meteorological characteristics on a typical day.

4.2.1 Airfield Geometry

The airfield configuration is the primary factor in determining the overall airport capacity due to its direct influence on how aircraft can operate. In theory, as the number of runways and taxiways increase, so should the capacity. However, the physical orientation and proximity of the various runway and taxiway surfaces may or may not contribute to the overall airfield capacity.

Runway Configuration

Different runway configuration and use diagrams are provided in FAA AC 150/5060-5, Change 2. For SUA's three runways, the use diagrams are selected using the distances between the different runway ends relative to the runway intersections. These diagrams allow the capacity calculations to account for the fact that some simultaneous operations are conducted on one of the other runways when Runway 12-30 is active. Otherwise, due to the orientation of the runways, the airfield is typically limited to a single runway operation.

Exit Taxiways

The capacity of a runway system is greatly influenced by the ability of aircraft to exit the runway as quickly and safely as possible. Once an aircraft has cleared the runway environment, another is able to either land or takeoff. Therefore, the number and location of exit taxiways directly influence runway occupancy time and overall capacity of the airfield system. Capacity is also enhanced if a full-length parallel taxiway system is provided since these taxiways generally have several connector taxiways (increasing the number of runway exits) and eliminate the need to back-taxi on the runway. Runways 12-30 and 16-34 have single parallel taxiways with multiple connectors. Runway 7-25 has a partial parallel taxiway which runs from the 25 end to almost the midpoint of the runway.

The FAA methodology utilizes an exit factor based upon the number of connector taxiways within a certain range. The optimal range for exit taxiways varies for different runway configurations and is primarily based on the aircraft mix index (described in a following section). For the purposes of the capacity calculations, each exit taxiway must also be separated by at least 750 feet. Throughout the planning period, the optimal exit range for SUA is 3,000 to 5,500 feet from each landing threshold. Using these criteria, the number of taxiway exits eligible for inclusion in the capacity calculations are shown in **Table 4-1**.

TABLE 4-1
ELIGIBLE TAXIWAY EXITS FOR CAPACITY CALCULATIONS

	3,000 to 5,500 Foot Range
Runway 12	2
Runway 30	2
Runway 16	1
Runway 34	1
Runway 7	2
Runway 25	2

SOURCE: ESA analysis 2021.

4.2.2 Operational Characteristics

Operational characteristics relative to airfield capacity include the aircraft mix index, the percent of aircraft arrivals, and the percent of aircraft touch and go operations. Each of these are described in the following sections based on the FAA methodology.

Aircraft Mix Index

The FAA has four aircraft categories (A through D) for capacity determinations which are based upon the maximum certificated takeoff weight, the number of engines, and the wake turbulence classifications. It should be noted that these capacity classes differ from the Aircraft Approach Categories utilized in other sections of this study. In the simplest terms, larger and heavier aircraft create more wake turbulence and require more entrail spacing to allow this turbulence to subside before another aircraft travels through the same area. Likewise, as an aircraft's size and weight increases, so does the time typically needed for it to slow to a safe taxiing speed or to achieve the needed speed for takeoff. Therefore, larger aircraft occupy the runway longer than smaller ones. For these reasons, aircraft classifications are used to determine the aircraft mix index which is a critical component for calculating airfield capacity.

The mix index is calculated by adding the percent of Class C aircraft plus three times the percent of Class D aircraft. Class A aircraft include single-engine aircraft less than 12,500 pounds. While Class B aircraft include multi-engine aircraft less than 12,500 pounds. The percent of Class A and B aircraft is not considered to significantly affect airfield capacity because the wake turbulence generated by these smaller aircraft dissipates fairly rapidly. Thus, the spacing can be reduced between Class A and B aircraft more than for Class C or D aircraft. Class C aircraft include multi-engine aircraft greater than 12,500 pounds, but less than 300,000 pounds with a large wake turbulence classification. Class D are multi-engine aircraft over 300,000 pounds with a heavy wake turbulence classification.

While a large portion of the aircraft currently operating at SUA are within Class A and B, there are also a number of Class C operations. As such, the mix index in 2019 was 22. In the future, operations conducted by Class C aircraft are expected to increase over the next 20 years resulting in a mix index of 35 by the end of the planning period (2040).

Percent of Aircraft Arrivals

The percent of arrivals is simply the ratio of aircraft arrivals to total operations during a peak or average hour of operations. The FAA methodology considers a 40, 50, or 60 percent arrivals factor to compute airfield capacity. Since aircraft on final approach are given priority over departures, a higher percent of arrivals during peak periods can reduce the hourly capacity due to the longer runway occupancy times for arrivals over departures. However, this is typically only considered when estimating capacity during peaks at airports with predominately commercial airline operations. For SUA, the percent of arrivals is assumed to equal those of departures on a typical day, given there are no commercial airline operations at the airport. Therefore, the 50 percent arrivals factor was applied to all of the capacity calculations.

Percent of Touch and Go Operations

A touch and go operation refers to a training procedure in which the pilot performs a normal landing followed by an immediate takeoff, without stopping or taxiing clear of the runway. While each touch and go operation actually accounts for two runway operations (one landing and one takeoff), this procedure typically takes less time than two operations by separate aircraft. Therefore, airports with significant touch and go operations will have a greater airfield capacity than a similar airport with less of these training operations.

As noted in the forecast chapter, most local operations are related to flight training which primarily include touch and go maneuvers. This was confirmed with the airport traffic control tower (ATCT) management during discussions on SUA’s operational counts included in the FAA’s Operations Network (OPSNET) data. Local operations, which accounted for approximately a third of the overall activity in 2019 are projected to decrease in share since more itinerant operations are projected over the 20-year planning horizon. Therefore, the percent of touch and go operations will also decrease over the planning period.

4.2.3 Meteorological Conditions

Different meteorological conditions influence the utilization of an airfield's runways. Variations in the weather resulting in limited cloud ceilings and reduced visibility typically lower airfield capacity, while changes in wind direction and velocity will dictate runway usage.

Ceiling and Visibility

As weather conditions deteriorate, pilots must rely on instruments to define their position both vertically and horizontally. Capacity is lowered during such conditions because aircraft are spaced further apart when they cannot see each other. For capacity calculations, FAA AC 150/5060-5, Change 2 defines three general weather categories, based upon the height of the clouds above ground level and visibility:

Visual Flight Rules (VFR) - Cloud ceiling is greater than 1,000 feet above ground level (AGL) and visibility is at least three statute miles.

Instrument Flight Rules (IFR) - Cloud ceiling is at least 500 AGL but less than 1,000 feet AGL and/or visibility is less than three statute miles but more than one statute mile.

Poor Visibility and Ceiling (PVC) - Cloud ceiling is less than 500 feet AGL and/or visibility is less than one statute mile.

Since SUA has straight-in non-precision instrument approach procedures established to Runways 12 and 30. These procedures also provide non-precision approaches with circling minimums; therefore, the airport is capable of accommodating aircraft during IFR conditions.

The ten years of wind, cloud ceiling, and visibility data obtained for the wind rose analysis from the FAA's online Windrose File Generator site was also utilized for the capacity analysis. For SUA, the data showed that VFR conditions occurred approximately 97.5 percent of the time, IFR conditions 2.5 percent of the time, and PVC conditions much less than one percent of the time.

Runway Utilization

The wind coverage analysis in the forecast chapter documents that overall, Runway 12-30 has better coverage than Runways 16-34 or 7-25. However, wind coverage is not the only factor that determines operational flow, especially at an airport with an ATCT. In addition to wind conditions; the type of aircraft and type of operation are also important. All three runways have the ability to physically accommodate most every type of aircraft operation currently occurring at SUA.

The individual runway end utilization shown in **Table 4-2** were derived from the historic wind conditions, discussions with ATCT management, and information from the recent Noise Exposure Map (NEM) update for SUA.

TABLE 4-2
RUNWAY END UTILIZATION

	Annual Average
Runway 12	51%
Runway 30	29%
Runway 16	4%
Runway 34	2%
Runway 7	11%
Runway 25	3%

SOURCE: ESA analysis, 2021.

4.2.4 Airfield Capacity Calculations

The preceding airfield geometry, operational characteristics, and meteorological conditions were first utilized to calculate hourly capacity. These results were then applied to determine the ASV in order to evaluate the ability of the airfield to accommodate the projected demand.

Hourly Capacity of the Runway System

The hourly capacity for SUA was calculated by analyzing the appropriate runway-use diagrams and figures for both VFR and IFR conditions. Using these, the aircraft mix index and percent of aircraft arrivals were applied to calculate the hourly capacity base. Next, a touch and go factor was determined using the percent of touch and go operations with the aircraft mix index. Finally, the taxiway exit factor was determined by the aircraft mix index, percent of aircraft arrivals, and number of eligible exit taxiways. A weighted hourly capacity was then calculated (**Table 4-3**) based on the percentage that VFR and IFR conditions have historically been observed for each different operational flow. It should be noted that all the calculations are based on the existing airfield configuration.

TABLE 4-3
HOURLY CAPACITIES OF THE RUNWAY SYSTEM

	Average VFR Hourly Capacity	Average IFR Hourly Capacity	Weighted Hourly Capacity
Base Year			
2019	140	57	138
Forecast			
2025	130	57	128
2030	123	56	121
2040	117	56	115

SOURCE: ESA analysis 2021.

Annual Service Volume

ASV is the overall measure of runway capacity at an airport. It represents the number of total operations that an airfield can support annually. In other words, ASV is the theoretical limit of operations that the airport can safely accommodate without unreasonable levels of delay occurring on a regular basis. To calculate ASV, first the ratio of annual demand to average daily demand, during the peak month, is calculated. Next, the ratio of average daily demand to average peak hour demand during the same time is determined. These values are then multiplied together with the corresponding weighted hourly capacity to compute ASV. The calculated ASV is included in **Table 4-4** and compared to the annual operations from the approved forecasts.

TABLE 4-4
AIRFIELD CAPACITY ANALYSIS

	Annual Operations	Annual Service Volume (ASV)	Capacity Level
Base Year			
2019	114,391	266,600	43%
Forecast			
2025	134,600	261,500	51%
2030	145,700	249,000	59%
2040	170,800	237,500	72%

SOURCE: ESA analysis 2021.

A demand that exceeds ASV can result in delays on the airfield. However, no matter how substantial an airport's capacity may appear, it should be realized that delays can occur even before an airport reaches its stated capacity. In fact, according to FAA Order 5090.5, *Formulation of the NPIAS and ACIP*, capacity enhancing projects need sufficient lead times so that the improvements can be properly planned, environmentally reviewed, designed, and constructed before the resulting delays become critical. For most every type of airfield capacity enhancing project, the FAA recommends planning for such improvements when activity levels reach 60 percent of the annual capacity so that improvements can developed before the 80 percent threshold is reached. For additional exit taxiways, the activity level trigger is 50 percent of the annual capacity in order to implement improvements before 70 percent occurs.

Based on the calculations in **Table 4-4**, it is expected that SUA will reach the 60 percent threshold in the second half of the 20-year planning period. However, it should be noted that the 80 percent threshold is not expected to occur within the 20-year horizon of this study. For exit taxiways, the airfield is projected to exceed the 50 percent threshold towards the end of the short-term planning period; therefore, taxiway projects with the potential to enhance the overall efficiency or bypass capability of the airfield system should be considered as soon as possible. If taxiway system improvements are made, it is likely that the 60 percent threshold would move to either the end or possibly beyond the study period. Changes or improvements to the published instrument approach procedures were not considered from a capacity standpoint given a majority of the airport's operations are conducted during visual conditions.

4.2.5 Runway and Taxiway Flow Analysis

In addition to the FAA airfield capacity calculations, evaluations of the different airfield arrival and departure flows were made to help identify any inefficient areas on the airfield. This evaluation focused on the following conditions:

- Runway 12-30 Movements – Southeast and Northwest Flows
- Runway 16-34 Movements – South and North Flows
- Runway 7-25 Movements - East and West Flows

Assessing the different flows individually provides the simplest way to observe how aircraft movements typically occur on the current taxiway system. Through meetings and conversations with ATCT management, the most common taxi routes utilized to access or exit the runway environment were documented. Detailing how the airfield is operated ultimately helps identify where future improvements should be considered, especially given the taxiway design guidance in FAA AC 150/5300-13A, Change 1, *Airport Design* was established after the last Airport Master Plan was conducted in 2010.

Runway 12 Movements – Southeast Flow

Typical aircraft arrival and departure movements for Runway 12 in a southeast flow are illustrated on **Figure 4-1**. Taxiway A provides access on the south side to both ends of the runway. Access to the Runway 30 end requires utilizing the end of Runway 34. **Figure 4-1** also depicts the FAA's optimal taxiway exit range described as part of the capacity calculations. The primary observations include:

Arrivals

1. Taxiway C is used predominantly by small aircraft exiting the runway.
2. Taxiway A3 is used by small and some large aircraft exiting the runway.
3. Taxiway D is used by most large aircraft exiting the runway.
4. Aircraft requiring the full runway length for landing utilize the end of Runway 34 to exit the runway at the southeast end of Taxiway A.
5. Some touch and go operations are sequenced on Runway 16 when Runway 12 is active. These operations will utilize Taxiway D1 to taxi back to the Runway 16 end for departure.

Departures

6. Taxiway A is used by most aircraft departing on Runway 12 to have the full runway length available.

7. Taxiway A2 is occasionally used by small aircraft for intersection departures.

8. Some small aircraft will depart on Runway 12 using Taxiway A1 if winds allow. This provides separation from jet aircraft departing on Runway 12 and avoids wake turbulence delays for the small aircraft.

Runway 30 Movements – Northwest Flow

Typical aircraft arrival and departure movements for Runway 30 in a northwest flow are illustrated on **Figure 4-2**. The figure also depicts the FAA's optimal taxiway exit range described previously. The primary observations include:

Arrivals

1. Taxiway C is used predominantly by small aircraft and the occasional large aircraft exiting the runway.

2. Taxiway A2 is used by some small and most large aircraft exiting the runway.

3. Taxiway A1 is used by large aircraft needing additional landing distance to exit the runway.

4. Aircraft requiring the full runway length for landing exit the runway at the northwest end of Taxiway A.

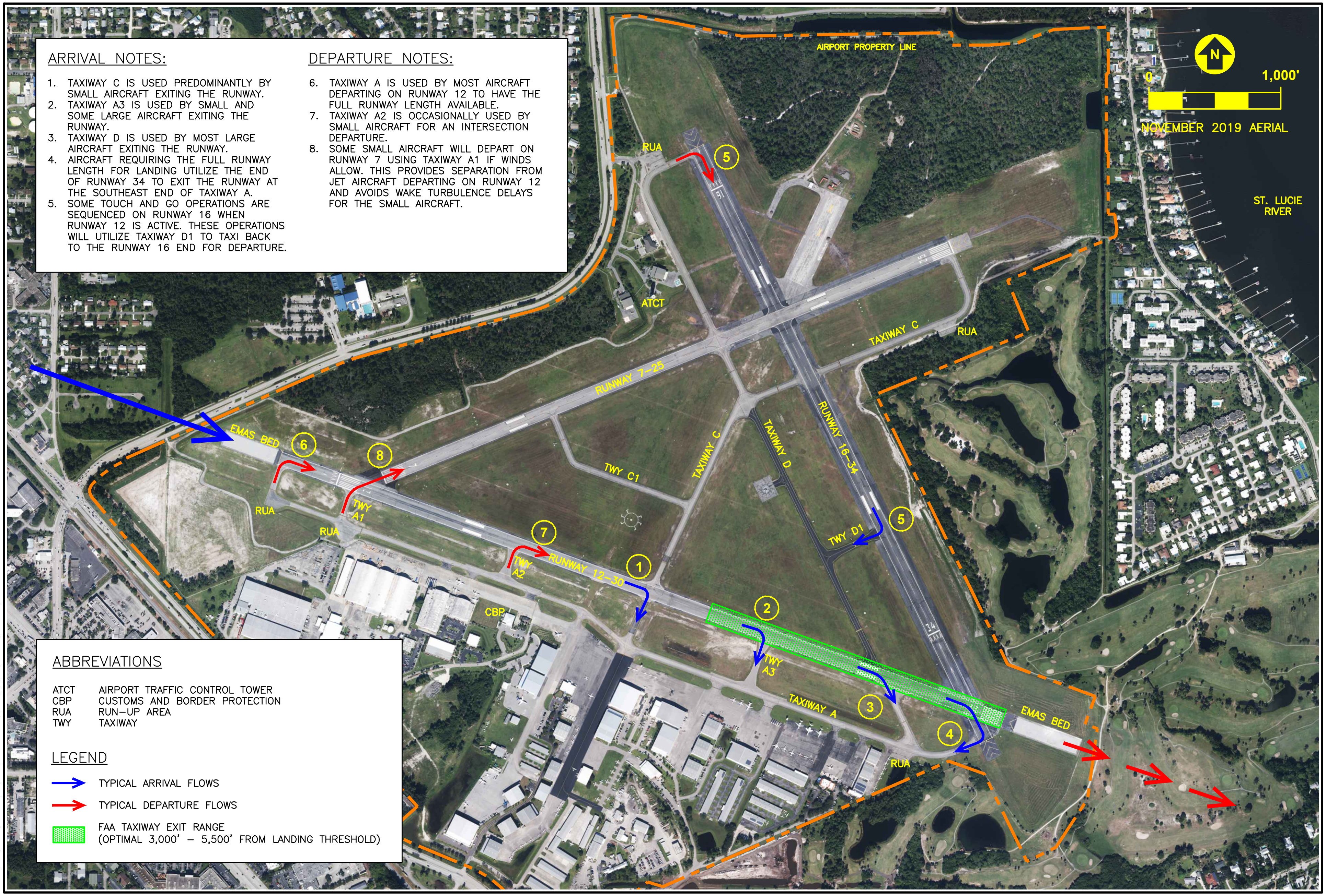
5. Some touch and go operations are sequenced on Runway 34 when Runway 30 is active. These operations will taxi back to Taxiway D1 for an intersection departure.

Departures

6. Taxiway D is used by most small aircraft for an intersection departure to avoid congestion at the runway end.

7. Taxiway A and the end of Runway 34 are used by some small and most large aircraft to have the full runway length available.

8. Some small aircraft will use Taxiway A to depart on Runway 34 if the wind allows. This is typically done by aircraft heading north or turning east to ultimately head south.



Source: ESA, 2021.

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FIGURE 4-1

RUNWAY 12 MOVEMENTS - SOUTHEAST FLOW

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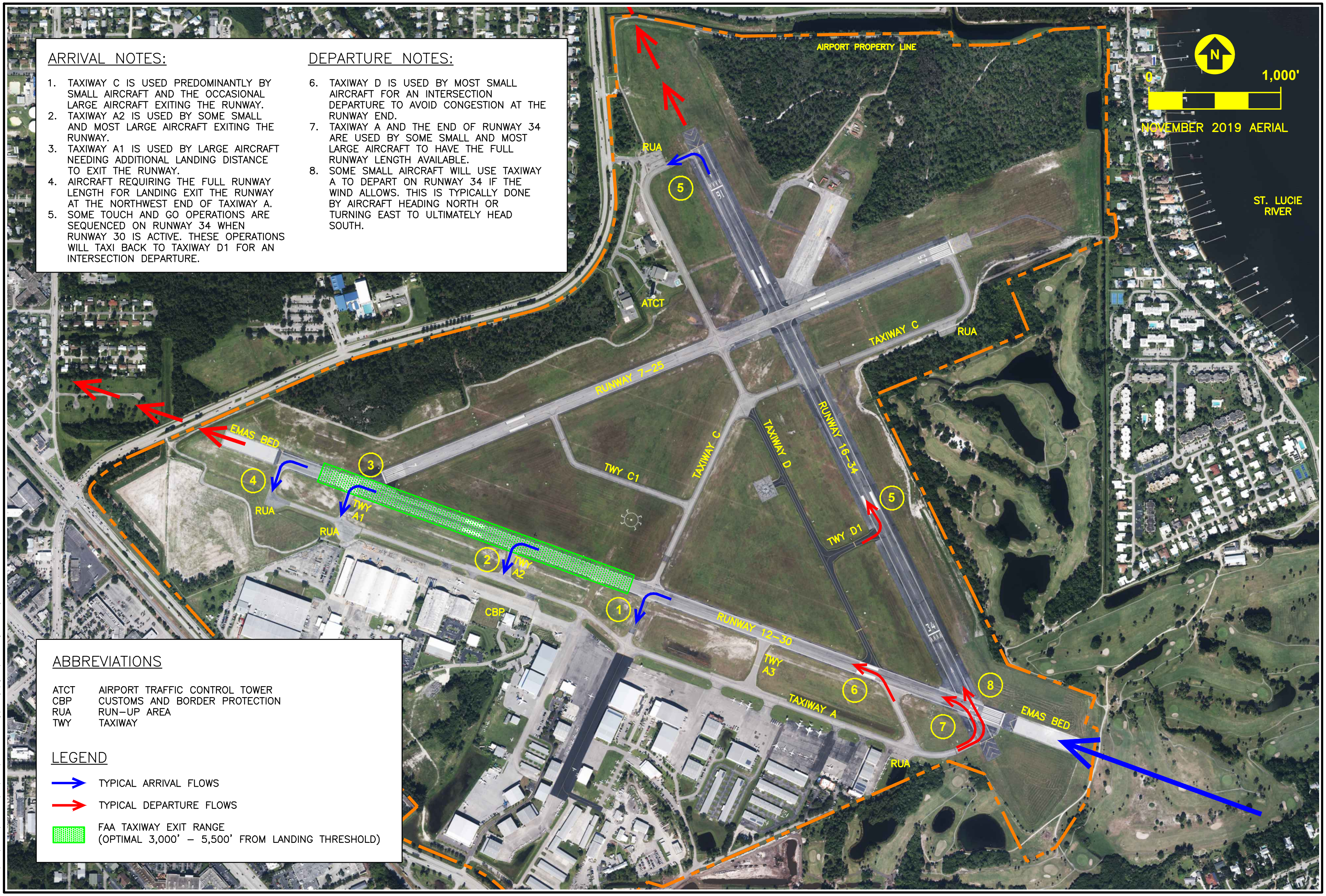

Source: ESA, 2021.

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FIGURE 4-2

RUNWAY 30 MOVEMENTS - NORTHWEST FLOW

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Runway 16 Movements – South Flow

Typical aircraft arrival and departure movements for Runway 16 in a south flow are illustrated on **Figure 4-3**. Generally, this crosswind runway primarily supports smaller aircraft operations; but due to its overall length it also supports large aircraft. Taxiway D provides access on the west side to both runway ends. **Figure 4-3** also depicts the FAA's optimal taxiway exit range described previously as part of the capacity calculations. The primary observations include:

Arrivals

1. Taxiway A is used by most large aircraft and some small aircraft exiting the runway.
2. Taxiway D1 is used by most small aircraft exiting the runway.
3. Taxiway D1 is used by training aircraft conducting stop and go operations that need to taxi back to the Runway 16 end for departure.

Departures

4. Due to its distance from most facilities, Runway 16 is primarily used for arrivals; however, Taxiway D is used by training aircraft conducting stop and go operations.

Runway 34 Movements – North Flow

Typical aircraft arrival and departure movements for Runway 34 in a north flow are illustrated on **Figure 4-4**. The figure also depicts the FAA's optimal taxiway exit range described previously. The primary observations include:

Arrivals

1. Taxiway D1 is occasionally used by small aircraft exiting the runway.
2. Taxiway C is used by most small aircraft exiting the runway.
3. Runway 7-25 is used by some small aircraft and some large aircraft exiting the runway.
4. Aircraft requiring the full runway length for landing exit the runway at the north end of Taxiway D.

Departures

5. Taxiway A is used by most aircraft departing on Runway 34 to have the full runway length available.
6. Taxiway D1 is used primarily by training aircraft for stop and go operations.

Runway 7 Movements – East Flow

Typical aircraft arrival and departure movements for Runway 7 in an east flow are illustrated on **Figure 4-5**. While this secondary runway mainly serves smaller aircraft operations; it also supports large aircraft on a regular basis. Taxiway C provides partial parallel taxiway access on the south side from the Runway 25 end and to almost the midpoint of the runway. **Figure 4-5** also depicts the FAA's optimal taxiway exit range described as part of the capacity calculations. The primary observations include:

Arrivals

1. Taxiway D is used by most small aircraft exiting the runway.
2. Runway 16-34 is used by some small aircraft and some large aircraft exiting the runway.
3. Taxiway C is used by most large aircraft and some small aircraft requiring the full runway length for landing.

Departures

4. Taxiway A1 is used by most aircraft departing on Runway 7.
5. Occasionally small aircraft will depart on Runway 7 from the Runway 12 end. This usually occurs when the aircraft utilizes the run-up area at the northwest end of Taxiway A.

Runway 25 Movements – West Flow

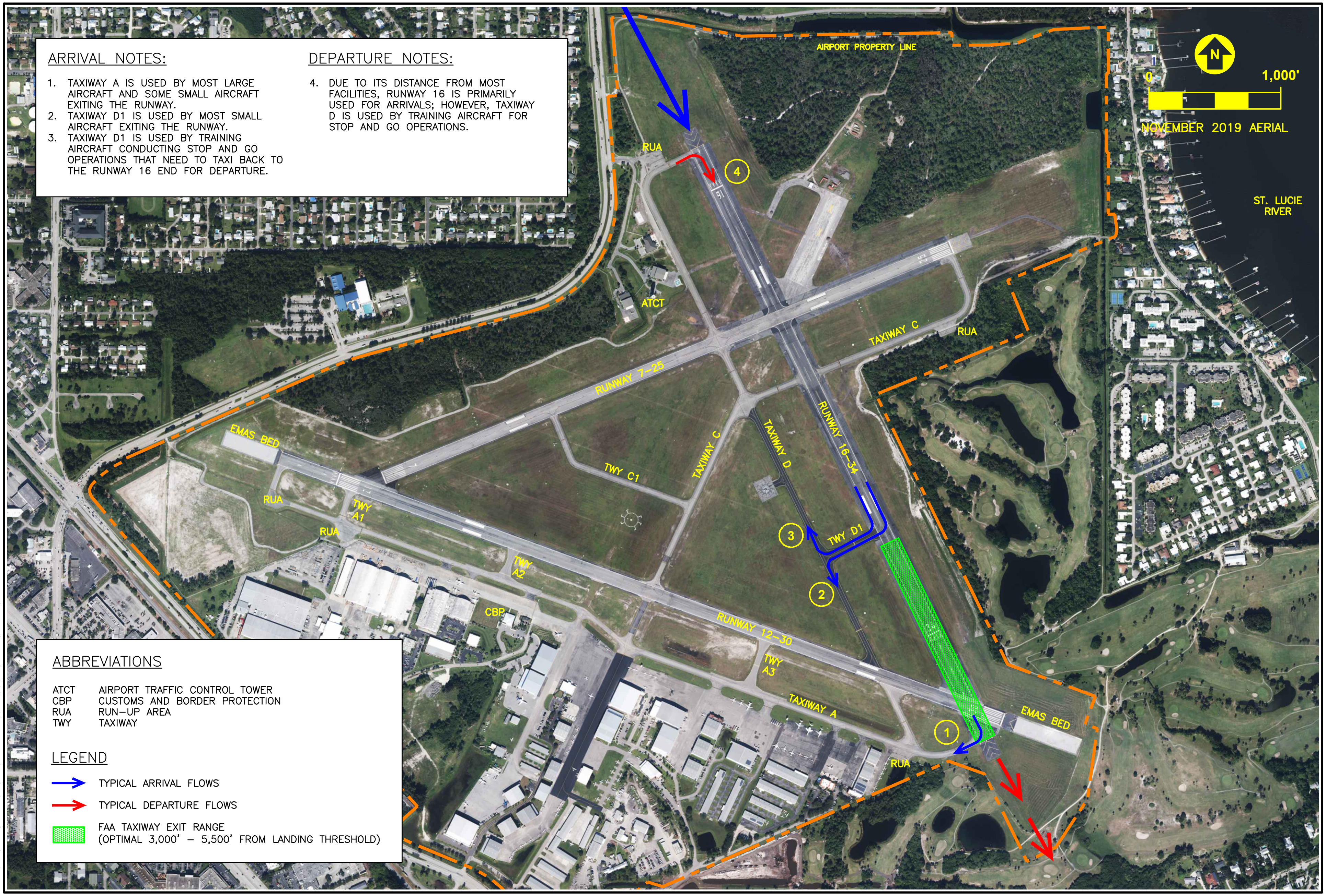
Typical aircraft arrival and departure movements for Runway 25 in a west flow are illustrated on **Figure 4-6**. The figure also depicts the FAA's optimal taxiway exit range described previously. The primary observations include:

Arrivals

1. Taxiway D is used by most small aircraft exiting the runway.
2. Taxiway C1 is used by some small aircraft and some large aircraft exiting the runway.
3. Taxiway A1 is used by large aircraft requiring the full runway length for landing.

Departures

4. Taxiway C is used by small and large aircraft; however, because of its distance from most facilities, Runway 16 is primarily used for arrivals.



Source: ESA, 2021.

Witham Field Master Plan

FIGURE 4-3

RUNWAY 16 MOVEMENTS - SOUTH FLOW

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Source: ESA, 2021.

FIGURE 4-4
RUNWAY 34 MOVEMENTS - NORTH FLOW

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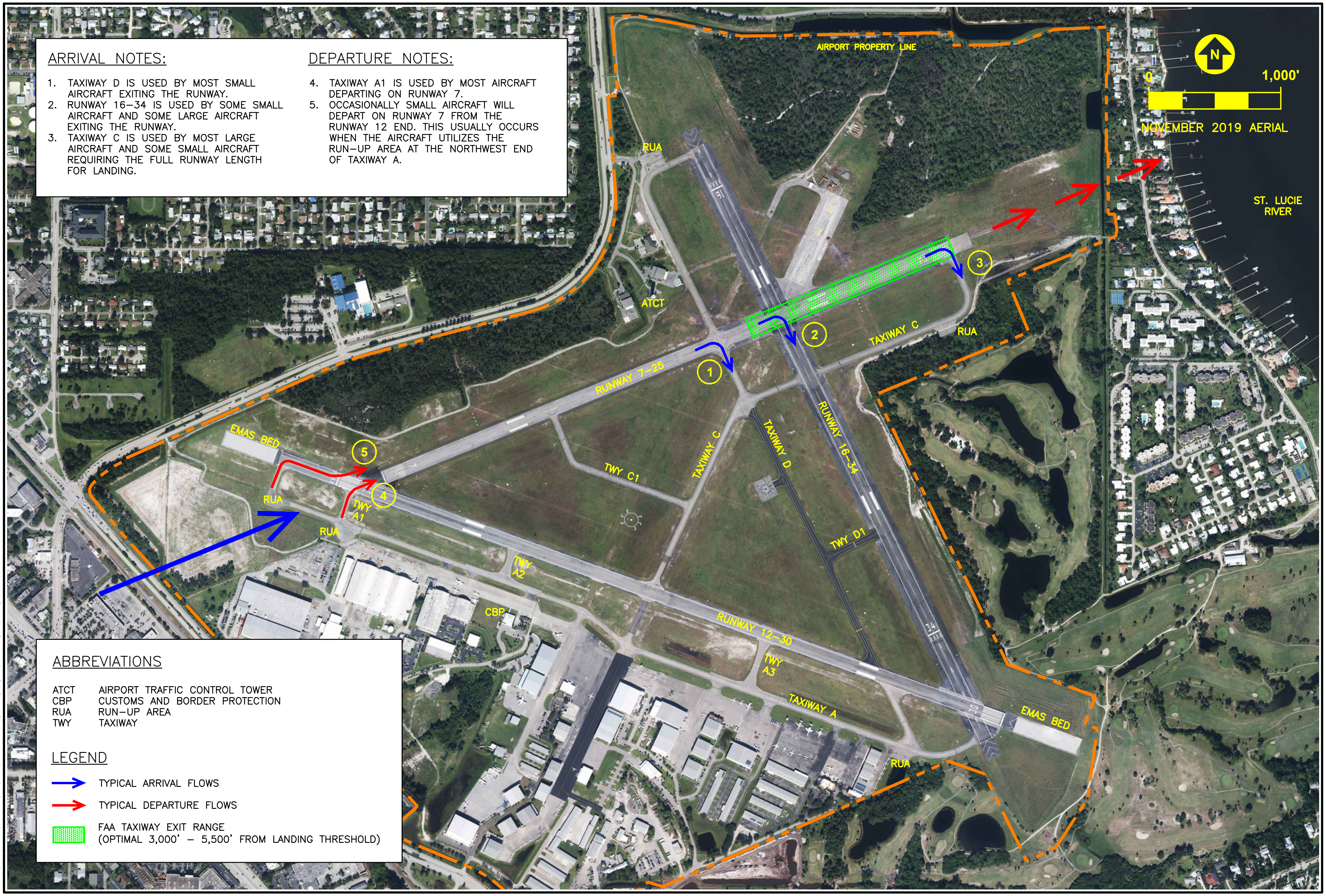

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Source: ESA, 2021.

FIGURE 4-5
RUNWAY 7 MOVEMENTS - EAST FLOW

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Source: ESA, 2021.

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FIGURE 4-6

RUNWAY 25 MOVEMENTS - WEST FLOW

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4.3 Runway Requirements

As the primary airfield component, a runway must have the proper length, width, and strength to safely accommodate the existing and future critical aircraft. In addition to the physical characteristics of a runway, there are a number of other safety-related design standards that must be met, including the Runway Safety Area, Runway Object Free Area, Runway Protection Zones, and Obstacle Free Zones. Each of these, as well as other runway requirements, are described in the following sections.

4.3.1 Runway Length Analysis

FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*, provides the current standards and methods for computing recommended runway lengths. Use of this AC is required when a runway extension project is intended to request or receive federal funding. Depending on the critical aircraft's maximum certificated takeoff weight (MTOW), the AC provides different methods for calculating runway length. They are based on the MTOW ranges of 12,500 pounds or less (small aircraft); over 12,500 pounds, but less than 60,000 pounds; and 60,000 pounds or more. It should be noted that depending on the aircraft manufacturer, MTOW may also be referred to as the maximum takeoff weight, maximum allowable takeoff weight, or maximum design takeoff weight.

While the procedures and design rationale vary depending on the weight category, each still requires some basic airfield data. This data is used in adjusting how an aircraft's takeoff and landing performance might be influenced by the characteristics at a specific airport. For SUA these include the established airfield elevation of 16 feet above mean sea level (AMSL) and the mean daily maximum temperature of the hottest month, which is 90 degrees Fahrenheit.

Length Required for Small Aircraft

Small aircraft are defined as those that have a MTOW of 12,500 pounds or less. The small aircraft group includes almost all single- and multi-engine (piston and turboprop) aircraft. The charts in FAA AC 150/5325-4B for determining the length required for small aircraft were not utilized in this study.

Requirements for Large Aircraft up to 60,000 Pounds

Using approved aircraft flight manuals, FAA AC 150/5325-4B provides performance curves to determine the runway length required for large aircraft weighing between 12,500 and 60,000 pounds. In addition to the airfield elevation and mean daily maximum temperature, information on the useful load factor, effective runway gradient, and typical weather conditions are required.

Useful load refers to the difference between an aircraft's MTOW and the empty weight. As such, the useful load factor provides an indication of the number of passengers, cargo, and fuel carried by an aircraft. In the FAA's charts there is an option to select either a 60 or 90 percent useful load factor. Essentially, the heavier the aircraft (higher useful load percentage) the more runway length required. Because of the airport's southeastern location within the nation, flights of 1,000 miles, 1,500 miles, or even longer (to get to the west coast) occur on a regular basis. As a result, both the 60 and 90 percent useful loads were calculated.

The FAA performance curves for jet aircraft weighing 12,500 to 60,000 pounds are also split into the categories of 75 and 100 percent of the fleet. FAA AC 150/5325-4B provides lists of the general aviation jet aircraft that represent 75 percent of the fleet flying in the U.S. This list combined with a second list represents 100 percent of the general aviation jet fleet in this weight range. The FAA's 100 percent of the fleet table includes the larger Beechcraft Hawker, Bombardier Challenger, Bombardier Learjet, Cessna Citation, and Dassault Falcon series business jets. Since all these aircraft conduct operations at SUA on a regular basis; the 100 percent of the fleet performance curves were used.

Applying local conditions to these performance curves yields an initial runway length requirement based on no wind, a dry runway surface, and zero effective runway gradient. These initial runway length requirements for SUA were 5,350 feet for a 60 percent useful load and 8,300 feet for the 90 percent useful load.

Adjustments are then made to the initial runway lengths for either takeoff or landing operations, but not for both, as the increases are not cumulative. Takeoff adjustments are based on the maximum difference in centerline elevation of the runway being considered while landing adjustments are only made for runways serving jet aircraft operations. For takeoffs, since the initial lengths are adjusted for a specific runway's effective gradient, the centerline elevation difference for the most critical runway was applied since all of the runways accommodate aircraft in this weight range. At SUA, Runway 12-30 has the greatest difference in centerline elevation with 5 feet between the high and low points of the runway. For landings, the initial length is increased by 15 percent (up to a specified limit) to account for the decrease in landing performance under wet and slippery conditions. After both takeoff and landing adjustments are considered, the final recommended length for large aircraft weighing between 12,500 and 60,000 pounds is 6,150 feet at a 60 percent useful load and 8,350 feet at a 90 percent useful load.

Specific Lengths for Aircraft Greater than 60,000 Pounds

FAA AC 150/5325-4B specifies that the Airport Planning Manuals (APMs) provided by the aircraft manufacturers be utilized for calculating specific takeoff and landing lengths of large aircraft over 60,000 pounds. Unfortunately, APMs are not published for most general aviation jets, including the critical aircraft for Runways 12-30 and 7-25, the Gulfstream G650 and Gulfstream G450, which have MTOWs of 99,600 and 74,600 pounds, respectively.

Runway Length Analysis Using Balanced Field Length

As most general aviation jets over 60,000 pounds do not have an APM, performance data from the aircraft manufacturers was used to analyze the runway lengths required for these aircraft. A number of the more common general aviation business jets operating at SUA today and weighing more than 12,500 pounds were evaluated. The resulting 49 aircraft are listed in **Table 4-5** based on their MTOW, from lightest to the heaviest, along with the corresponding runway length requirements.

Two different runway lengths have been shown for each aircraft. The first is the Balanced Field Takeoff Length. This is published by the aircraft manufacturers as the length required for takeoffs on a flat and dry runway, with the aircraft at MTOW and operating under standard atmospheric conditions (59 degrees Fahrenheit at sea level). Because the elevation at SUA is 16 feet AMSL but the average temperature is well in excess of 59 degrees Fahrenheit, these calculations are considered a best case scenario for the aircraft at MTOW and representative of only a few days each year.

The second number is the Required Takeoff Length at SUA which is calculated using the Balanced Field Takeoff Length for each aircraft adjusted for local conditions (airfield elevation, mean daily maximum temperature of the hottest month, and maximum difference in runway centerline elevation) per the accepted FAA methodology. In all cases these lengths are longer due to the climate of the local area. This is an important consideration as these figures represent the upper range of runway lengths required for each aircraft to be able to depart SUA at MTOW (without weight restrictions).

TABLE 4-5
SPECIFIC RUNWAY LENGTHS FOR GENERAL AVIATION JETS WEIGHING MORE THAN 12,500 POUNDS

Aircraft Type	Aircraft Reference Code	Maximum Takeoff Weight (pounds)	Balanced Field Takeoff Length (standard conditions)	Required Takeoff Length at SUA (local conditions with 90° F temp.)
Citation CJ3	B-II	13,870	3,450’	4,037
Citation II	B-II	14,100	3,450’	4,037
Citation Bravo	B-II	14,800	3,600’	4,211
Citation Encore	B-II	16,630	3,490’	4,084
Phenom 300	B-II	17,968	3,138’	3,677
Citation Excel	B-II	18,700	3,415’	3,997
Citation XLS	B-II	20,200	3,560’	4,165
Learjet 70	C-II	21,500	4,440’	5,182
Learjet 75	C-II	21,500	4,440’	5,182
Citation III	C-II	22,000	5,030’	5,865
Citation VII	C-II	23,000	4,850’	5,657
Sabreliner 80	C-II	23,300	4,550’	5,310
Sabreliner 65	B-II	24,000	5,895’	6,865
1125 Astra SP	C-II	24,650	5,395’	6,287
Gulfstream 150	C-II	26,100	5,499’	6,407
Hawker 800	C-II	28,000	5,032’	5,867
Gulfstream 200	C-II	35,450	6,083’	7,083
Gulfstream I	B-II	36,000	4,725’	5,512
Citation X	C-II	36,600	5,250’	6,119
Falcon 50	B-II	38,800	4,700’	5,483
Challenger 300	C-II	38,850	4,810’	5,610
Gulfstream 280	C-II	39,600	4,750’	5,541

TABLE 4-5
SPECIFIC RUNWAY LENGTHS FOR GENERAL AVIATION JETS WEIGHING MORE THAN 12,500 POUNDS

Aircraft Type	Aircraft Reference Code	Maximum Takeoff Weight (pounds)	Balanced Field Takeoff Length (standard conditions)	Required Takeoff Length at SUA (local conditions with 90° F temp.)
Challenger 350	C-II	40,600	4,835’	5,639
Falcon 2000S	B-II	41,000	4,325’	5,049
Challenger 600	C-II	41,100	5,700’	6,640
Falcon 2000LXS	B-II	42,800	4,675’	5,454
Challenger 601	C-II	45,100	6,050’	7,045
Challenger 605	C-II	48,200	5,840’	6,802
Challenger 650	C-II	48,200	5,640’	6,570
Falcon 900	B-II	49,000	5,360’	6,246
Challenger 800	C-II	53,000	6,305’	7,339
Gulfstream II	C-II	65,500	5,700’	6,640
Gulfstream III	C-II	69,700	5,100’	5,946
Falcon 7X	B-III	70,000	5,710’	6,651
Gulfstream 350	D-II	70,900	5,050’	5,888
Falcon 8X	B-III	73,000	6,000’	6,987
Gulfstream IV	C-II	74,600	5,450’	6,524
Gulfstream 450	D-II	74,600	5,600’	6,351
Falcon 6X	B-III	77,460	5,480’	6,385
Gulfstream 500	D-III	79,600	5,400’	6,293
Gulfstream V	C-III	90,500	6,110’	7,114
Gulfstream 550	D-III	91,000	5,910’	6,883
Global 5000	C-III	92,500	5,540’	6,455
Gulfstream 600	D-III	94,600	5,900’	6,871
Global Express	C-III	95,000	5,820’	6,778
Global 6000	C-III	99,500	6,476’	7,537
Gulfstream 650	D-III	99,600	5,858’	6,822
Global 8000	C-III	104,800	5,880’	6,848
Global 7500	C-III	106,250	5,800’	6,755

SOURCE: Aircraft manufacturers, industry databases, aircraft performance manuals, and ESA analysis, 2021.

Recommended Runway Lengths

The current lengths published for the runways are 5,828 feet for Runway 12-30, 5,000 feet for Runway 16-34, and 4,653 feet for Runway 7-25. However, the thresholds for Runways 12, 16, and 34 are displaced. For these displacements, the 2010 Airport Master Plan Update included declared distances calculations for Runways 12-30 and 16-34 as one of the sheets in the current April 2013 Airport Layout Plan (ALP) Drawing set associated with the study.

Declared distances determine, among other things, the actual Federal Aviation Regulation (FAR) takeoff length available for a runway. For this section it is important to note that the Accelerate Stop Distance Available (ASDA) calculated as part of the declared distances is the limiting length for takeoffs. The current 2013 ALP Drawing set reflects a full length ASDA (5,828 feet) for departures off either end of Runway 12-30. For departures off Runway 16 the ASDA is 4,120 feet while the ASDA for Runway 34 is 4,670 feet. The application of declared distances are addressed further in a following section.

Runway 12-30

As the primary runway, Runway 12-30 needs to be able to accommodate the takeoff and landing lengths required for the most demanding aircraft conducting 500 or more annual operations. Using the FAA's methodology, the final recommended length at SUA for large aircraft weighing between 12,500 and 60,000 pounds is 6,150 feet at a 60 percent useful load and 8,350 feet at a 90 percent useful load. Accommodating these lengths would require an additional 322 to 2,522 feet of length beyond the 5,828 feet currently available.

For aircraft over 60,000 pounds, the FAA methodology could not be applied since most general aviation jets do not have a manufacturer's APM. For this reason, it is essential to consider the Required Takeoff Lengths at SUA for each aircraft listed in **Table 4-5** (using the mean daily maximum temperature of the hottest month). Unlike the FAA methodology, which considers either a 60 or 90 percent useful load, the specific lengths for each general aviation jet under this methodology incorporates a 100 percent useful load (MTOW). Regardless, the most demanding aircraft analyzed (Global 6000 at 99,500 pounds MTOW) requires just over 7,500 feet. This is nearly 1,000 feet less than the FAA recommended length for aircraft up to 60,000 pounds at a 90 percent useful load.

For the C-III and D-III aircraft in **Table 4-5**, the average Balanced Field Takeoff Length is just above (5,836 feet) the available 5,828 feet on Runway 12-30. When adjusted for the local conditions using the mean daily maximum temperature of the hottest month, this average increases to 6,750 feet. As per the FAA methodology this adjustment utilized the 90 degrees Fahrenheit mean daily maximum temperature of the hottest month (August). The historic weather data shows that only the month of July has average maximum temperatures of 90 degrees Fahrenheit, while the other ten months have average maximum temperatures between 73 to 88 degrees Fahrenheit.

In 2019, less than 15 percent of all operations occurred during July and August, while a majority of the operations occur during the fall, winter, and spring months when the temperatures are cooler. Operations during these result in maximum takeoff calculations between those at standard atmospheric conditions and those using the maximum temperature of 90 degrees Fahrenheit. This explains why none of the airport tenants or customers interviewed during the master plan process requested an increase in the available takeoff length for Runway 12-30. Therefore, no additional length for Runway 12-30 is considered necessary.

Runway 16-34

As the crosswind runway, the length of Runway 16-34 must support those aircraft requiring the runway based on the wind rose analysis. The wind coverage analysis in the forecast chapter showed a crosswind runway at SUA is needed to support A-I and B-I aircraft during IFR conditions. However, the forecast chapter also documented that a number of jet aircraft within the B-II category, such as the Cessna Citation and Dassault Falcon models within this category, regularly use Runway 16-34. These critical aircraft are included within the FAA's 75 percent of the fleet category for determining runway lengths for aircraft weighing 12,500 to 60,000 pounds. FAA AC 150/5325-4B states that the aircraft in the 75 percent group require less than 5,000 feet of runway under standard atmospheric conditions (59 degrees Fahrenheit at sea level).

Of the 49 aircraft analyzed in **Table 4-5** using the Balance Field Takeoff Approach, 13 were B-II aircraft. The average Required Takeoff Lengths at SUA for these 13 aircraft is 4,830 feet. When the declared distances from the current 2013 ALP Drawing set are considered, the length available for takeoff (ASDA) on Runway 16 is 4,120 feet and 4,670 feet for Runway 34. Therefore, the ability to utilize more of the existing 5,000 feet of runway pavement for takeoffs will be evaluated in the alternatives chapter.

Runway 7-25

While Runway 7-25 is an additional runway, the length to accommodate the critical aircraft using it should still be evaluated. The forecast chapter documented that jet aircraft in the B-II category utilize Runway 7-25 on a regular basis. As with Runway 16-34, the average Required Takeoff Lengths for this group of aircraft at SUA is 4,830 feet. Therefore, improvements to the runway will be evaluated in the alternatives chapter to determine if any additional capability can be provided.

TABLE 4-6
EXISTING AND FUTURE RUNWAY LENGTH REQUIREMENTS

Runway	Critical Aircraft Group	Required Runway Length	Available Runway Length for Takeoffs[1]	Additional Length Required
12-30	D-III	6,750'	5,828'	None[2]
16-34	B-II	4,830'	4,120'	710'
7-25	B-II	4,830'	4,653'	177'

NOTES: 1. Runway 16-34 length based on the most restrictive declared distance included on the April 2013 ALP Drawing set.
2. Due to the Engineered Materials Arresting System (EMAS) beds and physical limitations off each end, as well as the fact that no tenants/users requested additional length.

SOURCE: FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*, November 2019 runway survey, and ESA analysis, 2021.

4.3.2 Runway Width Requirements

Runway width requirements are based on the runway design standards of the most critical aircraft defined in the forecast chapter. The minimum existing and future requirements for each runway are listed in **Table 4-7** along with the corresponding runway shoulder width and blast pad dimensions.

For shoulders, the requirement versus recommendation for paving the shoulders is based on the Airplane Design Group (ADG). Conversely, when required, blast pads are always paved.

TABLE 4-7
MINIMUM RUNWAY WIDTH, SHOULDER, AND BLAST PAD REQUIREMENTS

Runway	Runway Design Code	Pavement Width	Shoulder Width	Blast Pad Width	Blast Pad Length
12-30	D-III	100’	20’ stabilized	140’	200’
16-34	B-II	75’	10’ stabilized	95’	150’
7-25	B-II	75’	10’ stabilized	95’	150’

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

Runway 12-30 provides the 100 foot pavement width required for both the existing and future critical aircraft. There are also 12 foot paved shoulders on each side and then the soil immediately adjacent provides the additional space required for the 20 foot stabilized shoulders. The Engineered Materials Arresting System (EMAS) installed at both ends of the runway also serve to provide the required blast pads off each end.

At 100 feet wide, Runway 16-34 provides the pavement width required for both the existing and future critical aircraft. The extra runway width also serves to provide the required 10 foot stabilized shoulders. Both ends of the runway have a 120 foot wide by 150 foot long blast pad, which exceeds the existing and future requirement.

Similarly, at 100 feet wide, Runway 7-25 provides the pavement width required for both the existing and future critical aircraft. The extra runway width also serves to provide the required 10 foot stabilized shoulders. The 120 foot wide by 150 foot long blast pad at the Runway 25 end exceeds the requirement while the pavement at the Runway 7 end and its orientation with Runway 12-30 meets the paved area needed for a blast pad at that end.

4.3.3 Runway Pavement Strength and Condition

Pavement strength requirements for each runway at an airport are predicated upon the critical aircraft’s weight and how that weight is distributed through the landing gear. The Pavement Condition Index (PCI) provided for each runway in the existing conditions chapter was based on the June 2021 Florida Department of Transportation (FDOT) pavement evaluation report.

The 2021 Statewide Airfield Pavement Management Program report for SUA documented Runway 12-30 as having an area weighted PCI of 92 (good), Runway 16-34 with a PCI of 92 (good), and Runway 7-25 at 77 (satisfactory). The high pavement ratings for the primary and crosswind runway are the result of rehabilitation projects in 2016. For Runway 7-25 an asphalt concrete rehabilitation is recommended for 2025 given that PCI for this runway is expected to be 68 (fair) at that time. This pavement rehabilitation project is described by FDOT as a combination of asphalt pavement milling and overlay with 25 percent of the areas subject to full depth reconstruction.

In the 2019 Airport Improvement Program (AIP) Handbook, the FAA defines the minimum useful life of pavement rehabilitations as 10 years and 20 years for reconstructed or new pavement surfaces. However, since pavement condition depends on the use and environment, projects to rehabilitate airfield pavements are routinely conducted every 15 to 20 years after the previous major rehabilitation, strengthening, or new construction. These projects, which repair damage to the runway pavement resulting from normal wear, need to be conducted even at airports with regular pavement maintenance programs, including crack sealing and surface seal coats. Given the current condition of both Runways 12-30 and 16-34, the next rehabilitation for these runways should be planned for the latter half of the 20-year master plan horizon. For Runway 7-25, a rehabilitation of the runway pavement should be programmed within the first half of the 20-year planning period.

Additionally, the FAA considers the grooving of any runway serving or expected to serve jet aircraft as a high safety priority. Therefore, all three of the runways should continue to remain grooved.

4.3.4 Runway Safety Criteria

The safety surfaces required to protect aircraft operations and the public include the Runway Safety Area, Runway Object Free Area, Runway Protection Zones, and Obstacle Free Zones. The FAA definitions for these surfaces as well as their dimensions at SUA are included below.

Runway Safety Area (RSA) - A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overrun, or veer off the runway. The RSA needs to be: (1) cleared and graded with no potentially hazardous ruts, humps, depressions, or other surface variations; (2) drained by grading or storm sewers to prevent water accumulation; (3) capable, under dry conditions of supporting the occasional passage of aircraft without causing structural damage to the aircraft; and (4) free of objects, except for those that need to be located in the safety area because of their function. It should be noted that the FAA does not allow modifications to any RSA standards and that the area must be owned and controlled by the airport.

Runway Object Free Area (ROFA) - The ROFA is centered on the runway centerline. Standards for the ROFA require clearing the area of all ground objects protruding above the RSA edge elevation. Except where precluded by other clearing standards, it is acceptable to place objects that need to be located in the ROFA for air navigation or aircraft ground maneuvering purposes and to taxi and hold aircraft in the ROFA. Objects non-essential for air navigation or aircraft ground maneuvering purposes are not to be placed in the ROFA. This includes parked airplanes and agricultural operations. As with the RSA, the ROFA must be owned and controlled by the airport.

Runway Protection Zone (RPZ) – The RPZ is trapezoidal shaped area typically beginning 200 feet from the usable pavement end of a runway. The primary function of this area is to preserve and enhance the protection of people and property on the ground. Even though there is no vertical component, airports are required to maintain control of each runway’s RPZ. Such control includes keeping the area clear of incompatible objects and activities. While not required, this control is much easier to achieve and maintain through the acquisition of sufficient property interests in the RPZs.

Runway Obstacle Free Zone (ROFZ) - The ROFZ is a three-dimensional volume of airspace centered on the runway that supports the transition of ground to airborne operations (or vice versa). The ROFZ clearing standards prohibit taxiing, parked airplanes, and other objects, except frangible navigational aids or fixed-function objects (such as signage), from penetrating this zone. Precision instrument runways also require an Inner-transitional OFZ and Precision OFZ. If there is an approach lighting system, then an Inner-approach OFZ is also required.

Dimensions for the required RSA, ROFA, RPZ, and ROFZ shown in **Table 4-8** are directly related to the Aircraft Approach Category (AAC), ADG, and visibility minimums. As documented in the forecast chapter, the critical aircraft groups for each runway are not expected to change; therefore, the existing and future criteria is the same. For each runway this assumes there are no significant changes expected to the instrument approach minimums (addressed in a subsequent section).

TABLE 4-8
EXISTING AND FUTURE RUNWAY SAFETY CRITERIA

Runway	Runway Safety Area	Runway Object Free Area	Runway Protection Zone	Runway Obstacle Free Zone
12-30	500’ wide 600’ prior 1,000’ beyond	800’ wide 600’ prior 1,000’ beyond	1,000’ x 1,510’ x 1,700’ (Approach) 500’ x 1,010’ x 1,700’ (Departure)	400’ wide 200’ beyond
16-34	150’ wide 300’ prior 300’ beyond	500’ wide 300’ prior 300’ beyond	500’ x 700’ x 1,000’ (both Approach and Departure)	400’ wide 200’ beyond
7-25	150’ wide 300’ prior 300’ beyond	500’ wide 300’ prior 300’ beyond	500’ x 700’ x 1,000’ (both Approach and Departure)	400’ wide 200’ beyond

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

Runway Safety and Object Free Areas

All of the runways have compliant RSAs. For Runway 12-30, this is due to the EMAS beds installed at each end of the runway. It should be noted that when EMAS is installed, the overall graded RSA width is still require, along the sides of the EMAS bed. Additionally, since both EMAS beds were installed in 2011, these systems are nearing the end of their useful life and will need to be replaced.

Based on the criteria in **Table 4-8**, the ROFA required at the departure end of Runway 30 extends beyond airport property, overlapping a small portion of SE Monterey Road. In addition, the Runway 12-30 ROFA encompasses a portion of the airport security fencing to the south of Taxiway A on the northwest end of the runway. Both of these have been included as deviations to standards on the last two approved ALP drawings. At the departure end of Runway 16, the required ROFA extends beyond airport property. For Runway 7-25, the ROFA required off each runway end is in compliance.

Runway Protection Zones

When declared distances are applied to a runway, separate Approach and Departure RPZs may be required. The Approach RPZ begins 200 feet prior to the landing threshold (displaced or not), while the Departure RPZ begins 200 feet beyond the length declared for the Takeoff Run Available (TORA). While Runways 12, 16, and 34 are displaced and the current 2013 ALP Drawing set included declared distances for Runways 12-30 and 16-34; only the Runway 12 end is shown with separate Approach and Departure RPZs. The alternatives analysis will determine if declared distances will be applied to these two runways and therefore, whether or not separate Approach and Departure RPZs are required per the dimensions in **Table 4-8**.

In September of 2012, the FAA issued their Interim Guidance on Land Uses Within a Runway Protection Zone. Under the current guidance, any changes in the size or location of an airport's existing RPZs needs to be coordinated with the FAA. This coordination is required to determine if any new or modified land uses would be encompassed within the limits of the proposed RPZs and could require the airport to identify and document alternatives to changing the RPZs. The alternatives analysis will also identify any changes in the RPZs from those included on the current 2013 ALP Drawing set.

Runway Obstacle Free Zones

With the exception of an area near the departure end of Runway 34, all of the runways have compliant ROFZs. Approximately 1,000 square feet of the ROFZ corner to the south of the departure end of Runway 34 extends off property. This will be addressed as part of the alternatives analysis. These are the only ROFZ requirements since none of the runways at SUA have precision instrument capability or an approach lighting system.

Declared Distances

The use of declared distances is typically limited to those airport facilities that cannot provide certain design standards without shifting the landing thresholds and/or departure points of a runway. The application of declared distances is runway specific and requires FAA approval. Under declared distances, four different lengths are calculated for operations to/from a specific runway end. These distances are used by pilots to determine whether or not their aircraft (in a given configuration) can takeoff or land based on the lengths available. Declared distances include:

TORA	Takeoff Run Available
TODA	Takeoff Distance Available
ASDA	Accelerate Stop Distance Available
LDA	Landing Distance Available

As noted previously, the current 2013 ALP Drawing set includes calculations of declared distances for both Runway 12-30 and Runway 16-34. These declared distances were never included in any aeronautical publications for SUA and since they were calculated as part of the 2013 ALP, critical elements of the declared distances calculations have changed. For example, the runway survey data obtained in November 2019 as part of the FAA Airport Geographic Information System (AGIS) mapping conducted for this study resulted in slightly different overall lengths for both Runways 12-30 and 7-25 than those in the current 2013 ALP Drawing set. Additionally, the critical aircraft has changed for Runway 12-30 and the 2013 ALP Drawing set did not apply the correct RSA dimensions to the runways. For these and reasons described in previous sections, the alternatives analysis will calculate new declared distances as needed to meet the proper runway safety criteria.

4.3.5 Line-of-Sight Requirements

As part of the design and safety criteria, there are also two critical line-of-sight requirements that must be considered. The first is the Runway Visibility Zone (RVZ) which protects the proper line-of-sight between both existing and future runway configurations. A clear RVZ allows aircraft operating on the airfield to verify the location and movements of other aircraft and vehicles on the ground that could create a conflict. This zone must be kept clear of any fixed or movable objects, including parked aircraft, when the ATCT is closed. While the existing RVZ has no obstructions, any changes in the runway configuration or new facilities proposed will need to be considered to ensure no future impacts are created.

The other line-of-sight requirement is directly related to the ATCT and the ability for the controllers to have an unobstructed view of all existing and future aircraft movement areas. In addition to other setbacks and imaginary surfaces, the ATCT line-of-sight is a critical element when considering the location and height of future airport facilities, as well as the location of future aircraft movement areas. Currently the ATCT has a clear line-of-sight to most of the airport movement areas they are responsible for; the exceptions being both ends of Runway 12-30. For Runway 12, a recent tree clearing project improved the overall line-of-sight, but ATCT management has noted that visibility to the EMAS bed and to aircraft on short final could be improved. The EMAS bed and a portion of the short-final at the Runway 30 end is also obstructed by trees. A project to trim these trees and/or remove any obstructions to the current ATCT line-of-sight should be planned. All calculations for such clearing need to be based on the established eye height for the ATCT which is 90.8 feet AMSL.

4.4 Taxiway System Requirements

Taxiway systems include parallel taxiways, entrance/exit taxiways, connector taxiways, apron taxilanes, hangar taxilanes, bypass taxiways, and run-up areas. The airport's critical aircraft were utilized to establish the minimum taxiway system requirements.

4.4.1 Taxiways

Since the last master plan was conducted, the FAA has issued newer guidance on taxiways, primarily with respect to fillet design and layouts to enhance the safety of aircraft movements. The primary design criteria for the taxiways serving specific runways are provided in **Table 4-9**. Some of the taxiway standards are based on the newer Taxiway Design Groups (TDG) while others still remain a function of the critical aircraft's ADG.

TABLE 4-9
MINIMUM TAXIWAY SYSTEM REQUIREMENTS

Taxiways Serving	Airplane Design Group	Taxiway Design Group	Width	Safety Area	Object Free Area	Offset to Runway
12-30	III	2	35’	118’	186’	400’
16-34	II	1B / 2	25’ / 35’	79’	131’	240’
7-25	II	2	35’	79’	131’	240’

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

As noted in the individual taxiway sections, there are a number of areas that do not provide the newer fillet and lead-in taper areas. However, based on discussion with ATCT and airport operations management, they have not experienced any problems with the current fillet geometry, even for the largest aircraft ground movements. Therefore, they are not considered a priority and should only be modified when the associated taxiways need rehabilitation.

The FAA defines the minimum useful life of taxiway pavement rehabilitations as 10 years and 20 years for reconstructed or new pavement surfaces. However, since actual pavement conditions depend on the use and environment, projects to rehabilitate airfield pavements are routinely conducted every 15 to 20 years after the previous major rehabilitation, strengthening, or new construction. Specific information is provided in the description of the various taxiway systems needing improvements to meet standards or repairs.

Taxiway A

Prior to this master plan, Runway 12-30 and Taxiway A were designated as ADG II facilities. However, the FlightAware data utilized in the forecast chapter recognized that the airport has supported well over 500 annual operations by ADG III aircraft making this the existing critical aircraft for these pavements. Also, it was noted that any taxiways serving Runway 12-30 required a minimum width of 35 feet wide to accommodate TDG 2 aircraft. Since Taxiway A and its connectors range between 35 and 50 feet, no additional width is required.

Taxiway A provides the proper taxiway safety area; however, it does not provide the required object free area. As with the OFA for Runway 12-30, the 186 foot wide ADG III TOFA overlaps some storage areas and aircraft parking apron space just south of the northwest half of Taxiway A. For the southeast half of the taxiway, the ADG III TOFA does not overlap any facilities, but the tails of some aircraft can encroach this area depending on how far back they are pushed when using the north edge of the apron for parking.

The current parallel centerline offset is 300 feet for the half of the taxiway west of Taxiway C and 450 feet for the east half. As noted in the forecast chapter, this limitation is documented in the FAA

Chart Supplement for SUA so that pilots are aware that the ATCT must manage simultaneous ADG III aircraft movements on Runway 12-30 and the west half of parallel Taxiway A.

The 2021 FDOT pavement study documented that Taxiway A had an overall area weighted PCI of 59 (fair); however, this is a little misleading given a number of the connectors are in good condition. Conversely, a majority of the parallel portion of the taxiway was rated at 54 (poor). As such, the 2021 study recommended a full depth reconstruction of the parallel pavement section of Taxiway A and Taxiway A1 as soon as possible. The required reconstruction would be the best time to address the various non-standard conditions, including reconfiguring the fillets for the two end connectors and Taxiway A1 to meet the current FAA design standards.

Taxiway C

Taxiway C, as well as Taxiway C1, each provide the proper width, safety area, and object free area for the existing and future critical aircraft of both Runways 16-34 and 7-25. The partial parallel portion of Taxiway C to Runway 7-25 also exceeds the centerline offset required. Taxiway C was documented in the 2021 pavement condition report with an overall area weighted PCI of 88 (good). However, significant portions of the taxiway had sections in the satisfactory range and therefore the 2021 pavement report recommends the rehabilitation of these (combination of asphalt pavement milling and overlay with 25 percent of the areas subject to full depth reconstruction) between 2026 and 2030. For Taxiway C1 an asphalt concrete rehabilitation is recommended in 2022. These rehabilitations would also be the time to reconstruct the various fillets associated with both taxiways since neither meets the current FAA design standards.

Taxiway D

Taxiway D provides the proper width, safety area, object free area, and centerline offset for the existing and future critical aircraft utilizing Runway 16-34. With an overall PCI of 85 (top end of satisfactory), no rehabilitations are recommended by FDOT in their 10-year outlook. However, a rehabilitation will be required before the end of this study's 20-year planning horizon. That project will also need to include reconstructing all of the fillets to meet the current FAA design standards. An exception being Taxiway D1 which was constructed in 2019 and included the current FAA taxiway fillet geometry.

TABLE 4-10
SUMMARY OF TAXIWAY REQUIREMENTS

Taxiway	Width	Future TDG - ADG	Meets FAA Standards
A	35' - 50'	3 – III	No – Substandard width, TOFA, and offset to Runway 12-30. Need to reconstruct some fillets.
C	35'	2 – II	No – Need to reconstruct fillets.
D	35'	2 – II	No – Need to reconstruct some fillets.

SOURCE: AGIS Data and ESA analysis 2021.

Hot Spot

The FAA defines a Hot Spot as a runway safety related problem area on an airport that creates an increased risk for aircraft ground movements. Typically, it is a complex or confusing taxiway to taxiway, taxiway to runway, or runway to runway intersection with a history of, or potential for, runway incursions or surface incidents. Hot Spots are designated by the FAA and depicted on the official published airport diagrams. There are two Hot Spots identified at SUA.

Hot Spot 1 is where the southeast end of Taxiway A connects with the intersection of Runway 30 and Runway 34. For this area the FAA publications include a note that due to the intersecting runways, there is a risk for departure off the wrong runway and that pilots should check runway alignment. To help combat this, when Runway 30 or Runway 34 is active, any aircraft crossing the intersection of the runway ends are requested by the ATCT to use phraseology such as "Crossing 34 to get to 30" or the opposite.

Hot Spot 2 includes the intersection of Taxiway A1 with the intersection of Runway 12-30 and Runway 7. While there is no specific note for this area, the geometry is such that pilots need to maintain vigilance to ensure they access the proper runway and/or clear the runway environment. When Runway 12 is active, aircraft are required to hold on Taxiway A, prior to Taxiway A1, until clearance is approved. The phraseology used by the ATCT for these operations is "Approach Hold on Alpha."

For both of these Hot Spots, Taxiway A has all of the proper pavement edge lighting, airfield signage, and pavement markings required prior to the runway intersections. While not required, these areas should include the addition of enhanced taxiway centerline markings. These provide supplemental visual cues to alert pilots of an upcoming runway holding position marking to minimize the potential for runway incursions. Enhanced taxiway centerline markings are only used on taxiways which directly enter a runway.

For Hot Spot 1, the installation of elevated runway guard lights (commonly known as wig-wag lights) should also be considered. Wig-wag lights include a pair of elevated yellow flashing lights collocated on both sides of a runway's holding position signs and pavement surface markings. They provide a visual indication to anyone approaching the runway holding position that they are about to enter an active runway environment.

For Hot Spot 2, the installation of a clearance bar on Taxiway A, at the holding position prior to Taxiway A1, should be considered. Similar to the runway guard lights, the lights of a clearance bar advise pilots (and vehicle drivers) that they are approaching a hold point, other than a runway holding position. The clearance bar consists of a row of three in-pavement yellow lights that indicate a taxiway holding position, such as for the Approach Hold location on Taxiway A for Hot Spot 2. In addition, elevated runway guard lights should also be installed at the runway holding position on Taxiway A1. Both runway guard lights and clearance bars are effective visual aids in identifying runway or taxiway holding positions in both daytime and nighttime conditions.

Taxiway Designations

FAA AC 150/5340-18G, Standards for Sign Systems, includes the standards for designating taxiways. For runways with a parallel taxiway, the use alphanumeric designators at the entrance and exit taxiways located at the runway ends are required. Such designations promote positive location identification and reduce the risk of runway incursions. Currently the end connector taxiways do not have a unique designation. A project to redesignate the various parallel taxiway connectors, their associated signage, and the related aeronautical publications needs to be conducted.

4.4.2 Apron and Hangar Taxilanes

For each of the aircraft parking aprons, there are a number of different markings which delineate the areas dedicated for aircraft parking and the taxilane routes around or through these areas. At SUA, these taxilane routes are non-movement areas, meaning pilots do not need to contact the ATCT when utilizing them. The established taxilanes may need to be adjusted for future modifications to the aircraft apron areas, connector taxiways serving them, or aircraft parking space needs. While these are non-movement areas, they need to provide the proper taxilane design standards and setbacks for the aircraft they are intended to serve.

The primary taxilanes serving the various fixed base operator (FBO) facilities on the south side of the airfield were included in the 2021 pavement condition report. This includes the previous portion of Taxiway B, running south from Taxiway A. While this pavement was rated with an overall PCI of 28 (very poor), the primary pavement section is actually rated at 25 (serious). As such, the pavement study recommended an immediate reconstruction of this taxilane. On the opposite end of the spectrum is the taxilane which runs south of the Taxiway A and Taxiway C intersection, bisecting the two FBO facilities. This pavement, including a portion of another smaller taxilane coming off of it, were rehabilitated in 2019 and have a PCI rating of 100 (good) in the 2021 study. The other taxilanes included in the pavement study are those serving the various T-hangar buildings on the east side of the FBO facilities. Of the two, the taxilanes serving the easternmost T-hangars was given an overall PCI rating of 66 (fair), while the taxilanes serving the westernmost group of T-hangars was rated at 74 (satisfactory). As such, the 2021 study recommended an asphalt concrete rehabilitation for the easternmost T-hangar taxilanes in 2021 and the same for the westernmost T-hangar taxilanes in 2024. The southernmost T-hangar taxilanes currently utilized by the Witham Aero Club were not included in the pavement study.

4.4.3 New Taxiways and Taxilanes

The following sections address the need for new taxiways and taxilanes in order to support the activity projected in the aviation forecasts.

Parallel Taxiways

As noted previously, even though Taxiway A is a full length parallel taxiway for Runway 12-30, the western half has limitations due to the centerline offset. The alternatives chapter will explore options to eliminate any limitations for the simultaneous movement of ADG III aircraft on both Taxiway A and Runway 12-30.

Since a majority of the airport's facilities are located south of Runway 12-30, Taxiway C does not need to be a full length parallel taxiway. In fact, given the overall airfield configuration, Taxiway C, along with Taxiway A, provide adequate access to both ends of Runway 7-25. In the future, partial or full parallel taxiways would be needed to both Runways 16-34 and 7-25 if additional aviation related facilities are considered on the north side of the airport's property. These potential options will be explored as part of the alternatives chapter.

Taxiway Exits

The airfield capacity section indicated the airfield would exceed the 50 percent threshold towards the end of the short-term planning period. Therefore, taxiway projects with the potential to enhance the overall efficiency or bypass capability of the airfield system need to be considered as soon as possible. While bypass capability is addressed in a following section, the FAA methodology for calculating capacity showed that the exit taxiway factor is not maximized for operations unless at least two exits are available within the optimal exit range. **Table 4-1** shows that Runway 16-34 only has one taxiway exit for operations in either direction which meets the appropriate criteria for enhancing capacity.

An additional taxiway exit for each direction of Runway 16-34 would maximize the FAA's exit factor for capacity; however, this is only recommended for Runway landings on Runway 34. For Runway 16, **Figure 4-3** shows that Taxiway D1 is just prior to the optimal exit range required for the airfield as a whole. However, as per the notes on **Figure 4-3**, ATCT management confirmed that Taxiway D1 is primarily used by small aircraft, especially those that are conducing training stop and go operations. Technically the smaller aircraft by themselves would have an optimal exit range that would include Taxiway D1. Therefore, an additional exit for operations on Runway 16 would not contribute to the overall airfield capacity.

Access Taxilanes

Various taxilanes will be required to access future airfield facilities as they are developed. The final configuration will depend on the ultimate hangar sites and aircraft parking apron areas while the taxilane widths will be contingent on the intended use by different aircraft. The layouts of any additional taxilanes will ultimately depend upon the facilities they are constructed to serve.

4.4.4 Run-up Areas and Bypass Capability

Run-up areas are intended to serve the small general aviation piston fleet that need to perform engine checks before each departure. The FAA recommends providing run-up areas or holding bays when a runway's operations reach a level of 30 operations per hour. The activity forecasts showed that SUA conducted 59 operations during the peak hour of the average day in 2019.

As noted in the inventory, there are currently five run-up areas. These include two at the northwest end of Taxiway A (serving Runways 12 and 7), one at the southeast end of Taxiway A (serving

Runways 30 and 34), one at the north end of Taxiway D (serving Runway 16), and one at the east end of Taxiway C (serving Runway 25). While these run-up areas serve the piston fleet, they do not provide any bypass capability for the larger turboprop or jet aircraft. For this, bypass taxiways are typically located parallel to the end connectors. When the proper taxiway to taxiway separation is provided, the end connector and bypass taxiway are utilized to enhance the flow of aircraft departures.

Given the mix of both large and small aircraft using Taxiway A to access both ends of Runway 12-30, as well as the ends of Runways 7 and 34, the ability to provide bypass taxiways capable of supporting simultaneous ADG III operations will be included in the alternatives analysis. As noted previously, both ends of Taxiway A are also associated with Hot Spots and the addition of bypass capability would improve the safety and efficiency of operations. For simultaneous ADG III operation, these bypass taxiways would require a minimum taxiway centerline to centerline separation of 152 feet.

4.5 Instrument Procedures

Instrument approaches enable pilots to safely descend into the airport environment for landing during times of inclement weather and/or reduced visibility. As noted in the inventory, there are three categories for instrument approaches: precision approaches, approach procedures with vertical guidance, and non-precision approaches. Currently only Runway 12-30 has approach procedures with vertical guidance and straight-in non-precision minimums published for both ends.

The forecast chapter documented that approximately 20 percent of the activity at SUA was conducted as an instrument operation under an instrument flight plan; however, only a small portion of these were conducted under actual instrument conditions. The airfield capacity section documented that over the last ten years, instrument meteorological conditions have occurred 2.5 percent of the time. It was revealed during discussions with ATCT management and aircraft operators at SUA that the current published instrument approach procedures have accommodated virtually every landing attempted during actual instrument conditions. Given this and the fact that precision approaches require significant setbacks from the runway environment, an approach lighting system, and for some, high intensity runway edge lighting; no precision approaches will be established at SUA.

Approach procedures with vertical guidance are defined as any approach that has visibility minimums not lower than ¾ of a mile and the capability of safely guiding aircraft down to heights greater than or equal to 250 feet above the threshold. When visibility minimums are less than one mile, but not lower than ¾ of a mile, the required RPZ increases significantly in size. Similarly, the imaginary surfaces under Title 14 Code of Federal Regulations (CFR) Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace* also change (addressed in the following section). Regardless, approach procedures with vertical guidance can be established where they are limited to not lower than one mile visibility minimums. Under this scenario the required RPZ(s) and 14 CFR Part 77 surfaces do not increase. Therefore, the ability to potentially establish additional approach procedures with vertical guidance for Runway 16-34 and/or Runway 7-25 will be evaluated in the alternatives chapter.

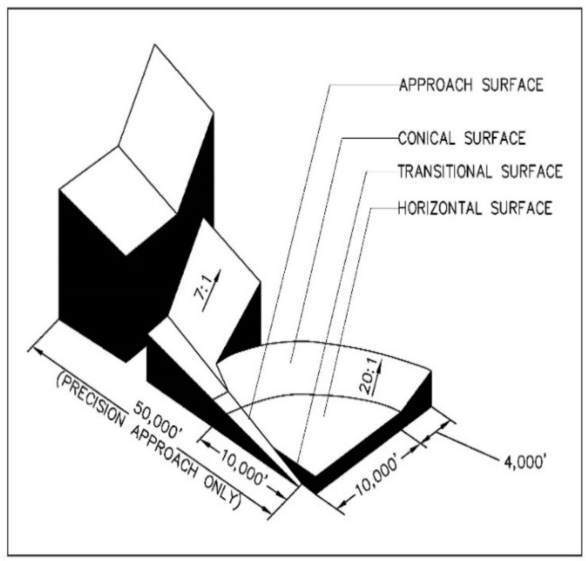
Non-precision approach procedures are one of the easiest to establish at an airport given the smaller setbacks required and the fact that they can be based on Global Positioning System (GPS); eliminating the need for any on-airfield navigational equipment. The current non-precision approaches to both ends of Runway 12-30 provide procedures with straight-in lateral guidance, as well as circling procedures to the airport environment, during instrument conditions where the visibility is not lower than one statute mile.

While instrument procedures are runway end specific, the authorization to establish any new approach begins with an Airport Airspace Analysis. The subsequent approval process of the ALP drawings created as part of this study will include an Airport Airspace Analysis conducted by the FAA to determine the ability of the runways to accommodate any new instrument approach minimums proposed. When an actual instrument procedure is requested, all requirements, including the proper environmental review, desired approach minimums, whether circling approach procedures are desired, the obstruction survey needed to support the procedure, and the approved ALP must be provided to the FAA.

4.5.1 14 CFR Part 77 Imaginary Surfaces

The airspace around airports is protected by the imaginary surfaces defined in 14 CFR Part 77. When combined, the five different imaginary surfaces of this federal regulation protect airspace and the ability for aircraft to safely fly into and out of an airport. These surfaces must be incorporated into the local planning and land use ordinances to control the height of objects in the vicinity of the airport. As such, the future surfaces are the most critical in order to protect the viability of the airfield improvements identified in this study. **Figure 4-7** provides a general illustration of the five different imaginary surfaces, while the descriptions and specific dimensions as they apply to SUA are described in the following sections.

FIGURE 4-7: 14 CFR PART 77 IMAGINARY SURFACES



Primary Surface

The Primary Surface is a rectangular area symmetrically located about each runway centerline and extending a distance of 200 feet beyond each paved runway end. The width of the Primary Surface is based on the type of approach a particular runway has, while the elevation follows, and is the same as that of the runway centerline, along all points. Since Runway 12 currently has an approach procedure with a published visibility minimum equal to ¾ mile, the Primary Surface width is 1,000 feet. Both Runway 16-34 and Runway 7-25 require a 500 foot wide surface for the existing circling instrument approaches with visibility minimums greater than ¾ of a mile, even though they are both classified by the FAA as visual runways. If in the future any of the Runway 16-34 or Runway

7-25 ends obtain an approach procedure where the visibility minimums are equal to or less than ¾ mile, the Primary Surface width would increase to 1,000 feet.

Horizontal Surface

The Horizontal Surface is a level oval-shaped area situated 150 feet above the established airport elevation, extending 5,000 or 10,000 feet outward from the Primary Surface, depending on the runway category and approach procedure available. For Runway 12-30 the Horizontal Surfaces will have a radius of 10,000 feet while only a radius of 5,000 feet is required for Runways 16-34 and 7-25 due to their current visual classification. For either of these runways, the Horizontal Surface will change to 10,000 feet if a straight-in non-precision instrument approach procedure is established to at least one end.

Conical Surface

The Conical Surface extends outward for a distance of 4,000 feet beginning at the outer edge of the Horizontal Surface, and sloping upward at a ratio of 20:1. This surface is the same for all three runways, regardless of any potential changes that may occur due to lower approach minimums or the runway category.

Approach Surface

The Approach Surfaces begin at the end of the Primary Surface (200 feet beyond the paved runway end) and slope upward at a ratio determined by the runway category and type of instrument approach available to the specific runway end. The inner width and elevation of the Approach Surface conforms to that of the Primary Surface while the outer width and overall length is also governed by the runway category and instrument approach procedure available.

Both ends of the current Runway 12-30 Approach Surfaces extend out 10,000 feet at a slope of 34:1. For Runway 12 end, the surface extends to an outer width of 4,000 feet since it has a non-precision instrument approach with visibility minimums as low as ¾ of a mile. The surface extends to an outer width of 3,500 feet for the Runway 30 end since this end has a non-precision approach greater than ¾ of a mile. If Runway 30 were to also obtain visibility minimums are as low as ¾ mile, then the Approach Surface would extend to an outer width of 4,000 feet.

Being classified as visual runways, the Approach Surfaces to the ends of Runways 16-34 and 7-25 all extend out 5,000 feet at a slope of 20:1 to an outer width of 1,500 feet. If any of these runway ends obtain a straight-in non-precision instrument approach procedure, the required Approach Surface will extend out 10,000 feet at a slope of 34:1 and like Runway 12-30, the outer width will depend on visibility minimums established.

Transitional Surface

The Transitional Surface is a sloping area beginning at the edges of the Primary and Approach Surfaces and sloping upward and outward at a 7:1 slope.

4.5.2 Threshold Siting Surfaces

The criteria for establishing runway thresholds are defined in FAA AC 150/5300-13A, Change 1. These airport design surfaces, which are categorized by a Runway Type number, are utilized to ensure that the required approach surface is clear of obstacles. It should be noted that these approach surfaces are not the same as those defined in 14 CFR Part 77 and are therefore referred to as the Threshold Siting Surfaces (TSS).

The runway threshold siting standards in FAA AC 150/5300-13A, Change 1 were updated in July 2020 by FAA Engineering Brief 99A. Each end of Runway 12-30 is designated as both a Type 4 and Type 6 runway for the existing and future instrument approach visibility minimums greater than or equal to ¾ statute mile. The Type 4 TSS has a 20:1 sloped surface which begins 200 feet prior to the landing threshold, has an inner width of 400 feet, an outer of 3,400 feet, and extends out 10,000 feet. The Type 6 surface has a 30:1 sloped surface which begins at the landing threshold, has an inner width of 300 feet, an outer of 1,520 feet, and extends out 10,000 feet.

Each of the ends associated with Runways 16-34 and 7-25 are designated as Runway Type 3 (visual runways serving large airplanes). The Type 3 approach TSS has a 20:1 sloped surface which begins at the landing threshold, has an inner width of 400 feet, extends out initially 1,500 feet to a width of 1,000 feet, and then continues at that width an additional 8,500 feet. Should these runways obtain non-precision approach categories, depending on the actual visibility minimums, they will require the Type 4 and Type 6 TSSs like Runway 12-30.

Runway thresholds should be located such that there are no penetrations to the required TSS for both the existing and future approach visibility minimums. The ability to provide the TSS criteria to each runway threshold is addressed in the alternatives chapter.

4.5.3 Departure Surfaces

If any single runway end at an airport has a published instrument approach procedure, the FAA applies an instrument Departure Surface off all of the active runway ends at the airport. When there are no declared distances, the Departure Surface starts at the departure end of the runway. For a runway with declared distances, the Departure Surface starts at the end of the TODA. In either case, Section 1 of the Departure Surface begins at the same elevation as the departure end of the runway, has an inner width equal to the runway width, splays out from the corners of the usable runway at 15 degree angles, and extends out to 12,152 feet (2 nautical miles) at a 40:1 slope to end 304 feet above the runway end elevation. From the edge of the usable runway, Section 2 rises upward to 150 feet above the runway end elevation at a point 500 feet on either side of the runway centerline. Section 2 also rises upward along the extended runway centerline at the same 40:1 slope until reaching 304 feet above the runway end elevation. Upon reaching 304 feet, the surface levels out until the end of Section 1. The Departure Surface criteria are found in FAA Engineering Brief 99A.

Both sections of the Departure Surface should be clear of all obstacles. If it is not possible, penetrations to the surface must be evaluated through the FAA's Obstruction Evaluation/Airport Airspace Analysis (OE/AAA) process. If obstacles cannot be removed, minimum takeoff climb rates are published (as part of the departure procedure) which are higher than the 200 feet per minute required for the 40:1 surface. An airport sponsor can also request that a specific runway end be designated as Not Authorized (NA) for instrument departures, in which case the 40:1 Departure Surface would not apply. The ability to provide the current Departure Surface criteria off each runway end is evaluated as part of the new ALP drawing set.

4.6 Airfield Environment

A number of facilities are necessary to support the operations of the airfield environment. Airfield lighting is required for airports intended to be utilized for nighttime operations as well as for operations during less than visual meteorological conditions. These along with pavement markings, signage, and other navigational aids are addressed in the following sections.

4.6.1 Runway Lighting

Both Runways 12-30 and 7-25 have Medium Intensity Runway Lights (MIRLs) consisting of base mounted light emitting diode (LED) fixtures on concrete cans with the cables in conduit. While these systems are considered to be in good condition, they will likely need to be replaced before the end of the 20-year planning period. While not required, High Intensity Runway Lights (HIRLs) should be considered to replace the MIRL systems on Runway 12-30 to facilitate positive identification of the runway environment given the light pollution surrounding the airport. In addition, a MIRL system with LED fixtures on concrete cans with the cables in conduit should be installed on Runway 16-34.

4.6.2 Taxiway Lighting

All of the taxiways are equipped with blue Medium Intensity Taxiway Lights (MITLs). Taxiways A2 and A3 have incandescent fixtures while all others utilize base mounted LED fixtures on cans with conduit. These systems are all considered to be in good condition. The incandescent MITLs on Taxiways A2 and A3 should be replaced with more efficient LED taxiway lighting the next time the individual systems need a major repair. Similarly, any new taxiways should also utilize MITL systems with LED fixtures installed on cans with conduit.

4.6.3 Airfield Signage

Currently the airfield has a number of illuminated signs installed as part of the various runway and taxiway lighting circuits. The signs primarily consist of LED fixtures and are in good condition since many were replaced as part of recent taxiway lighting projects. As with the taxiway lighting, the signage on Taxiways A2 and A3 are currently incandescent and should be replaced with LED units when the taxiway lights are upgraded.

In the future, the inclusion of lighted airfield signage is required for any new taxiway in order to maintain the efficient and safe movement of aircraft to and from the runway environment. Typically, these are placed on the left side of the taxiway but can be located on the right when necessary to meet clearance requirements or if it is impractical on the left side. Any new fixtures should also be LED units. In addition, the signage panels need to be replaced more often given the sun and saltwater environment of the airport. The same is true for the runway distance remaining signs.

4.6.4 Pavement Markings

Runway pavement and displaced threshold markings are painted white, while taxilane pavement markings are painted yellow. FAA guidelines state that all taxiways should have centerline markings and runway holding position markings whenever they intersect with a runway. Many surface markings on light-colored pavements require glass reflector beads and need to be outlined in black paint without beads to enhance their conspicuity. This is true for all Portland Cement Concrete (PCC) surfaces and older asphalt pavements. In as little as two years, many asphalt surfaces (new or treated) can become 'light-colored pavements.' This is especially true in Florida; therefore, glass beads and black outlines need to be included as part of all future pavement markings at SUA.

Runways

Runway pavements are marked with painted lines and numbers in order to aid in the identification of the runways from the air and to provide information to the pilot during the approach phase of flight. The FAA classifies three marking schemes depending on the type of runway:

Visual – minimum requirement for landing designator markings and centerline stripe.

Non-precision – minimum requirement for landing designator markings, centerline stripe, and threshold markings.

Precision - minimum requirement for landing designator markings, centerline stripe, threshold markings, aiming point markings, touchdown zone markings, and edge markings.

The non-precision markings are also applied to runways having approaches with vertical guidance not lower than ¾ mile visibility minimums. Depending on the type of aircraft activity and physical characteristics of the pavement, additional markings beyond those listed may be required for visual and non-precision runways.

Each runway has the appropriate markings for the types of aircraft and instrument approaches they support, including those with displaced thresholds. However, threshold markings should be added to Runway 16-34 the next time the pavement is remarked.

For all three runways, the pavement markings typically last for ten years; however, there are a number of variables that could significantly shorten that period, especially given the rain, sun, and coastal conditions at SUA. Therefore, at least two remarking projects will be required for the runways during the course of the planning period.

Taxiways and Taxilanes

With the existing instrument approaches and critical aircraft, the taxiways serving Runways 12-30 require holding position markings to be offset at a 250 foot perpendicular distance from the runway centerline. Taxiways serving Runways 16-34 and 7-25 require a 200 foot offset for the holding position markings. All of the taxiways at SUA have holding position markings with a 250 foot offset, which provides more space than required by the design standards. As such, there is no reason the markings need to be moved immediately and remarking the holding positions can be delayed until the next scheduled maintenance of pavement markings.

While not required, enhanced taxiway centerline markings should be considered as part of any future remarking of taxiway pavements. The enhanced markings are along the last portion of the taxiway centerline prior to the runway holding position marking in order to improve situational awareness and minimize the potential for runway incursions. As noted previously, enhanced taxiway centerline markings should be considered at each end of Taxiway A due to Hot Spots 1 and 2.

Any new taxiways or taxilanes should also have the appropriate centerline and holding position markings required. And as with the runway pavements, periodic taxiway and taxilane remarking will likely be required between the different pavement rehabilitation projects due to normal weathering and wear from regular usage.

4.6.5 Takeoff and Landing Aids

Over the course of the planning period some new takeoff and landing aids should be installed and some will require repair or replacement. The following sections describe these systems.

Runway End Identifier Lights

Runway End Identifier Lights (REIL) consist of a pair of synchronized white flashing lights which are situated on each side and abeam of the runway end threshold lights. The current unidirectional REILs installed on both ends of Runway 12-30 are considered to be in good condition. These systems only need to be maintained and replaced as needed over the course of the planning period. A project to add REILs to Runways 16-34 and 7-25 should be considered in the future.

Visual Glide Slope Indicators

Visual descent information is provided to pilots at SUA using Precision Approach Path Indicator (PAPI) systems on the ends of Runways 12-30 and 7-25. While these units are considered to be in good condition, it is likely they will need to be replaced before the end of the planning period. PAPIs should also be included to each end of Runway 16-34 as part of the project to install edge lights on that runway.

Automated Weather Observing System

The Automated Weather Observing System (AWOS) located in the middle of the airfield needs to be replaced. While the current system has been regularly maintained, it is subject to the saltwater environment of the airport and therefore susceptible to a faster deterioration of components and general corrosion. Additionally, parts like the spectrometer have failed on multiple occasions.

Compass Calibration Pad

The existing compass calibration pad is considered to be in good condition. However, considerable erosion has occurred around the edges of the pavement; therefore, it is recommended that a future taxiway rehabilitation project include a contingency to strengthen and/or reinforce the pavement edges of the pad.

4.7 General Aviation Facilities

The following sections address the facilities necessary to directly support the general aviation activity at SUA. A number of one-on-one interviews were conducted with the primary tenants, airport management, ATCT management, and other key stakeholders at the onset of the study. This outreach generated input to facilitate the assessment of the hangar, aircraft parking apron, and FBO terminal facilities.

4.7.1 Aircraft Storage Hangar Requirements

Because hangars provide protection from weather and security, they are one of the most desirable means for aircraft storage at any airport. Most of the hangar space at SUA is used for based aircraft, with occasional use by itinerant aircraft during maintenance or extended visits. At the end of 2019, nearly 75 percent of the based aircraft at SUA were stored in hangars, which included T-hangars, shade hangars, box hangars, and clearspan hangars.

T-hangars are fully enclosed buildings which have individual t-shaped stalls, each capable of storing one aircraft (typically a single-engine or light multi-engine aircraft) in a nested, back to back configuration. Shade hangars, which due to the similar configuration are also referred to as T-shelter hangars, are essentially T-hangar buildings without walls. Although the shade hangars at SUA were demolished in 2020, they were considered for this analysis because at the end of 2019, they housed aircraft accounted for in the base year of the 20-year forecast. For the purposes of this analysis, the shade hangars at SUA were categorized as T-hangars; therefore, just under 40 percent of the based aircraft were stored in T-hangars at the end of 2019.

Depending on the size, clearspan hangars are capable of holding one to multiple different aircraft and commonly have an attached office, shop, and/or storage space. The smaller clearspan hangars are sometimes referred to as private hangars while those which provide individual stalls or units are referred to as box hangars. Regardless, clearspan hangars can accommodate multiple aircraft types while also serving to provide maintenance or other aviation related services. For the purposes of this analysis, clearspan hangars represent any hangar, other than T-hangars, expected to be used by based aircraft.

Given the airport's coastal environment, it is expected that the overall percent of aircraft stored in hangars will increase; presuming new hangars will be constructed. This assumption is supported by the current 100 percent hangar occupancy rate, the active T-hangar wait list maintained by one FBO, and the fact that both FBOs frequently receive requests for hangar space, given there is very little to none available in south Florida. In fact, FBO management has indicated based on the number of calls they receive, they could immediately fill two 25,000 SF clearspan hangars with aircraft.

When these assumptions and past trends are combined with the forecasted based aircraft demand, it is estimated that an additional 49 T-hangar units need to be considered during the planning period. As in the past, these would accommodate a majority of the single-engine and some multi-engine aircraft. Furthermore, a mix of both small and large hangar facilities should also be planned to support the 92 additional based aircraft expected to be stored in clearspan hangars by the end of the planning period. While this could include some single-engine aircraft, most of the clearspan hangar space would be utilized by future based multi-engine and jet aircraft, as well as rotorcraft. The existing based aircraft storage facilities and expected future demands are summarized in **Table 4-11**.

TABLE 4-11
EXISTING AND FUTURE BASED AIRCRAFT STORAGE FACILITIES

	T-Hangars	Clearspan Hangars	Aircraft Parking Apron	Total Based Aircraft
2019	127	117	89	333
2040	155	209	91	455
Additional Aircraft Expected to Use	**49***	**92**	**2**	

*Accounts for the loss of 21 shade hangars demolished in 2020.

SOURCE: ESA analysis 2021.

Given the consistent demand SUA has experienced for years, additional clearspan hangar space should be considered above the amount needed to accommodate the additional aircraft shown in **Table 4-11**.

4.7.2 Aircraft Parking Aprons

For planning purposes, based and itinerant aircraft apron requirements are calculated separately since they can have slightly different characteristics. Areas for small aircraft are typically designed for ADG I size aircraft with tie-down capability. Large aircraft apron space includes the area necessary to park ADG II and ADG III multi-engine and jet aircraft, as well as rotorcraft. The methods used to estimate the minimum apron space required for based and itinerant aircraft parking are provided in the following sections.

Based Aircraft Parking Area

Following the hangar utilization rate, approximately 25 percent of the based aircraft were parked on aprons in 2019. Of these, the majority were single-engine with only a few multi-engine and jet aircraft. Minimum areas of 330 to 630 square yards (SY) for the small to larger aircraft were applied to the mix of based aircraft currently parked on an apron. Then, following accepted planning criteria, this value was increased ten percent. The result is that a minimum apron space of 35,100 SY is required for the based aircraft stored outside in 2019.

As stated in the previous section, it is assumed that an increasing percentage of the based aircraft demand will be met through the use of hangar facilities throughout the planning period; again presuming new hangars will be provided. It was also assumed that the remaining based aircraft stored outside will continue to predominantly be single-engine aircraft. Therefore, using the same methodology described above, an additional 37,500 SY was estimated as the minimum for the based aircraft expected to be stored on aprons by 2040. Despite the overall growth in based aircraft, this lower figure reflects the fact that more aircraft (as evidenced by the hangar wait list alone) are expected to be stored in hangars in the future.

Itinerant Aircraft Parking Area

Itinerant apron space is intended for relatively short-term parking, usually less than 24 hours (possibly overnight), primarily associated with transient aircraft. For planning purposes, a preferred approach to determining space needs is to calculate the total number of peak day itinerant aircraft that can be expected on the apron during the average day. This was performed by using the peak activity projections, local versus itinerant splits, and operational fleet mix figures from the approved aviation activity forecasts.

Based on typical space and maneuvering requirements, a minimum area of 400 SY was applied per itinerant single-engine aircraft; 760 SY for itinerant multi-engine and rotorcraft; and 1,860 SY for itinerant jets. Overall, this methodology is considered conservative, given that the space allocation per aircraft only includes a minimal area for the associated apron movement areas. The methodology resulted in 54,800 SY of itinerant apron space required in 2019 and 117,500 SY by 2040.

Summary of Aircraft Parking Apron Requirements

Table 4-12 summarizes the aircraft parking apron requirements and then compares them to the overall apron space available in 2019. The existing apron space includes all of the areas utilized by both based and itinerant aircraft. This does not include any of the small access aprons in front of the T-hangar units or the areas immediately in front of the various clearspan hangars.

TABLE 4-12
AIRCRAFT PARKING APRON REQUIREMENTS

	2019	2040
Recommended Area for Based Aircraft (subtotal)	35,100 SY	37,500 SY
Minimum Area Required for Itinerant Aircraft (subtotal)	54,800 SY	117,500 SY
Combined Apron Space Requirements		
Total Area for Based and Itinerant Aircraft	89,900 SY	155,000 SY
Combined Aircraft Apron Areas Available in 2019	80,000 SY	80,000 SY
Surplus (+) / Deficit (-)	-9,900 SY	-75,000 SY

SY = Square Yards

SOURCE: ESA analysis 2021.

It should be noted that while the methodology results in a current deficit; this is due to the fact that the estimate is based upon peaking characteristics for the itinerant aircraft. In addition, a rehabilitation of the existing aircraft parking aprons will be required during the planning period. The existing aprons had PCI ratings that ranged from satisfactory to fair.

4.7.3 Fixed Base Operator Terminal Requirements

Currently there is approximately 15,500 SF of terminal space provided by the two FBOs. This space is utilized for their customer service, waiting, flight planning, rest, vending, rental car, and restroom areas, as well as FBO administration, operations, and other support tenants.

The number of passengers and pilots during the peak hour of the average day is utilized to evaluate the general amount of FBO terminal space required. The following methodology and assumptions were developed based on industry trends, site visits, and meetings with both airport and FBO management. A summary of the key variables and resulting FBO space requirements are included in **Table 4-13**.

- The number of operations conducted during the peak hour of the average day during the peak month was calculated in the forecast chapter. This accounts for arriving, departing, local, and itinerant users.
- The number of peak hour operations were then adjusted to eliminate local operations using the local versus itinerant splits from the forecast chapter for each planning period. It is assumed that the FBO facilities are primarily used itinerant operators.

- The adjusted peak hour operations (arriving or departing) were estimated to average three individuals for each aircraft in 2019. The assumption is that for the different sized aircraft, typically only the two pilots and one passenger (or one pilot and two passengers) utilize the FBO terminal facilities. For the larger aircraft, this assumption is reasonable given in many instances passengers are directly picked up and dropped off at the aircraft, bypassing the FBO facilities. By the end of the planning period, this estimate was increased to five individuals per aircraft.
- An area of 100 SF was applied to each peak hour pilot/passenger to assess the minimum FBO space required.

TABLE 4-13
FIXED BASED OPERATOR TERMINAL SPACE REQUIREMENTS

	2019	2040
Peak Hour Operations	59	66
Itinerant Peak Hour Operations	39	43
Average Individuals Per Aircraft	3	5
Minimum Space Required	11,700 SF	31,500 SF
Existing FBO Terminal Space	15,500 SF	15,500 SF
Surplus (+) / Deficit (-)	3,800 SF	-16,000 SF

SF = Square Feet

SOURCE: ESA analysis 2021.

Based on the analysis, the existing FBO terminals should provide adequate space through the first half of the 20-year planning period. In the second half, the increase in both jet and large multi-engine itinerant operations will necessitate the need for double the current space provided today. It should be noted that this estimate is for general planning purposes as the actual space required will depend on many other factors, not the least of which is the level of service the FBO terminal operators want to provide their customers.

4.8 Support and Service Facilities

Key facilities to support the airport activity were described in the existing conditions chapter. Any improvements needed for these over the course of the 20-year planning horizon are identified in the following sections.

4.8.1 Airport Administration Building

The airport is in the process of replacing the current airport administration facilities with a new two story facility providing a total of 8,600 SF. The new facility will be located immediately south of the existing administration building and will continue to accommodate all of the airport's administrative and operations services, as well as the airfield electrical vault. Since the existing equipment of the airfield electrical vault cannot be taken offline while the new facility is developed, it will all be replaced with new equipment.

4.8.2 Airport Maintenance Building

The current maintenance building provides the shop, storage, and office space needed to maintain the airport's maintenance equipment. It also includes a multi-purpose community and training room. A 3,000 SF covered large equipment storage area was constructed just north of the maintenance building at the beginning of 2020. These facilities are considered in good condition and no additional facilities are anticipated at this time.

4.8.3 Fuel Farms

The three separate fuel farms at SUA are managed by the two FBOs. The ability to add some new tanks does exist; however, doing so versus potentially receiving more fuel deliveries is a business decision for the operators of the facilities. However, a common request among many of the aircraft operators requiring 100LL fuel is for a self-serve facility. Sites for one or more future self-service 100LL tanks will be evaluated in the airport alternatives in order to provide different options for possible operators of such a facility.

4.8.4 U.S. Customs and Border Protection

While the U.S. Customs and Border Protection (CBP) facility is considered adequate for the planning horizon, their ability to process multiple aircraft simultaneously is limited. This is due to the fact that the CBP facility only has a dedicated 900 SY sterile aircraft parking apron. This 90 foot by 90 foot area can only accommodate one of the larger general aviation jets that regularly utilize the CBP services. Once the new airport administration building is complete and the existing one demolished, the ability to improve the CBP apron will exist. At that time the pavement in this area will require a full depth reconstruction given it was documented with a PCI of 33 (very poor) in the 2021 pavement study.

4.8.5 Airport Traffic Control Tower

Constructed in 1995, the ATCT structure and equipment is still considered to be in good condition. Regardless, equipment replacements and remodeling of the interior spaces should be programmed given the facility will be 55 years old by the end of the 20-year planning period.

4.9 Summary of Facility Requirements

Table 4-14 provides a general summary of the facility requirements that were determined necessary to satisfy the approved aviation demand forecasts. Essentially, this table includes the minimum improvements required over the 20-year planning period. Some additional facilities will also be planned and included as part of the final ALP drawing set and Capital Improvement Program to maximize the flexibility of the airport and the ability to respond to future opportunities. The order in which these improvements are listed does not have any relation to the priority or phasing of such projects.

TABLE 4-14
MINIMUM 20-YEAR FACILITY REQUIREMENTS

Category	Proposed Improvements
Runways	Potential to provide additional length on Runways 16-34 and 7-25.
	Rehabilitate Runway 7-25.
	Future rehabilitations of Runways 12-30 and 16-34.
	Replace EMAS beds at both ends of Runway 12-30.
	Options to improve safety criteria for Runways 12-30 and 16-34 (e.g. declared distances).
	Clear obstructions within ATCT line-of-sight to approach ends of Runway 12-30.
	Potential approach procedures with vertical guidance to Runways 16-34 and 7-25.
Taxiways	Reconstruct and improve standards for Taxiway A.
	Rehabilitate Taxiways C, C1, and D.
	Install elevated Runway Guard Lights on Taxiway A at holding position for Runways 30 and 34 (Hot Spot 1).
	Install in-pavement Clearance Bar Lights on Taxiway A at the approach hold position prior to Taxiway A1 (Hot Spot 2).
	Rehabilitate taxilanes serving FBO facilities.
	Additional exit taxiway for Runway 34.
	Taxiway or taxilane access to new facilities.
	Potential to provide bypass capability to each end of Taxiway A.
Airfield	Install MIRLs on Runway 16-34 with LED fixtures.
	Replace MITLs on Taxiways A2 and A3 with LED fixtures.
	Replace incandescent airfield signage with LED fixtures.
	Replacement of REILs and PAPIs as needed. Add systems to Runway 16-34.
	Replace AWOS.
Airport Facilities	T-hangar facilities (49 additional units).
	Clearspan hangars (to accommodate 92 new aircraft).
	Additional aircraft parking apron space (minimum 75,000 SY).
	Additional FBO terminal space (minimum 16,000 SF).
	Rehabilitate aircraft parking aprons.
	Self-serve 100LL fuel tank(s).
	Expand and reconstruct CBP sterile aircraft parking apron.
	Update ATCT facility and replace equipment.

SOURCE: ESA, 2021.

CHAPTER 5

Environmental Overview

CHAPTER 5
Environmental Overview

5.1 Introduction

Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5070-6B, Change 2, *Airport Master Plans*, encourages the consideration of environmental factors in airport master planning to "help the sponsor thoroughly evaluate airport development alternatives and to provide information that will help expedite subsequent environmental processing." Also, Florida Department of Transportation (FDOT) *2021-2022 Guidebook for Airport Master Planning* notes that there are different environmental processes for projects that are funded by the FAA or FDOT. However, both agencies clearly recognize that it is not the intent of a master plan to complete the federal and state environmental review processes. Instead, the information should identify and set the stage for understanding what future environmental evaluations and clearances may be needed.

This chapter provides an overview of known environmental resources that will be considered during the identification and evaluation of airport alternatives in this master plan. The types of environmental reviews are addressed at the end of this chapter while potential environmental impacts associated with specific concepts are discussed as part of the evaluation of airfield alternatives. The environmental resources discussed in this chapter include many of those identified in FAA Order 5050.4B, *National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions*, and FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*. This overview does not constitute an Environmental Assessment (EA); instead, it is intended to help prepare for NEPA review that may be required by the FAA for future improvements occurring at Witham Field (SUA).

5.2 Air Quality

The federal *Clean Air Act*, as amended, required the U.S. Environmental Protection Agency (EPA) to establish National Ambient Air Quality Standards (NAAQS) for principle air pollutants considered harmful to public health and the environment. Those areas where the NAAQS are not met are designated as "nonattainment." Martin County is currently classified as "attainment" for all criteria air pollutants listed in the NAAQS. Emission sources at SUA, which are typical of airports, include aircraft engines, ground support equipment, auxiliary power units, motor vehicles, temporary use of construction equipment, and various stationary sources, such as back-up generators.

The existing and projected activity for SUA, in conjunction with the County's attainment status, indicates that continued operation of the airport is not likely to substantially affect air quality, exceed thresholds that require detailed air quality analyses, or require conformance with a State Implementation Plan (SIP). Any future airport projects that require NEPA review will consider the project's effect on air quality. Certain projects and tenant activities, such as operating paint booths, will need to comply with applicable regulations and permit requirements.

5.3 Biological Resources

5.3.1 Biotic Communities and Vegetation

SUA covers a land area of approximately 700 acres. The existing land use and cover types have been mapped for SUA using the South Florida Water Management District (SFWMD) Florida Land Use, Cover, and Forms Classifications Systems (FLUCCS) data for Martin County. The FLUCCS communities are listed in **Table 5-1** below and are depicted on **Figure 5-1**.

TABLE 5-1
FLORIDA LAND USE, COVER, AND FORMS CLASSIFICATION SYSTEMS (FLUCCS) COMMUNITIES AT SUA

Land Use Code	Description
1110	Fixed Single Family Units
1820	Golf Course
3200	Upland Shrub and Brushland
4110	Pine Flatwoods
5300	Reservoirs
8110	Airports

SOURCE: SFWMD 2015 and ESA 2022.

Potential impacts to biotic communities are regulated by a variety of agencies at the federal, state and local level, depending upon the project type and resource affected. In Martin County, local agencies support development review, but it is the federal and state regulatory agencies that have jurisdiction over the resource categories discussed in this section.

5.3.2 Wildlife, Listed Species, and Essential Fish Habitat

Wildlife Hazard Management

A FAA compliant Wildlife Hazard Assessment (WHA) was completed and submitted to the FAA in July 2015. Subsequently, a Wildlife Hazard Management Plan (WHMP) was completed and approved by the FAA in March 2018. As detailed in the WHMP, future airport improvements should be designed to minimize wildlife hazards to the greatest extent possible.

Listed Species

In addition to assessing impacts under NEPA, airport improvement projects are subject to other federal and state laws associated with wildlife and protected species. Most notable is the federal

Source: SOUTH FLORIDA WATER MANAGEMENT DISTRICT, 2015 AND ESA, 2022.

FIGURE 5-1

FLORIDA LAND USE COVER AND FORMS CLASSIFICATION SYSTEM (FLUCCS)

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Endangered Species Act, which protects and recovers imperiled species and the habitats upon which they depend. The FAA and/or other federal agencies that may be involved with airport improvement projects at SUA are required to determine if their action(s) would affect listed species.

Depending upon the potentially impacted habitat or species affected, coordination with the U.S. Fish and Wildlife Service (USFWS), National Oceanic and Atmospheric Administration (NOAA) Fisheries, and/or the Florida Fish and Wildlife Conservation Commission (FFWCC) may be required. In cases where wetlands are also impacted, this coordination typically occurs in conjunction with the wetland permitting process.

A review of publicly available resources such as the Florida Natural Areas Inventory (FNAI) and previous environmental studies (including the WHA and WHMP) has identified the area around and including SUA as potentially having suitable habitat for federal and state listed wildlife species. **Table 5-2** provides the listed species for which suitable habitat may exist or for which there is a possibility of occurrence on or directly adjacent to the airfield.

TABLE 5-2
FEDERAL AND STATE LISTED WILDLIFE SPECIES IN THE VICINITY OF SUA

Common Name	Scientific Name	USFWS / NOAA Listings	FFWCC Listing
Fish			
Atlantic sturgen	*Acipenser oxyrinchus*	E	FE
Largetooth sawfish	*Pristis*	E	FE
Opossum pipefish	*Microphis brachyurus*	C	
Striped croaker	*Bairdiella sanctaeluciae*	C	
Scalloped hammerhead shark	*Sphyrna lewini*	E	FE
Smalltooth sawfish	*Pristis pectinata*	E	FE
Reptiles			
American alligator	*Alligator mississippiensis*	T(S/A)	FT(S/A)
Eastern indigo snake	*Drymarchon couperi*	T	FT
Gopher tortoise	*Gopherus Polyphemus*	C	ST
Birds			
American oystercatcher	*Haematopus palliatus*		ST
Bald eagle	*Haliaeetus leucocephalus*	*	

TABLE 5-2
FEDERAL AND STATE LISTED WILDLIFE SPECIES IN THE VICINITY OF SUA

Common Name	Scientific Name	USFWS / NOAA Listings	FFWCC Listing
Florida sandhill crane	*Antigone canadensis pratensis*		ST
Florida scrub jay	*Aphelocoma coerulescens*	T	FT
Florida burrowing owl	*Athene cunicularia floridana*		ST
Red-cockaded woodpecker	*Dryobates borealis*	E	FE
Least tern	*Sternula antillarum*		ST
Little blue heron	*Egretta caerulea*		ST
Tricolored heron	*Egretta tricolor*		ST
Wood stork	*Mycteria americana*	T	FT
Mammals			
Florida bonneted bat	*Eumops floridanus*	E	FE
West Indian manatee	*Trichechus manatus*	T	FT

This information is provided as a guide to project planning and is not a substitute for site-specific surveys. Such surveys may be needed to assess species' presence or absence, as well as the extent of project effects on listed species and/or designated critical habitat.

USFWS = U.S. Fish and Wildlife Service
FFWCC = Florida Fish and Wildlife Conservation Commission
NOAA = National Oceanic and Atmospheric Administration
E = Endangered
T = Threatened
SC/SSC = Species of Special Concern
C = Candidate for list at the Federal Level by USFWS
T(S/A) = Threatened (Similarity of Appearance) to American crocodile - *Crocodylus acutus*
* = Federal protection under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.
NOTE: Candidate species receive no statutory protection under the Endangered Species Act (ESA). The FWS encourages cooperative conservation efforts for these species because they are, by definition, species that may warrant future protection under the EPA.

SOURCE: USFWS, FFWCC, Florida Natural Areas Inventory (FNAI), Accessed September 2021.

While the resources reviewed indicates that the airport is located in an area that has the potential for the occurrence of listed wildlife, SUA does not currently contain habitat that would support a majority of the listed species identified in **Table 5-2**. The following specific-species surveys, monitoring, consultation, and/or permitting guidelines (established by FFWCC and/or USFWS) should be considered for airport projects within the property limits: Easter indigo snake, Gopher tortoise, American bald eagle, Florida scrub jay, Wood stork, and the Florida bonneted bat. Further, it should be noted that all construction projects that require clearing of large areas should be stabilized as quickly as possible (avoid leaving large, cleared areas for extended duration) to prevent attracting nesting shorebirds.

Essential Fish Habitat

The *Magnuson-Stevens Fishery Conservation and Management Act* (16 U.S.C. 1801, et seq.) reflects the Secretary of Commerce and Fishery Management authority and responsibilities for the protection of essential fishery habitat. The Act specifies that each federal agency shall consult with the Secretary with respect to any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken, by such agency that may adversely affect any Essential Fish Habitat (EFH) identified under this Act. EFH is defined by the Act as "…those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Waters include aquatic areas and their associated physical, chemical, and biological properties that are used by fishes and may include areas historically used by fishes. Substrate includes sediment, hard bottom, structures underlying the waters, and any associated biological communities. Necessary means the habitat required to support a sustainable fishery and the managed species contribution to a healthy ecosystem. Spawning, breeding, feeding, or growth to maturity covers all habitat types used by a species throughout its life cycle. Only species managed under a Federal Fishery Management Plan (FMP) are covered.

NOAA Fisheries, also known as National Marine Fisheries Service (NMFS), reviews potential impacts to marine listed species and coordinates for projects that may affect EFH. There are four required components of an EFH consultation. These include: 1) Notification, 2) EFH Assessment, 3) NMFS EFH Conservation Recommendations, and 4) Department of the Army, Corps of Engineers (USACE) Response. SUA is located within the Southeast Regional Office of NOAA Fisheries. Typically, EFH assessments are conducted where projects have the potential to affect identified resources, mostly in-water activities or activities that could affect coastal vegetation or substrate. For SUA, EFH consultation may be required for projects that discharge into the adjacent St Lucie River. This would include any projects where stormwater improvements require alteration of conveyances or structures within or connected to the St Lucie River.

5.4 Department of Transportation Act: Section 4(f) and Other Environmentally Sensitive Public Lands

Section 4(f) of the *Department of Transportation Act of 1966* (re-codified and renumbered as Section 303© of 49 U.S. Code) states that the Secretary of Transportation will not approve any program or project that requires the use of publicly-owned land of a public park or recreation area; or wildlife and waterfowl refuge of national, state, or local significance; or land of an historic site of national, state, or local significance as determined by the officials having jurisdiction thereof, unless:

1. There is no feasible and prudent alternative to use of such land and such program, and

2. The program or project includes all possible planning to minimize harm to the park, recreation area, wildlife and waterfowl refuge, or historic site resulting from the use.

At this time, there is only one identified recreational area and 72 historical resources (as listed on the National Register of Historic Places and the Florida Master Site File), located adjacent to or within one mile of the airport. The Section 4(f) recreational area is the Martin County Sailfish Sands Golf Course that is located along SUA's south and southeastern property boundary. The historical resources are further identified and discussed in Section 5.6 *Historical, Archaeological, and Cultural Resources*. There are no wildlife and waterfowl refuges located on or in the immediate vicinity of SUA. The Indian River located approximately 1.4 miles east of SUA is the closest feature designated as critical habitat.

5.5 Hazardous Materials and Waste Management

5.5.1 Hazardous Materials

Federal, state, and local laws regulate hazardous materials use, storage, transport, or disposal. Major laws and issue areas include:

- Resource Conservation and Recovery Act (RCRA) - hazardous waste management.
- Hazardous and Solid Waste Amendments Act - hazardous waste management.
- Comprehensive Environmental Response, Compensation, and Liability Act - cleanup of contamination.
- Superfund Amendments and Reauthorization Act (SARA) - cleanup of contamination.
- Emergency Planning and Community Right-to-Know (SARA Title 11) - business inventories and emergency response planning.

According to the Florida Department of Environmental Protection (FDEP) RCRA on-line database and depicted on **Figure 5-2**, at SUA there are six sites currently listed that contain fuel storage tanks, two sites listed as waste cleanup sites, and ten sites that store, generate, transport, treat, and dispose of hazardous waste. As shown in **Table 5-3**, about half of these sites are permitted as small quantity generators. The two monitoring locations: Former Western Drainage Ditch – SWMU 10 and Stuart 1, 2 DEP Plume are currently under a FDEP monitoring program and in compliance. No other outstanding contamination issues were noted.

Source: NEPAssist and Resource Mapping Tool, USEPA and Resource Conservation Act On-Line Database, Accessed 2021.

FIGURE 5-2

RCRA AND PETROLEUM CLEANUP SITES

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TABLE 5-3
RESOURCE CONSERVATION AND RECOVERY ACT SITES AT SUA

Facility ID	Name	Generator Type	Compliance/ Enforcement Issues[1]
8511581	Stuart Jet Center LLC	Storage Tank	In Compliance
8520065	Vought Aircraft Inc	Storage Tank	In Compliance
8624171	Martin County Public Works	Storage Tank	In Compliance
8841377	Stuart Jet Center LLC – East	Storage Tank	In Compliance
9300295	Atlantic Aviation	Storage Tank	In Compliance
9809584	Martin County Sheriff	Storage Tank	In Compliance
ERIC_16933	Former Western Drainage Ditch - SWMU 10	Waste Cleanup Site	FDEP Monitoring
ERIC_15005	Stuart 1, 2 DEP Plume	Waste Cleanup Site	FDEP Monitoring
FLD043117522	Triumph Aerostructures LLC	Small Quantity Generator	In Compliance
FLD982143802	Gateway The Filter Store	Small Quantity Generator	In Compliance
FLD982121709	Martin County Public Works	Small Quantity Generator	In Compliance
FLD984176800	Stuart Jet Center LTD	Small Quantity Generator	In Compliance
FLR000086496	Concrete Systems Inc Marine	Small Quantity Generator	In Compliance
FLR000083949	Atlantic Aircraft Refinishing Inc.	Small Quantity Generator	In Compliance
FLR000146597	Galaxy Aviation of Stuart	Small Quantity Generator	In Compliance
FLD982141616	Martin County Sheriffs Garage	Small Quantity Generator	In Compliance
FLR000130401	Precision Jet Services Inc	Small Quantity Generator	In Compliance

TABLE 5-3
RESOURCE CONSERVATION AND RECOVERY ACT SITES AT SUA

Facility ID	Name	Generator Type	Compliance/ Enforcement Issues[1]
FLR000038604	Stuart Jet Center	Small Quantity Generator	In Compliance

Compliance and enforcement information available in the EPA ECHO report only available for previous 5-year period.

SOURCE: FEDP and EPA 2021.

National Priority List (NPL) sites, also referred to as “Superfund” sites, are considered by EPA to have the most significant public health and environmental risks to neighboring areas. A review of EPA on-line databases did not reveal any NPL sites or facilities on or in the vicinity of SUA.

5.5.2 Waste Management

Per FAA Order 5100.38D, Change 1 *Airport Improvement Program Handbook*, master plans funded with Airport Improvement Program (AIP) dollars must address issues related to the airport’s recycling, reuse, and waste reduction programs. This includes:

- Assessing the feasibility of solid waste recycling at the airport;
- Minimizing the generation of waste at the airport;
- Identifying operations and maintenance requirements;
- Reviewing waste management contracts; and
- Identifying the potential for cost savings or generation of revenue.

The SUA Recycling, Reuse, and Waste Reduction Plan (RRWRP) includes a review of the airport’s waste management and recycling throughout the airfield facilities. The RRWRP prepared as part of this master plan is included in **Appendix C**.

5.6 Historical, Archaeological, and Cultural Resources

Several laws and regulations require that possible effects on historic, archaeological, and cultural resources be considered during the planning and execution of federally-funded projects. The primary laws that pertain to the treatment of historic, architectural, archaeological, and cultural resources during environmental analyses are the *National Historic Preservation Act* (NHPA), the *Archaeological Resources Protection Act*, and the *Native Graves Protection and Repatriation Act*. Historic, architectural, archaeological, and cultural resources may include archaeological sites, buildings, structures, objects, districts, works of art, architecture, and natural features that were important in past human events. They may consist of physical remains, but also may include areas where significant human events occurred, even though evidence of the events no longer exists.

A review of the EPA's NEPAssist database and the Florida Master Site File, indicates that a total of seven resource structures and three resource groups are NHRP-listed historical properties located on or directly adjacent to the airport boundary. Of these resources, only one (MT01573 – *Witham Field Airport*) is located on SUA property. Additional resources adjacent to the airport will not be affected by any future improvements proposed.

5.7 Energy Supply and Natural Resources

Florida Power and Light (FPL) is the electric power supplier to SUA and has a network capable of serving existing and prospective tenants at the airport. The proposed airport improvements projects would require lighting; power for specialized equipment, tools, and processes; office equipment; and air conditioning. Local power utility requirements would primarily include electric service. Overall, there is sufficient capacity to accommodate the projects envisioned in this master plan. Additionally, no substantial energy-related impacts or issues regarding the ability to supply energy to SUA were noted during any recent improvement projects.

5.8 Noise and Compatible Land Use

In order to assess the potential noise impacts that would result from projected aircraft activity levels, the Noise Exposure Maps (NEMs) developed in 2021 and approved as part of the Title 14 Code of Federal Regulations (CFR) Part 150 Noise Study for SUA were adopted for use in this master plan. As noted in the forecast chapter and **Appendix B**, the forecasted operational data used to create the 2020 and 2025 NEMs is the same as the activity projections approved for this study.

The day-night average sound level (DNL) contours were generated using Version 3B of the FAA's Aviation Environmental Design Tool (AEDT) for both a base year (2020) and a future (2025) condition. The base year noise contours (**Figure 5-3**) reflect the existing airfield configuration with the actual aircraft operational fleet mix that occurred during 2020. The contours for the future condition (**Figure 5-4**) are based on the annual aircraft activity levels and expected operational fleet mix at that time. No changes to the airfield configuration or its primary operational characteristics are expected to occur by 2025.

A description of the 14 CFR Part 150 modeling efforts can be found in **Appendix D**, which includes additional figures of the noise contours depicted on land use maps and supporting tables that summarize the acreage of the different land use types within the noise contours. **Appendix D** also includes the FAA letter documenting that the NEMs were prepared in accordance with the requirements of 14 CFR Part 150.

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Source: AEDT 3B; ESA, 2022.

Witham Field Master Plan

FIGURE 5-3

2020 DAY-NIGHT AVERAGE SOUND LEVEL (DNL) CONTOURS

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C:\Users\ddicarlo\Documents\SUA\05 Graphics-GIS-Modeling\Drawings\Figures\SUA MP Figure 5-4.dwg

Source: AEDT 3B; ESA, 2022.

FIGURE 5-4

2025 DAY-NIGHT AVERAGE SOUND LEVEL (DNL) CONTOURS

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5.9 Water Resources

Prior environmental studies, permit actions, reports, GIS data, and other available information was reviewed to determine the extent of water resources on airport property. The USACE, FDEP, and SFWMD have jurisdiction over these resources at SUA.

5.9.1 Wetlands

SUA is located within the St Lucie Watershed and while no jurisdictional wetlands have been identified within the airport property limits, field reviews should be conducted within the naturally occurring areas of the airport property prior to any clearing and permitting activities. Although SUA property limits do not abut the St Lucie River, discharge from the airport flows through stormwater features located along the northern and eastern sections of the property boundary that directly discharges into the St Lucie River. Water quality impacts to the St Lucie River and any other surface water features (i.e. stormwater swales, ditches and ponds) will require some level of NEPA review and permitting. In the event that jurisdictional wetland resources are identified, potential impacts to these water resources can be off-set through the purchase of credits at an agency approved mitigation bank with service areas covering the airport, such as RG Reserve or Bluefield Ranch. Mitigation through a bank is consistent with the hierarchy of mitigation preference established by the USACE in their 2008 Mitigation Rule, and it is compatible with the airport and FAA's goal of reducing wildlife hazards at the airport.

5.9.2 Other Surface Waters

SUA maintains two larger stormwater drainage features located within the northeaster and eastern sections of the airport property. These features are identified as reservoirs, which discharge to the St. Lucie River. These drainage structures are maintained in order to reduce wildlife hazards on airport property. In addition, the airport operates under stormwater management permits and implements pollution prevention plans and best management practices. Permitting will be required should a proposed project at SUA be determined to impact these facilities. National Pollutant Discharge Elimination System (NPDES) regulations also serve to protect water quality. In Florida, the NPDES permit program is administered by the FDEP. An NPDES Generic Permit for construction will be required for projects at SUA that disturb more than one acre.

5.9.3 Floodplains

Executive Order 11988, *Floodplain Management*, directs federal agencies "to take actions to reduce the risk of flood loss, minimize the impact of floods on human safety, health, and welfare, and restore and preserve the natural and beneficial values served by the flood plains." Department of Transportation Order 5650.2, *Floodplain Management and Protection*, and FAA Orders 5050.4B and 1050.1F contain policies and procedures for implementing the Executive Order and evaluating potential floodplain impacts. Agencies are required to make a finding that there is no practicable alternative before taking action that would encroach a floodplain based on a 100-year flood.

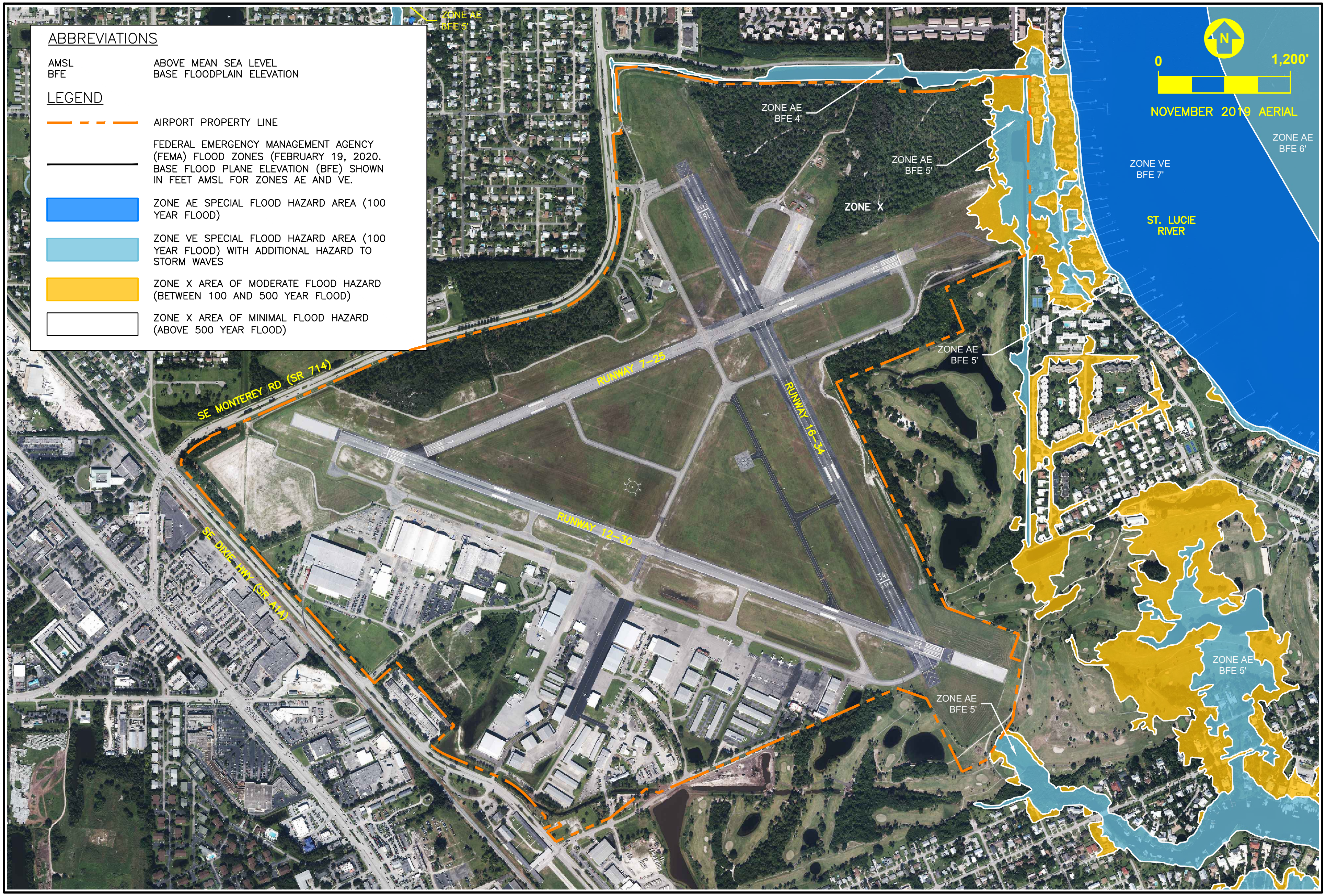
The Federal Emergency Management Agency (FEMA) identifies flood hazard areas that are depicted on Flood Insurance Rate Maps (FIRMs). A floodplain is defined as the lowlands and relatively flat areas adjoining inland and coastal waters including flood prone areas of offshore islands that are, at a minimum, prone to the 100-year flood. The 100-year floodplain is considered the base floodplain. The most recent FEMA Flood Insurance Rate Maps (FIRM), published February 19, 2020, were adopted by Martin County on August 24, 2021. **Figure 5-5** depicts the updated FIRMs for the area surrounding SUA.

The entire airport property is identified as Zone X, which includes Moderate Risk Areas. Zone X areas that are identified as moderate have a 0.2 percent probability of flooding every year (also known as the 500-year floodplain). No base flood elevations or base flood depths are shown within these zones and flood insurance is not typically required by regulation in these zones.

5.10 Construction Impacts

Construction impacts are generally short-term in nature and would vary depending on which projects are implemented. The construction required for any proposed improvement could have the potential to impact air quality, surface transportation, water quality, and noise through the use of heavy equipment and vehicle trips generated from construction workers traveling to and from the project sites.

For water quality, each project will have to adhere to the applicable Stormwater Pollution Prevention Plan maintained by SUA. Projects would also require notification or permitting through the FDEP in compliance with the NPDES program. In Florida, this program is delegated to the state and does not require additional authorization through the EPA. This process includes development of, and adherence to, best management practices for preventing or reducing the release of pollutants from a construction site. Construction impacts would be evaluated as part of any NEPA analysis required, prior to constructing any of the proposed improvement projects.



Source: FEMA FLOOD INSURANCE RATE MAPS (FEBRUARY 19, 2020), ACCESSED SEPTEMBER 2021.

FIGURE 5-5

FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) FLOOD ZONES

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5.11 Types of Environmental Reviews

5.11.1 Federal Reviews

The FAA is responsible for ensuring compliance with NEPA with respect to actions at federally obligated airports. The processing of Airport Improvement Program grant applications and Airport Layout Plan approvals are two types of "federal actions" commonly undertaken by the FAA in support of airport improvement projects which require environmental review under NEPA. While NEPA requires varying levels of interagency coordination, development of environmental documents under NEPA does not exempt airport projects from compliance with other federal environmental laws (e.g., *Endangered Species Act*) or state and local environmental regulations.

The process for on-airport development requiring NEPA changed somewhat when Congress passed the FAA Reauthorization Act of 2018. Section 163 of the act modified the scope of actions that trigger a particular class of federal actions under NEPA. Specifically, Section 163(d) narrowed the scope of ALP modifications considered formal actions within the regulatory authority of the FAA. Sections 163(a-c) define other factors related to how the land was acquired and whether a release of the land from aeronautical use is required. In short, all on-airport projects are now subject to a Section 163 review by the FAA Orlando Airports District Office before initiating the NEPA process. Depending on the type of project, the Section 163 could result in 1) a Categorical Exclusion (CatEx) with a release of the Airport Sponsor from federal obligations, 2) a CatEx or Environmental Assessment (EA) for the aeronautical elements, or 3) a combination of the two. NEPA requirements may also bypass the EA and go straight to an Environmental Impact Statement (EIS).

For those projects that involve a federal action and therefore trigger environmental review under NEPA, the three types of documentation are summarized in **Table 5-4**. CatEx and EA documents are usually prepared by the Airport Sponsor and, if the documentation meets FAA requirements, they are accepted by the FAA and become federal documents. EIS documents are prepared by the FAA. Every future project recommended as part of this master plan is subject to the appropriate level of environmental review at such time that a specific project is considered ready for implementation. It should be acknowledged that most airport actions require some level of NEPA review, and a project does not need to be federally funded to require NEPA compliance.

TABLE 5-4
TYPES OF FAA NEPA REVIEW DOCUMENTATION (NOT SPECIFIC TO SUA)

Categorical Exclusion	The FAA has identified certain actions that may be categorically excluded from a more detailed environmental review. However, extraordinary circumstances, such as wetland impacts, may preclude Categorical Exclusion (CATEX). A CATEX requires a review of impacts and completion of forms provided by the FAA. In some cases, documentation and agency coordination may be necessary to address extraordinary circumstances (see FAA ARP SOP No. 5.00). CATEXs that may apply to future airport development projects at SUA are summarized below (emphasis added). See FAA Orders 1050.1F and 5050.4B for a more detailed description of these and other categorically excluded actions that may apply to development projects at SUA. 1. Access and service road construction that does not reduce the level of service on local traffic systems below acceptable levels. 2. Construction, repair, reconstruction, resurfacing, extending, strengthening, or widening of a taxiway, apron, loading ramp, or runway safety area; or the reconstruction, resurfacing, extension, strengthening, or widening of an existing runway – *provided the action would not result in significant erosion or sedimentation and will not result in a significant noise increase over noise sensitive areas or result in significant impacts on air quality*. 3. Construction or limited expansion of accessory on-site structures, including storage buildings, garages, hangars, T-hangars, small parking areas, signs, fences, and other essentially similar minor development items. 4. Construction or expansion of facilities – such as terminal and parking facilities or cargo buildings, or facilities for non-aeronautical uses that *do not substantially expand those facilities*. 5. Demolition and removal of FAA or non-FAA on-airport buildings and structures, *provided no hazardous substances or contaminated equipment are present on the site of the existing facility*. Does not apply to historic structures. 6. Placing fill into previously excavated land with material compatible with the natural features of the site, *provided the land is not delineated as a wetland*; or minor dredging or filling of wetlands or navigable waters for any categorically excluded action, *provided the fill is of material compatible with the natural features of the site and the dredging and filling qualifies for an U.S. Army Corps of Engineers nationwide or a regional general permit*. 7. Grading of land, removal of obstructions to air navigation, or erosion control measures, *provided those activities occur on and only affect airport property*. 8. Topping or trimming trees to meet 14 CFR Part 77 standards for removing obstructions which can adversely affect navigable airspace.
Environmental Assessment	An Environmental Assessment (EA) is prepared for proposed actions with expected minor or uncertain environmental impact potential. An EA requires analysis and documentation similar to that of an EIS, but with somewhat less detail and coordination. The FAA will review the EA and decide to either issue a Finding of No Significant Impact (FONSI) or prepare an Environmental Impact Statement (EIS). Future airport development projects and actions at SUA that may require an EA are summarized below (emphasis added). See FAA Orders 1050.1F and 5050.4B for more information. 1. Runway extensions due to possible wetland impacts, potential off-airport impacts related to aircraft noise, and potential impacts to affect listed species habitat. 2. Taxiway construction due to possible wetland impacts and potential to affect listed species habitat. 3. Aircraft parking apron; hangar and structures; and/or access road projects that may not qualify for a CATEX due to extraordinary circumstances (e.g., wetland impacts may not qualify for a nationwide or regional general permit). 4. Approval of operations specifications or amendments that may significantly change the character of the operational environment of an airport. 5. New air traffic control procedures (e.g., instrument approach procedures, departure procedures, in route procedures) and modifications to currently approved procedures that routinely route aircraft over noise sensitive areas at less than 3,000 feet above ground level.
Environmental Impact Statement	An Environmental Impact Statement (EIS) is prepared for major federal actions, which are expected or known to significantly affecting the quality of the human environment. At this time, no future airport development projects at SUA are expected to require the preparation of an EIS.

Compiled by ESA, 2022.

5.11.2 State Reviews

For projects that require NEPA compliance, state environmental reviews typically initiate with the Florida State Clearinghouse which is administered by FDEP. A primary function of the Florida State Clearinghouse is to serve as the state's single point of contact for the receipt of federal activities that require interagency review, which includes activities subject to consistency review under the Florida Coastal Management Program. Upon completion of their review, the Clearinghouse will typically issue a letter summarizing any potential concerns or inconsistencies regarding the proposed activity. The clearance letter will also include information on obtaining necessary state permits and will inform the applicant if there is a need to submit additional information to a specific state agency for review. In cases where NEPA compliance is not required, direct coordination with the relevant state regulatory agencies may still be required. Information related to the specific agencies and coordination and/or permits required, is discussed in each of the individual resource sections in this chapter.

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CHAPTER 6

Airport Alternatives Analysis

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CHAPTER 6
Airport Alternatives Analysis

6.1 Introduction

This chapter evaluates options to meet the facility requirements identified for Witham Field (SUA) over the 20-year planning period. The identification and evaluation of alternative concepts and the subsequent potential improvements were facilitated through meetings with airport management, local government, air traffic managers, the Federal Aviation Administration (FAA), and Florida Department of Transportation (FDOT), as well as input from the airport tenants.

While a number of projects to maintain and improve the airport will be required over the course of the 20-year planning period, only options for the most noteworthy are presented in this chapter. These include providing the proper runway and taxiway requirements; additional aircraft hangar and parking apron space; and some of the support and service facilities. While there are inherent difficulties in expressing certain factors in comparable terms, at a minimum, each improvement must meet the applicable FAA and FDOT standards for safety.

6.2 Airfield Constraints Analysis

An analysis of the key operational and physical airfield constraints was conducted prior to defining airport alternatives. This effort ensured that factors impacting project feasibility, the community, the environment, and the long-term viability of the airport were considered while evaluating different improvement options. Among the constraints considered; airfield design standards, surfaces, and setbacks for the safety of operations are the most critical. **Figure 6-1** reflects the airfield standards established as part of previous chapters of this master plan study. The critical surfaces for Runway 12-30 are based on an Aircraft Approach Category (AAC) designation of D and Airplane Design Group (ADG) of III, while Runways 16-34 and 7-25 have surfaces for the B-II design category.

6.2.1 Airspace Surfaces

Title 14 Code of Federal Regulations (CFR) Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace* defines airspace surfaces for the purpose of identifying obstructions at or in the vicinity of an airport. Some obstructions may be considered a hazard to air navigation. As described in the facility requirements, the rectangular Primary Surfaces follow the same elevation as that along the nearest point of the adjacent runway centerline. Because the runway system at SUA is basically flat, only those objects essential to air navigation or the movement of aircraft should be located within the Primary Surfaces. The existing Primary Surfaces are not included on **Figure 6-1** since the one for Runway 12-30 needs to be changed (addressed in a subsequent section) and the ones for Runways 16-34 and 7-25 are the same as the Runway Object Free Areas (ROFA) associated with these runways. As shown, the ROFAs also encompass the required Runway Safety Areas (RSA) for each runway.

Fixed and moveable objects are also considered potential obstructions if they penetrate any of the Approach or Transitional Surfaces that extend upward and outward from each Primary Surface. For purposes of clarity, these surfaces were excluded from **Figure 6-1** as they vary in height depending on their proximity to the Primary Surface. Likewise, the figure does not reflect the required Threshold Siting Surfaces (TSS) or Departure Surfaces off each runway end; however, they will be included as required in the evaluation of alternatives.

6.2.2 ATCT Line-of-Sight

The existing SUA airport traffic control tower (ATCT) line-of-sight must be considered so that the controllers have an unobstructed view of all aircraft movement areas. The line-of-sight lines depicted on **Figure 6-1** are the most critical based on the current airfield configuration. The evaluation of future development alternatives will consider any line-of-sight shifts from potential airfield changes or if line-of-sight would be obstructed by any proposed improvement. Effects on ATCT line-of-sight were based on the established eye height for the ATCT, which is 90.8 feet above mean sea level (AMSL).

6.2.3 Runway Protection Zones

The existing Runway Protection Zones (RPZ) off each of the six runway ends are shown on **Figure 6-1**. As documented in the facility requirements, separate Approach and Departure RPZs may be required when declared distances are applied to a runway. Declared distances were proposed as part of the current April 2013 Airport Layout Plan (ALP) Drawing set for both Runways 12-30 and 16-34. While the declared distances calculated were never published in any of the aeronautical publications for SUA, **Figure 6-1** reflects the separate Approach and Departure RPZs required based on the existing displaced thresholds on the Runway 12, 16, and 34 ends.

The current FAA document *Interim Guidance on Land Uses Within a Runway Protection Zone* was issued in September of 2012. Under this guidance, any new or modified land use within a RPZ, whether on- or off-airport property, as well as any proposed change to a RPZ location and size must be coordinated with the FAA to determine compatibility. When there are no changes, but still incompatible land uses within an existing RPZ extending beyond the current airport property boundary, the interim guidance states that the FAA will continue to work to remove or mitigate any incompatible land uses as practical. Updated declared distance calculations and the potential changes to the RPZs are addressed in a subsequent section.

Source: ESA, 2022.

FIGURE 6-1
EXISTING AIRFIELD CONSTRAINTS

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6.2.4 Physical Constraints

The evaluation of constraints also included the airport's physical setting within the surrounding developed community. The identification of airport alternatives considered, in general terms, the potential complexity, cost, and social impacts of acquiring land, relocating residences, impacting businesses, and/or modifying roads.

As shown on **Figure 6-1**, the west side of the airport property is bounded by SE Dixie Highway (SR A1A) and SE Monterey Drive. To the east, the airport is primarily bounded by the Martin County Sailfish Sands Golf Course and some residential communities. While the airport is in close proximity to the St. Lucie River, none of the property directly borders the river and is minimally affected by the most recently published Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) flood hazard.

6.3 Runway System

The facility requirements chapter identified a number of improvements for the runways, some of which require analysis to arrive at the best recommendation. Each of the potential options addressed in the following sections have the primary intent to improve the overall safety and efficiency of the runway system.

6.3.1 Runway 12-30

The primary considerations for Runway 12-30 include the need to apply declared distances and the impact of the existing approach minimums.

Application of Declared Distances

New declared distances have been calculated for Runway 12-30 since those included in the current 2013 ALP Drawing set have changed slightly due to the updated runway data captured as part of the 2019 Airport Geographic Information System (AGIS) survey conducted as part of this study. This new data was utilized with the required runway design standards, as well as the existing Modifications of Standards (MOS) for the ROFA to determine the following:

TORA	Takeoff Run Available
TODA	Takeoff Distance Available
ASDA	Accelerate Stop Distance Available
LDA	Landing Distance Available

With the exception of the LDA for Runway 12, all of the declared distances equal the runway length of 5,828 feet. Due to the displaced threshold on Runway 12, the LDA must be reduced the same distance of the displacement (460 feet) for an available length of 5,368 feet. The revised declared distances that need to be published for Runway 12-30 as soon as possible are included in **Table 6-1**.

TABLE 6-1
DECLARED DISTANCES REQUIRED FOR RUNWAY 12-30

	TORA	TODA	ASDA	LDA
Runway 12	5,828’	5,828’	5,828’	5,368’
Runway 30	5,828’	5,828’	5,828’	5,828’

NOTES: Based on the existing and future D-III runway design standards, with not lower than ¾ mile visibility minimums.

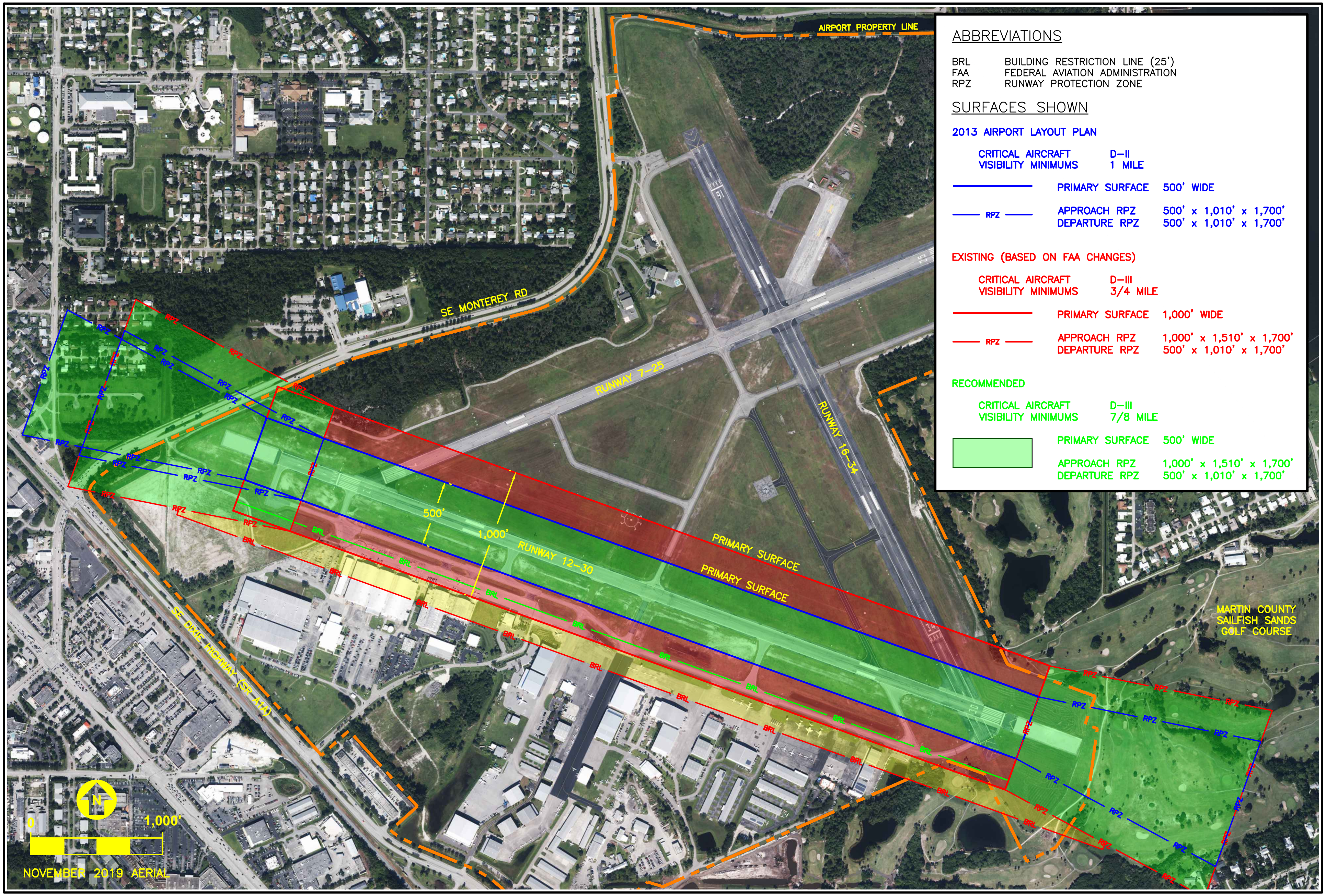
SOURCE: Calculations based on November 2019 runway survey and AGIS data.

Published Instrument Approach Minimums

For Runway 12-30, the current 2013 ALP Drawing set includes the 14 CFR Part 77 surfaces required for an other than utility runway, with visibility minimums greater than 3/4 mile. This was due to the existing and future non-precision approaches (at that time) that were limited to one mile visibility minimums to both ends. Correspondingly, the current 2013 ALP Drawing set includes the RPZs required off each end of Runway 12-30 for the existing and future critical aircraft at that time (D-II), with not lower than one mile visibility minimums. These surfaces are illustrated on **Figure 6-2**.

Sometime in 2013 (assumed after the ALP was in its final stages of approval) the FAA changed the non-precision approach with one mile visibility minimums to Runway 30 to an approach with visibility minimums of 7/8 mile. In 2014, the FAA did the same to Runway 12, lowering the non-precision visibility minimums from one mile to 7/8 mile. While these did not change the required 14 CFR Part 77 surfaces, they did change the size of the required RPZs off each end. The current 2013 ALP Drawing set includes the existing and future RPZs (500’ x 1,010’ x 1,700’) required on both ends of Runway 12-30 for a D-II runway with not lower than one mile visibility minimums. The changes made by the FAA required a larger Approach RPZ (1,000’ x 1,510’ x 1,700’) off each end of Runway 12-30 as a D-II runway with not lower than 3/4 mile visibility minimums.

In 2019 the FAA changed the non-precision approach to Runway 12 again, reducing the visibility minimums from 7/8 mile to 3/4 mile. This change is still current today and even with Runway 12-30 as an existing (and future) D-III runway, the Approach RPZ requirement does not change from that required in 2014 (1,000’ x 1,510’ x 1,700’). However, changes to the 14 CFR Part 77 surfaces are required since the 7/8 mile and 3/4 mile are categorized differently than they are in the FAA airport design standards. For the 3/4 mile visibility minimums on Runway 12, the Primary Surface increases in width from 500 to 1,000 feet. These existing conditions are also depicted on **Figure 6-2**. While not included on the figure, the inner width of the 14 CFR Part 77 Approach Surfaces to both ends of Runway 12-30 also increase, since they are the same width as the Primary Surface. Additionally, the outer width of the Runway 12 Approach Surface also increases for the 3/4 mile minimums.



Source: ESA, 2022.

FIGURE 6-2

2013 AIRPORT LAYOUT PLAN, EXISTING, AND RECOMMENDED RUNWAY 12-30 SURFACES

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The changes made by the FAA in 2019 placed a number of airport facilities within the required 14 CFR Part 77 surfaces. The area hatched in red on **Figure 6-2** illustrates that the current 1,000 foot Primary Surface encompasses all of the aircraft apron parking space on the western half of the Runway 12-30 flightline. This includes the U.S. Customs and Border Protection (CBP) sterile aircraft parking apron. The area hatched in yellow represents the 25 foot building/aircraft parking restriction line associated with the 1,000 foot Primary Surface. As shown, this covers a significant portion of the aircraft apron space on the eastern half of this flightline, as well as a number of structures greater than 25 feet along the flightline.

There are basically three options SUA can pursue to address the impacts of the larger 14 CFR Part 77 surfaces required for the existing 3/4 mile visibility minimums to Runway 12.

1. Remove any obstructions to the 14 CFR Part 77 surfaces. This would include structures, aircraft parking areas, fencing, equipment storage, vegetation, etc. This may also require amendments to local zoning for any potential obstructions off-airport property.

2. Request that the FAA conduct an analysis to determine which of the obstructions to the 14 CFR Part 77 surfaces actually impact the published approach minimums to Runway 12. Such an evaluation is initiated through the FAA's Obstruction Evaluation/Airport Airspace Analysis (OE/AAA) website, with the final determination indicating which would have to be removed or which could remain if properly marked and/or lighted.

3. Formally request that the FAA change the Runway 12 approach visibility minimums back to 7/8 mile. This process should be initiated by contacting the FAA Orlando Airports District Office (ADO) in addition to making the request on the FAA's Instrument Flight Procedure (IFP) Request Process website.

Given there is already an insufficient amount of aircraft apron space (especially for the larger aircraft with tail heights up to and exceeding 25 feet), SUA cannot afford to lose the use of any existing facilities along the Runway 12-30 flightline. Additionally, while not shown on **Figure 6-2**, there is also the issue of protecting the larger areas of the 14 CFR Part 77 Approach Surfaces. Therefore, it is recommended that SUA management request the existing Runway 12 visibility minimums be reduced from 3/4 mile to 7/8 mile. While it is understood that the primary intent of the 14 CFR Part 77 surfaces are for "notification" and that a more detailed evaluation by the FAA may show that the current facilities do not constitute significant obstructions; the fact remains that FDOT State licensing standards require all 14 CFR Part 77 surfaces to be clear. In addition, discussions during the master plan process with airport management, air traffic managers, and the fixed based operators (FBOs) revealed that no significant impacts were expected if the Runway 12 visibility minimums were reverted back to 7/8 mile.

6.3.2 Runway 16-34

The facility requirements identified the need to evaluate the takeoff length available on Runway 16-34, the establishment of declared distances, and the potential for future instrument approach procedures.

Application of Declared Distances

Before an evaluation of the takeoff length available on Runway 16-34 can be conducted, the proper declared distances must be calculated. As noted in the facility requirements, the current 2013 ALP Drawing set did not apply the proper RSA dimensions for the runways at SUA. In addition, the ROFA dimensions for Runway 16-34 were also incorrect. Because of this, the declared distance calculations included in the 2013 ALP Drawing set are not accurate.

Existing Conditions

Figure 6-1 illustrates the proper RSA and ROFA for Runway 16-34 based on the existing and future B-II critical aircraft, with not lower than one mile visibility minimums. The figure also shows the existing 336 foot displaced threshold on the Runway 16 end and the 900 foot displaced threshold on the Runway 34 end. Using these surfaces, the existing displaced thresholds, and the 2019 AGIS survey runway data; new declared distances were calculated as shown in **Table 6-2**.

TABLE 6-2
EXISTING DECLARED DISTANCES REQUIRED FOR RUNWAY 16-34

	TORA	TODA	ASDA	LDA
Runway 16	5,000’	5,000’	4,800’	4,464’
Runway 34	5,000’	5,000’	5,000’	4,100’

NOTES: Based on the existing and future B-II runway design standards, with not lower than 1 mile visibility minimums.

SOURCE: Calculations based on November 2019 runway survey and AGIS data.

As there is only 100 feet of full width RSA and ROFA between the physical end of Runway 34 and the airport property boundary with the Martin County Sailfish Sands Golf Course, both the Runway 16 ASDA and LDA calculations had to be reduced by 200 feet to provide the full 300 feet required.

Since the existing, as well as future RSA and ROFA required for Runway 16-34 have been corrected from those shown on the current 2013 ALP Drawing set, the opportunity exists to re-establish the landing thresholds in their proper location. However, in doing so, the 14 CFR Part 77 and Threshold Siting Surfaces (TSS) must be considered.

Runway 16 Threshold Correction

On the Runway 16 end, the aeronautical publications state that the threshold is displaced 336 feet for trees. The existing 20:1 14 CFR Part 77 Approach Surface begins at the end of the Primary Surface, which is 200 feet beyond the paved runway end. The AGIS data identified three trees that penetrated the Approach Surface between 2.2 and 6.6 feet. There are no penetrations to the existing Type 3 TSS to Runway 16 as this 20:1 surface begins at the 336 foot displaced threshold. This places it 536 feet in from the Approach Surface; therefore, 26.8 feet higher. Consequently, the landing threshold could be at the physical end of the runway. If this correction were made, the Approach Surface location would not change, but the Type 3 TSS would then be 200 feet in from the Approach Surface and therefore 10 feet higher. Given the greatest penetration to the Approach Surface is less than 10 feet, the Type 3 TSS from the physical end of the runway would not have any penetrations, as it has similar inner dimensions to the Approach Surface.

The corrected threshold would also require a modification of the existing Approach RPZ. If corrected, the Approach RPZ would simply be collocated with the existing Departure RPZ off this end of the runway.

Runway 34 Threshold Correction

A similar situation exists to correct the existing 900 foot displaced threshold on the Runway 34 end. For this end, the aeronautical publications also state that the threshold is displaced due to trees. The 2019 AGIS data showed that a number of trees to the southwest of the physical end of Runway 34 penetrated both the 14 CFR Part 77 Primary Surface and 20:1 Approach Surface. Since the AGIS data was collected, these trees, many of which were located on the Martin County Sailfish Sands Golf Course, have been removed. There are still a few individual trees off-airport property that penetrate the 20:1 Approach Surface between 1.2 and 5.3 feet. There are no penetrations to the existing Type 3 TSS to Runway 34 as this 20:1 surface begins at the 900 foot displaced threshold. This places it 1,100 feet in from the Approach Surface; therefore, 55.0 feet higher.

From an obstruction standpoint, the landing threshold could be at the physical end of the runway since as with the Runway 16 end, if this correction were made, the Approach Surface location would not change, but the Type 3 TSS would then be 200 feet in from the Approach Surface and therefore 10 feet higher. However, eliminating the entire displaced threshold on Runway 34 is not feasible due to the intersection with Runway 12-30. While all of the pavement markings required for Runway 34 could be established prior to the intersection; aircraft landing on Runway 34 would touch down on or near the crowned Runway 12-30 centerline. This is not considered an ideal or even safe situation for aircraft touching down for landing.

Ultimately, the preferred location of the corrected Runway 34 threshold was established using criteria found in FAA Advisory Circular (AC) 150/5340-1M, Change 1, *Standards for Airport Marking (Sections: 2.2 – Interruption of Surface Markings, and 2.9 – Displaced Threshold Markings)*. This results in the ability to move the current Runway 34 threshold back 460 feet, leaving a displacement of 440 feet. This potential correction to the Runway 34 threshold is illustrated in **Figure 6-3**.

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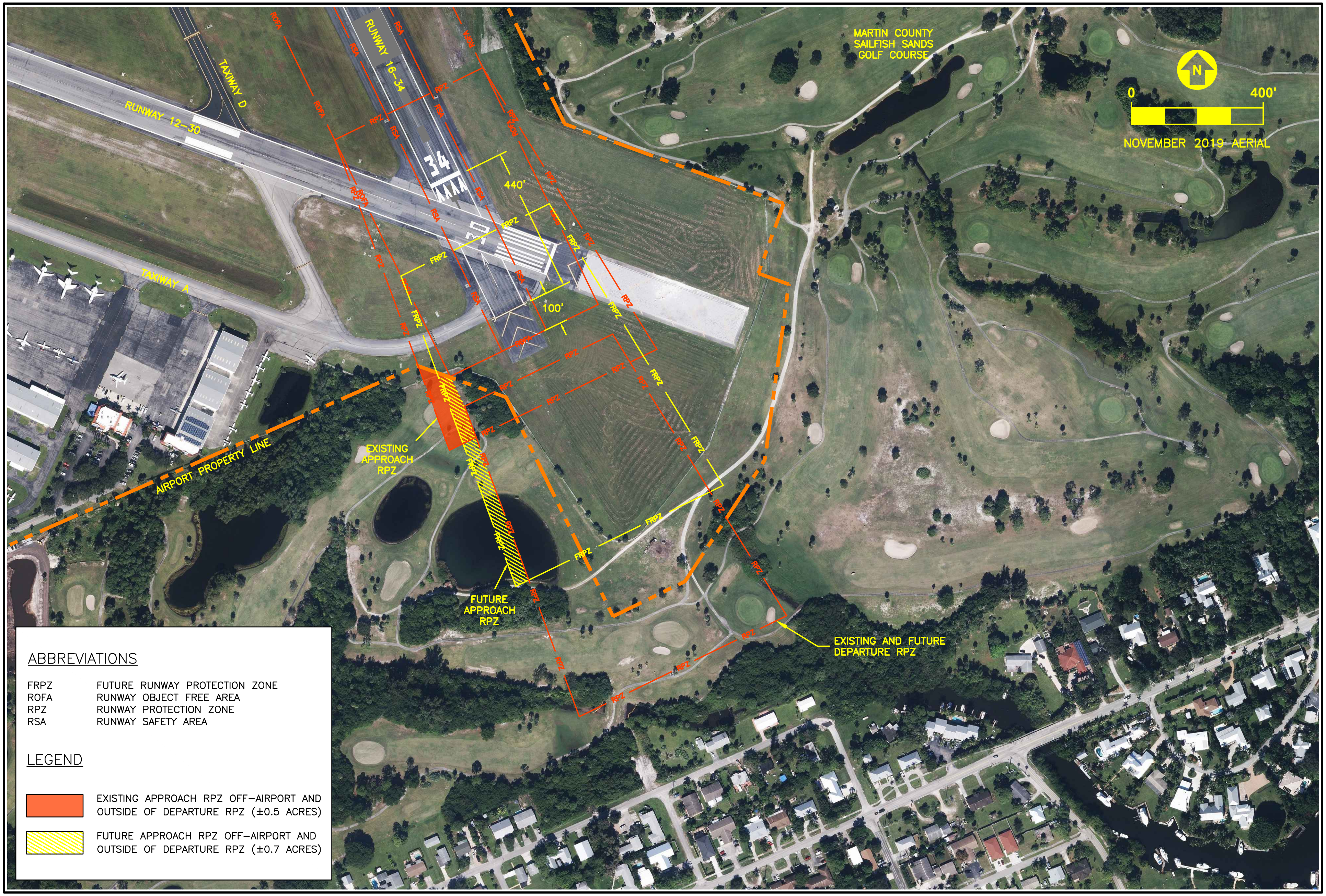

Source: ESA, 2022.

FIGURE 6-3

RUNWAY 34 THRESHOLD CORRECTION

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The corrected threshold would also require a modification of the existing Approach RPZ with the new displaced threshold. If the threshold is corrected, the current Approach RPZ would also shift back 460 feet, while the existing Departure RPZ on this end of the runway would remain the same. This shift would change the amount of the Approach RPZ, outside of the existing Departure RPZ, that would be off-airport property. As detailed on **Figure 6-3**, the existing Approach RPZ covers approximately 0.5 acres off-airport, beyond the existing Departure RPZ while the corrected Approach RPZ would encompass approximately 0.7 acres. While this is a slightly larger area, **Figure 6-3** shows that the corrected Approach RPZ would not overlap as many features of the Martin County Sailfish Sands Golf Course. In fact, nearly half of the corrected Approach RPZ that is beyond the existing Departure RPZ would be over a pond on the golf course.

Future Declared Distances

In order to correct the thresholds at both ends of Runway 16-34, airport management would need to establish the new threshold locations with the FAA (to potentially include an updated obstruction survey off each runway end), remark the runway, and request updates to the associated aeronautical publications. It would also require an update to the existing declared distance calculations required for Runway 16-34 that were included in **Table 6-2**. With the corrected thresholds described, the future declared distances would only change the LDA available as shown in **Table 6-3**.

TABLE 6-3
FUTURE DECLARED DISTANCES FOR RUNWAY 16-34

	TORA	TODA	ASDA	LDA
Runway 16	5,000’	5,000’	4,800’	4,800’
Runway 34	5,000’	5,000’	5,000’	4,560’

NOTES: Based on the future B-II runway design standards, with not lower than one mile visibility minimums, Runway 16 with no displaced threshold, and Runway 34 with a 440 foot displaced threshold.

SOURCE: Calculations based on November 2019 runway survey and AGIS data.

As noted in previous chapters, the current markings on Runway 16-34 are in good condition and will not need to be remarked until about the midpoint of the 20-year planning horizon. Therefore, it is recommended that the thresholds be corrected at that time. In addition to the remarking, improvements to Runway 16-34 at that time should also include installing Medium Intensity Runway Lights, as well as Runway End Identifier Lights and Precision Approach Path Indicators for each runway end.

Additional Runway Length

The required takeoff length for Runway 16-34 was calculated as 4,830 feet. A need for additional runway length was identified in the facility requirements chapter based on the most restrictive declared distance (4,120 feet) from the 2013 ALP Drawing set. However, as shown in both **Tables 6-2** and **6-3**, the updated declared distances show the shortest takeoff distance (ASDA) is 4,800 feet for departures on Runway 16.

In order to capture an additional 30 feet for takeoffs on Runway 16, either the runway would have to be extended that distance to the northwest or the RSA and ROFA extended 30 feet to the southeast. Any extension to the northwest would also require the associated runway surfaces to also shift. This would create new off-airport obstructions to the 20:1 14 CFR Part 77 Approach Surface and incompatible uses within the limits of the RPZ. On the southeast end, additional property would need to be acquired from the Martin County Sailfish Sands Golf Course to provide any increase in the required RSA and ROFA. However, unlike the situation for Runway 12-30, the property required in this case includes active features of the golf course. Given these potential impacts and the fact that Runway 16-34 is only short 30 feet in one direction, no additional runway length is recommended.

Establishment of Instrument Approach Procedures

For both ends of Runway 16-34, the establishment of a straight-in non-precision instrument approach capability with visibility minimums of not lower than one mile is possible; however, a full U.S. Standard for Terminal Instrument Procedures (TERPS) analysis would need to be conducted first to identify the controlling obstructions and then a determination made as to whether or not a procedure to either end could be established. This is due to the fact that a straight-in non-precision approach would not only increase the size of the 14 CFR Part 77 Approach Surface, but also lower it to a 34:1 slope. Likewise, the current Runway Type 3 TSS to each end would increase to a Type 4 TSS to the end(s) with a non-precision approach with not lower than one mile visibility minimums. While the Type 4 TSS has the same 20:1 slope as the current Type 3 TSS, it is a larger surface and it begins 200 prior to the landing threshold.

In addition to the TERPS analysis, FAA AC 150/5300-13A, Change 1, *Airport Design* requires a Non-Vertically Guided Survey (NVGS) for any new non-precision approach. Information related to the details of this survey requirement is found in FAA AC 150/5300-18B, *General Guidance and Specifications for Submission of Aeronautical Surveys to NGS: Field Data Collection and Geographic Information System (GIS) Standards*. Essentially, this AC provides the specifications for the collection of airport survey data needed to support the aeronautical and airport engineering information required. Therefore, a TERPS analysis and NVGS will be included in the capital improvement program to explore this potential, as well as to establish the level of environmental review necessary to establish non-precision approaches to one or both ends of Runway 16-34.

6.3.3 Runway 7-25

The facility requirements identified the need to evaluate the takeoff length available and the potential to establish future instrument approach procedures for Runway 7-25. Since Runway 7-25 does not have any displaced thresholds and thus no declared distances, there is 4,653 feet available for takeoffs and landings in each direction.

The required takeoff runway length was calculated the same as Runway 16-34 at 4,830 feet, since both runways serve the same mix of aircraft. As shown on **Figure 6-1**, any extension of the runway to the southwest would overlap Runway 12-30, resulting in the need to extend the runway more than the additional 177 feet calculated as needed. Any extension to the southwest would also require the current 20:1 14 CFR Part 77 Approach Surface and RPZ on this end of the runway to overlap the area that has recently been cleared for future hangar and aircraft parking apron facilities. On the northeast end of the runway, any extension would also extend the 20:1 14 CFR Part 77 Approach Surface and RPZ an equal distance. Almost any extension to the northeast, most certainly 177 feet, would place the RPZ over a number of the residences located along SE St. Lucie Boulevard. For these reasons and the fact that Runway 7-25 is an additional runway, no additional runway length is recommended.

For both ends of Runway 7-25, the establishment of a straight-in non-precision instrument approach capability with visibility minimums of not lower than one mile is possible; however, as with Runway 16-34, a full TERPS analysis would need to be conducted first to identify the controlling obstructions and then a determination made as to whether or not a procedure to either end could be established. While there are no penetrations to the current 20:1 14 CFR Part 77 Approach Surface or the Runway Type 3 TSS, as with Runway 16-34, these surfaces would change for the end(s) of Runway 7-25 being evaluated for a straight-in non-precision approach. It is recommended that Runway 7-25 be included as part of the TERPS analysis, NVGS survey, and environmental review project programmed for Runway 16-34.

6.4 Taxiway System

With the exception of Taxiway A, there are no true options to consider for the various improvements recommended for the taxiway system. As noted, in previous sections, the current Taxiway A centerline offset is 300 feet for the half west of Taxiway C and 450 feet for the east half. The taxiway requires a 400 foot offset for the simultaneous movement of the critical ADG III aircraft on both Runway 12-30 and Taxiway A.

6.4.1 Existing Taxiway A Improvements

For the west half of Taxiway A, a large area would have to be prohibited from use to provide the proper ADG III parallel taxiway centerline offset and required ADG III Taxiway Object Free Area (TOFA). This area includes the CBP sterile aircraft parking apron, Precision Jet Services aircraft parking apron, and storage areas for Daher Aerospace. As such, this is not considered a viable option and the airport should maintain the current documentation in the FAA Chart Supplement which notifies pilots of this limitation and that the ATCT must manage simultaneous ADG III aircraft movements on this half of Taxiway A.

Conversely, the existing 450 foot offset on the east half of Taxiway A provides the opportunity to shift the taxiway centerline 50 feet towards Runway 12-30. Such a shift (shown on **Figure 6-4**) would create enough space between the existing aircraft parking apron edge and the ADG III TOFA. This would eliminate the potential for any of the aircraft parked along the apron edge from encroaching into the Taxiway A TOFA. This additional space would also allow a perimeter road for airport vehicles and fuel trucks to traverse the area without having to utilize Taxiway A or portions of the apron. The potential shift in Taxiway A should be considered as part of the full depth reconstruction of Taxiway A recommended in the 2021 FDOT pavement study.

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Apr 21, 2023 – 11:45am C:\Users\jholiday\Documents\Aviation Planning\Airports\SUA\05 Graphics–GIS–Modeling\Drawings\Figures\SUA MP Figure 6-4.dwg

Source: ESA, 2022.

FIGURE 6-4
RECOMMENDED AIRFIELD IMPROVEMENTS

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Another improvement to increase the efficiency and safety of aircraft movements along Taxiway A would be to enhance the existing run-up areas serving the taxiway. As noted, there are currently three run-up areas off Taxiway A; however, due to their limited size, they do not always allow for the larger jet aircraft, particularly during seasonal peaks, to bypass smaller piston aircraft conducting engine checks before departures. A project is underway to expand the run-up area at the westernmost end of Taxiway A. **Figure 6-4** shows the initial plan to reconfigure this run-up area to include a larger area with multiple holding bays. Each will be marked such that any aircraft using them would remain clear of the ADG III TOFA required on Taxiway A. Unfortunately, due to an existing leasehold, the airport property line, and a stormwater pond, it is not possible to expand the run-up area at the east end of Taxiway A.

6.4.2 New Partial Parallel Taxiway to Runway 12-30

A new partial parallel taxiway on the north side of Runway 12-30 should be considered for the long-term planning horizon. As shown in **Figure 6-4**, this taxiway would connect to the physical end of Runway 12, cross Runway 7-25, intersect Taxiway C, and tie into Taxiway D. Discussions with SUA's air traffic management indicated that such a dual parallel system would eliminate a number of the departure delays that are experienced when Runway 12 is active, especially during seasonal peaks. The dual taxiway would also provide additional options for the movement of both small and large aircraft, to and from the various runways. If constructed, this project would require the relocation of the segmented circle; however, the future Automated Weather Observing System (AWOS) could remain at the existing site as it is outside of the ADG III TOFA for the new partial parallel taxiway. Finally, it may be determined that Taxiway C1 is no longer needed or that it could be modified to tie more directly into the new partial parallel taxiway.

6.5 Recommended Airfield Improvements

Figure 6-4 combines all of the recommended airfield improvements identified in the previous sections, as well as others that did not have any true alternatives and/or were included to support the general aviation facility concepts described in the next section.

6.6 General Aviation Facilities

Only a few areas on the airfield are available for future general aviation facilities. At this time, none of these areas have airfield access, only a few have landside access, and some require redevelopment. These areas have been evaluated to determine their ability to accommodate the different types of aviation facilities needed over the 20-year planning horizon. The key objective was to create a plan where the limited remaining airport land would be reserved for the highest and best use to support the facilities identified for the 20-year planning period. These include:

- T-hangars (49 additional units)
- Clearspan Hangars (to accommodate 92 new aircraft)
- Aircraft Parking Apron (additional 75,000 square yards)

6.6.1 Elements for Alternative Concepts and Evaluation

The following sections outline features and considerations applied to the evaluation of the potential general aviation facility alternatives.

Hangar Characteristics

As noted in the facility requirements, the additional T-hangars would accommodate a majority of the based single-engine and some multi-engine aircraft. The T-hangars included in the different concepts utilize the Erect-A-Tube N54-42 nested T-hangar building footprint which is 54 feet wide by 231 feet long for a ten-unit structure. This is nearly identical in size to Fulfab's LK42 nested T-hangar building, both of which have an overall height under 20 feet. These popular T-hangar buildings can accommodate aircraft with a wingspan up to 41.5 feet and tail height of 12 feet in each unit. T-hangars of this size were used since they can accommodate a number of the most common single-engine and smaller multi-engine (piston and turboprop) aircraft. This T-hangar size can also represent the footprint for a shade hangar able to accommodate similarly sized aircraft. At a minimum, each T-hangar has a 25 foot wide taxilane with an object free area of 79 feet to provide Taxiway Design Group (TDG) 1A/B and ADG I standards.

For additional clearspan hangars, the concepts create options for small and large facilities to accommodate the expected mix of different multi-engine and jet aircraft, as well as some rotorcraft. Plans for the larger hangars consider the fact that most will provide storage for a mix of aircraft types, some will support specific services such as aircraft maintenance, and others will serve as private facilities. Thus, a key element in developing concepts for such facilities is flexibility and the ability for some to support the larger ADG III aircraft. Each configuration for clearspan hangar layouts reflects taxilanes with the minimum width of 35 feet and object free areas of either 115 or 162 feet required for TDG 2 and ADG II or ADG III standards.

Buildings Elevations and Setbacks

Figure 6-1 illustrated a number of the existing airfield constraints to include the most critical airfield design surfaces and imaginary surfaces. These and any future changes to them are a significant component on where and how high a facility can be established. In addition, each area on the airport has different characteristics which also need to be considered. These are identified in the descriptions of the concepts considered.

Evaluation Criteria

A number of attributes are utilized to evaluate how well an area of the airport is capable of accommodating future facilities. The following outlines the general criteria applied to the general aviation options considered.

Airside Access - how each site ties into the ultimate airfield configuration for aircraft operations.

Compatibility with Adjacent Uses – the positive or negative impact a proposed facility might have on existing features, whether airport or community related. Compatible land use and the potential related impacts were included as part of the airport sustainability program included in **Appendix E**, as well as in the airport infrastructure resiliency elements detailed in **Appendix F**.

Flexibility of Configuration - ability to accommodate some of the initial demand while also preserving the option to accommodate changing needs over the 20-year planning horizon.

Potential Environmental Impact – identification of whether a proposed concept will impact any features documented in the environmental overview chapter or the stormwater management element of the airport infrastructure resiliency found in **Appendix F**.

Landside Access – ability to provide tenants and customers with roadways and automobile parking for facilities.

Constructability – considers if a proposed improvement creates any impacts to existing facilities or airfield operations.

6.6.2 Northeast Airport Facilities

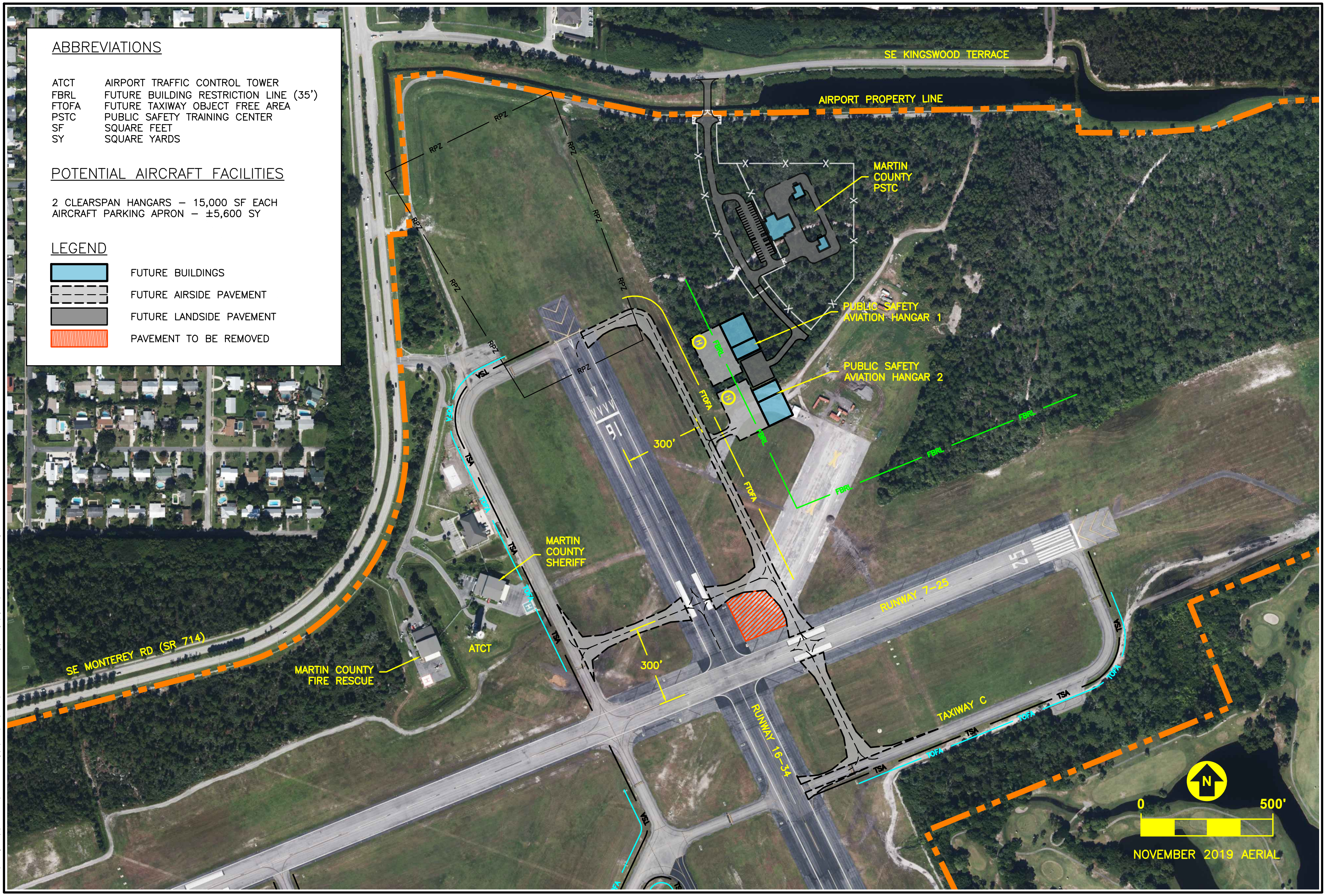
The northeast corner of the airfield has the most open space on the airport property. The only current use in this area is the Martin County Fire Rescue Training Facility. There are no permanent structures associated with this facility which is located off the end of the decommissioned runway pavement in this area. Current landside access is limited to a dirt road and there is no airfield access, nor is any required.

Recently Martin County's new Public Safety Training Facility (PSTC) has been approved for construction in this corner of the airport. As shown in **Figure 6-5**, the PSTC site will include three structures (an administration building, burn building, and training tower) with landside access off of SE Kingswood Terrace. Once completed, this complex will replace the current facilities off the end of the decommissioned runway.

Figure 6-5 shows that there will still be a large amount of space to the south and east of the new PSTC site; however, most of this area is not suitable for construction due to the existing ground conditions. The soils in this area are considered mucky since they are prone to regular ground water inundation due to the proximity of stormwater infrastructure and the fact that it is one of the lowest points on airport property. Even the area where the current Martin County Fire Rescue Training Facility is located is not suitable for future construction as this area use to be a large stormwater pond up until 2004.

Between the future PSTC site and the approach end of Runway 16, there is space that could support future aviation related facilities. This area somewhat limited to the north due to the various imaginary surfaces for the approach end of Runway 16, but there is enough space for a few clearspan hangars and their associated aircraft parking aprons. While these hangars would have landside access off the new road being built for the PSTC site, a taxiway would be needed to tie it into the airfield.

During various discussions during the development of the master plan, the topic of both the Martin County Sheriff's Office Aviation Unit and Martin County Fire Rescue needing both newer and larger facilities came up. It has since been decided that the space available for clearspan hangars in the northeast would serve as the ideal location for these future facilities. As such, **Figure 6-5** includes conceptual layouts for the relocation of these facilities, to include the partial parallel taxiway and aircraft parking apron areas large enough to support their helicopter operations. Once relocated to this side of the airfield, the existing Martin County Sheriff's Office Aviation Unit and Martin County Fire Rescue facilities adjacent to the ATCT can be renovated and leased to a new aviation tenants. The only drawback is that the Martin County Fire Rescue facility does not have airside access; therefore. if a rotorcraft operator cannot be found to lease the facility, its highest and best use may be to lease it to a non-aeronautical business.



Source: ESA, 2022.

FIGURE 6-5
CONCEPT FOR NORTHEAST AIRPORT FACILITIES

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6.6.3 South Airport Facilities

On the south side of the airport property off of SE Aviation Way is a 15 acre site which currently supports different facilities and services of the Martin County Public Works department. Since there have been discussions about this facility eventually relocating to a larger site off-airport property, three concepts were developed to determine how the area might be utilized in the future to support aviation related uses.

For airfield access, each concept would extend the existing taxilane between the Atlantic Aviation and Witham Aero Club leaseholds. Each concept would also utilize the existing landside access into the area off SE Aviation Way. In addition, two other parcels between SE Aviation Way and the drainage ditch running through the area could be utilized for future non-aeronautical development and potentially stormwater management enhancements for the area. These options are identically shown on each of the three concepts, to include the possibility of acquiring the two small, odd-shaped parcels in this area.

Concept A is included as **Figure 6-6** and is based on the option of providing more affordable shade hangars in lieu of T-hangar structures on this side of the airfield. As shown, the taxilanes into the area would be 25 feet wide and provide ADG I object free areas. In addition to the 60 shade hangar units shown, the concept also includes the option for additional paved aircraft parking apron areas, a 100LL self-serve fuel tank, a pilot's lounge space, and an aircraft wash rack area.

Concept B (see **Figure 6-7**) looks at the potential to provide four large 25,000 square foot (SF) hangars with at least an equal amount of apron space in front of each. Since these hangars would accommodate the much larger aircraft, the taxilane access would require the realignment and widening of the existing taxilane as shown to provide an ADG III object free area.

Figure 6-8 shows how the area under Concept C could provide a mix of both small and large general aviation facilities. This includes two 12,000 SF clearspan hangars, 44 shade hangar units, and approximately 10,800 square yards (SY) of aircraft parking apron. Airfield access to the site would require the shifted and widened taxilane with up to an ADG III object free area. Concept C also provides the option for a 100LL self-serve fuel tank and aircraft wash rack area.

As demonstrated, once the Martin County Public Works facilities are relocated, the south parcel could be developed any number of ways to support future general aviation facilities. However, given the high demand for additional T-hangar and/or shade hangar units, the configuration shown in Concept A aligns best with the current demand for facilities given the limited space at the airport for future improvements.

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Source: ESA, 2022.

Witham Field Master Plan

FIGURE 6-6

SOUTH AIRPORT FACILITIES - CONCEPT A

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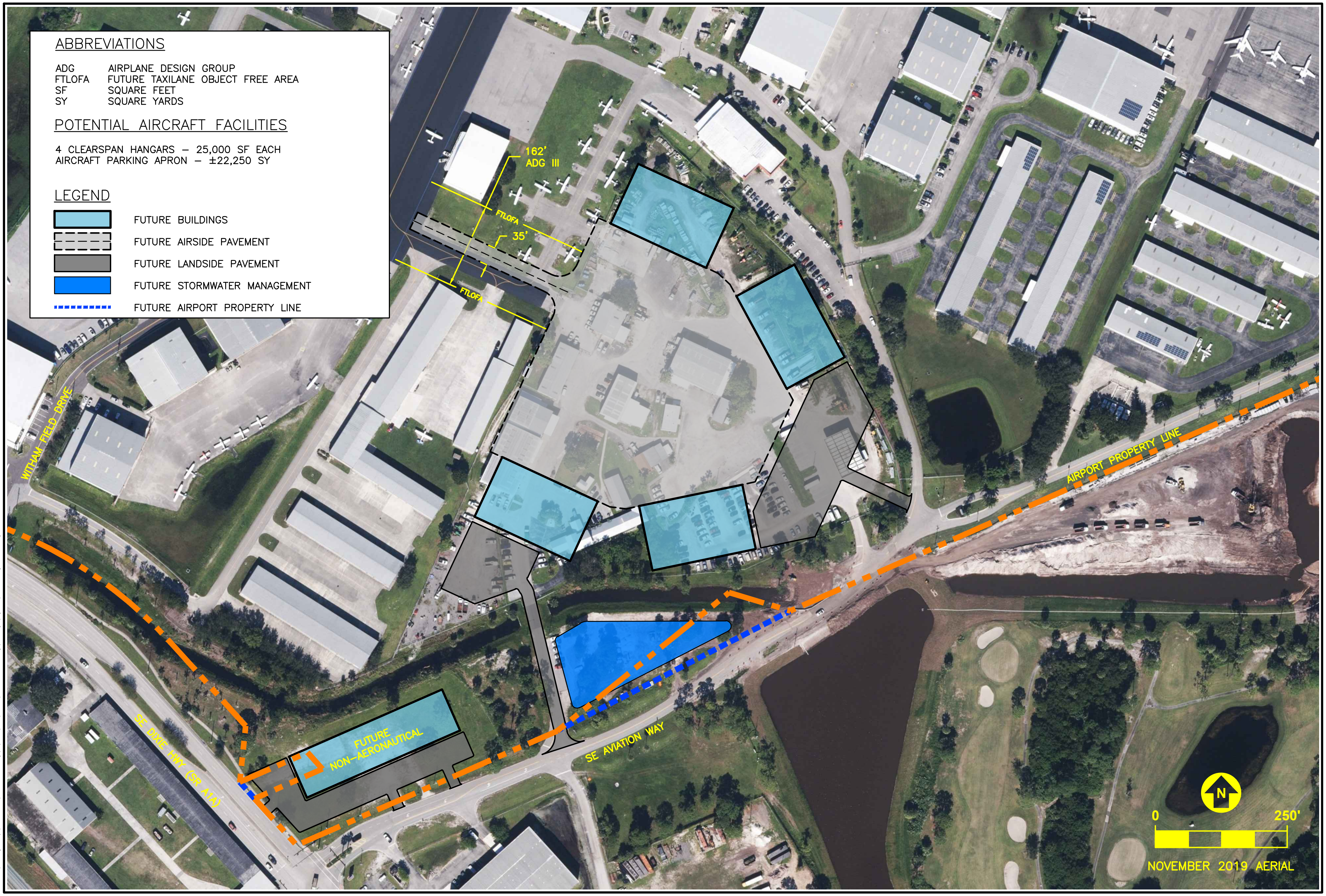

Source: ESA, 2022.

FIGURE 6-7
SOUTH AIRPORT FACILITIES - CONCEPT B

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Source: ESA, 2022.

FIGURE 6-8
SOUTH AIRPORT FACILITIES - CONCEPT C

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6.6.4 Southwest Airport Facilities

Between SE Airport Road and the existing aviation related facilities off Witham Field Drive, there is an area of nearly 13 acres. Approximately nine acres of this triangular shaped area is currently under a lease option with Daher Aerospace while the remaining four acres has been considered in the past for both aviation related and non-aeronautical facility improvements. While SE Airport Road provides landside access to the entire area, the ability to provide airside access is much more difficult due to a large drainage retention area and the existing leaseholds of both APP Jet Center and Atlantic Aviation. Therefore, any airside access would require the renegotiation of existing airside leaseholds and for part of the site, the potential reconfiguration of the existing stormwater features.

For planning purposes, three concepts showing the potential of this area have been illustrated in **Figures 6-9** through **6-11**. Concept A explores the option of providing only aviation related facilities. While there are many potential layouts possible, the one shown in **Figure 6-9** includes ten 12,000 SF clearspan hangars, about 26,500 SY of aircraft parking apron space, and taxilanes with ADG II object free areas. Concept B (see **Figure 6-10**) includes a potential layout of only non-aeronautical facilities. This option does not require the renegotiation of any existing leaseholds nor does it impact existing stormwater features. Concept C combines the two, with consideration for potential aviation related uses on the northeast side of the site as shown in **Figure 6-11**. This eliminates any potential impacts to the existing stormwater features, but would still require the renegotiation of one existing leasehold for airside access. The aviation related portion provides five 12,000 SF clearspan hangars, 9,100 SY of aircraft parking apron space, and taxilane access with an ADG II object free area. All three of the concepts depict providing a connection with SE Mohawk Lane to SE Airport Road which would significantly improve the ability for vehicles to move between the different parts of the airport.

For the 20-year planning horizon, Concept B is preferred given the current inability to provide airside access to this area due to existing leaseholds. However, should the existing leaseholds change, consideration should be given to determine whether or not airside access into this area would be possible for future aviation related facilities.

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Source: ESA, 2022.

FIGURE 6-9
SOUTHWEST AIRPORT FACILITIES - CONCEPT A

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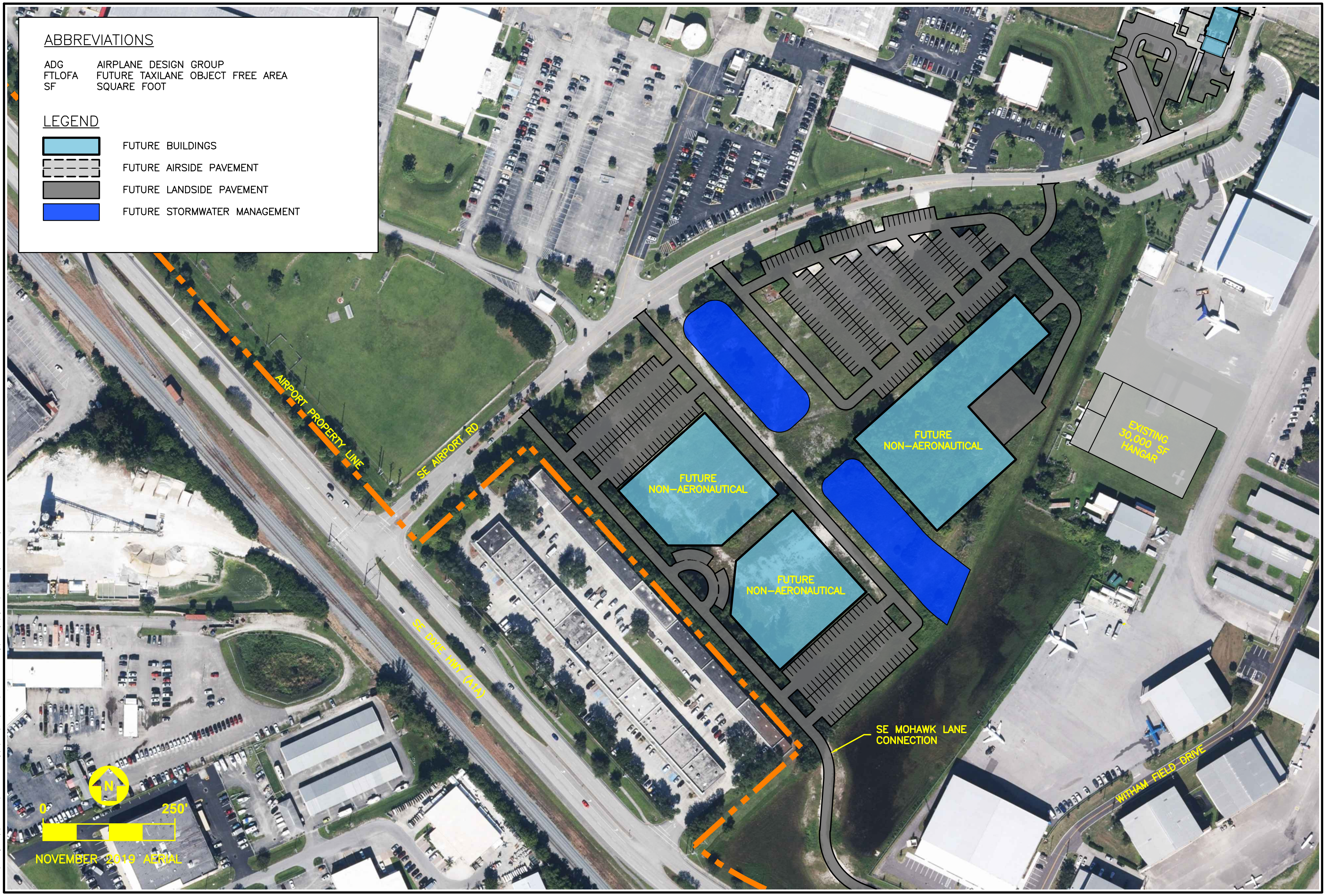

Source: ESA, 2022.

FIGURE 6-10
SOUTHWEST AIRPORT FACILITIES - CONCEPT B

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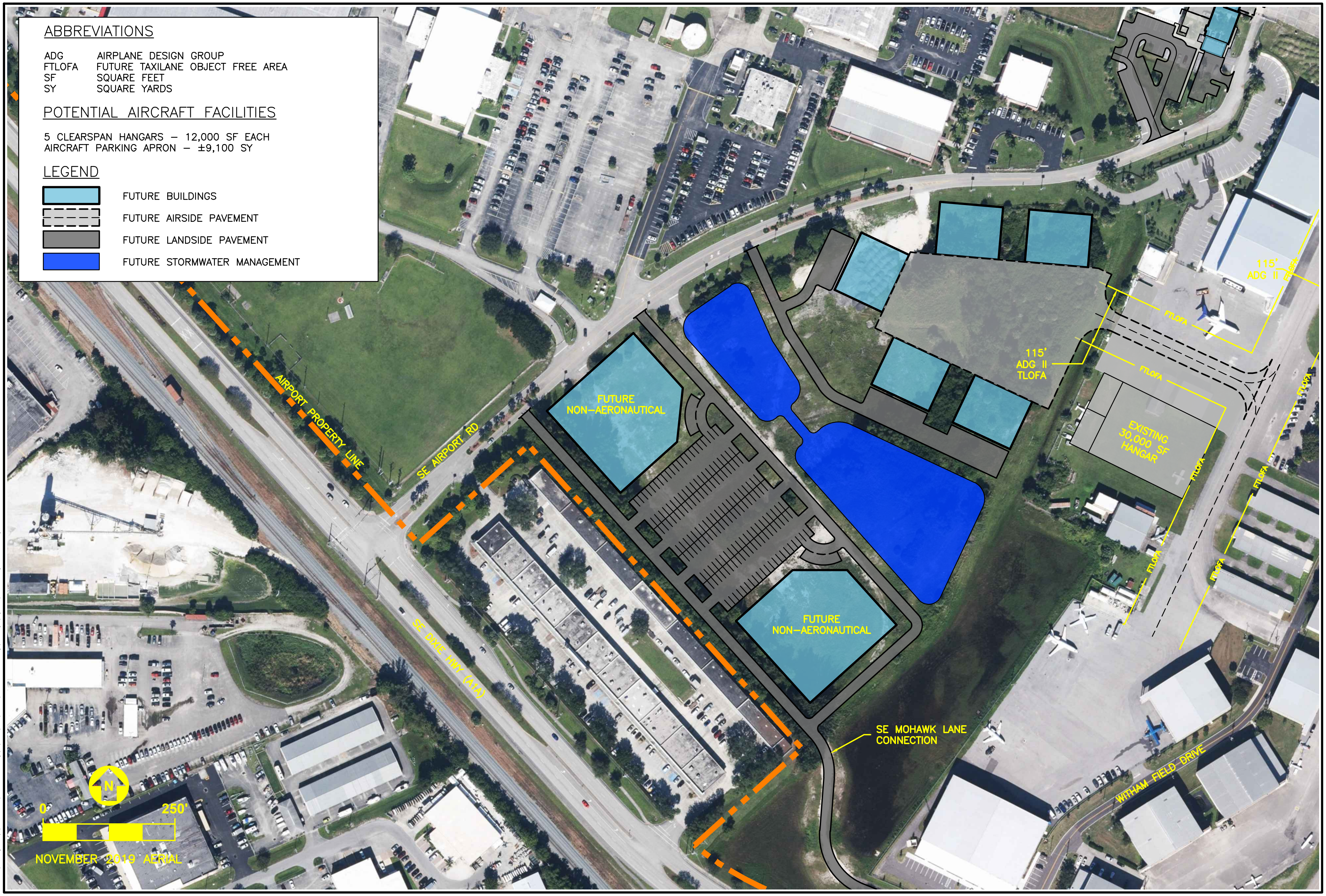

Source: ESA, 2022.

FIGURE 6-11
SOUTHWEST AIRPORT FACILITIES - CONCEPT C

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6.6.5 West Airport Facilities

The airport recently cleared a number of vegetative obstructions that were in the approach to Runway 7 and to a lesser extent, the approach to Runway 12. This project created the opportunity for new aviation related facilities to be established on the west side of the airport. However, any improvements considered would have to remain outside of the RPZs required off the ends of Runways 12 and 7; remain below the 14 CFR Part 77 Approach and Transitional Surfaces; and below the TSS required for Runway 7. Each conceptual layout for this area requires airfield access, landside access off SE Dixie Highway (A1A), stormwater management, and to maintain the existing vegetative barrier to the community along the perimeter of the site.

Initially, two layouts were created to demonstrate the potential facilities that could be accommodated in this area with the limitations mentioned above. Concept A (see **Figure 6-12**) illustrates three 25,000 SF clearspan hangars with ADG III taxilane access coming off the westernmost end of Taxiway A to serve the larger aircraft expected. Concept B in **Figure 6-13** reflects a site with 14 smaller clearspan/box hangars and 50 T-hangar units to accommodate the current demand for small aircraft facilities. It also depicts the ability to provide ADG I taxilane access off the westernmost end of Taxiway A. Both concepts include space to provide additional stormwater management features for this side of the airfield.

Since this site could accommodate either configuration described above, a third potential configuration (Concept C) was created to combine the smaller clearspan/box hangars and T-hangars with a large clearspan hangar (see **Figure 6-14**). Concept C is preferred for this area as it provides flexibility for future aircraft facilities.

6.7 Summary of Recommended Airport Improvements

The preceding sections have identified and analyzed the options related to the key future improvements for SUA. The concepts considered focused on meeting as many of the 20-year requirements while working to continuously improve the airfield's operational efficiency and safety. All of the preferred options were combined to create the overall airport improvement plan included as **Figure 6-15**. This plan will be utilized as the basis for the development of the new Airport Layout Plan Drawing set and improvement program described in the following chapters.

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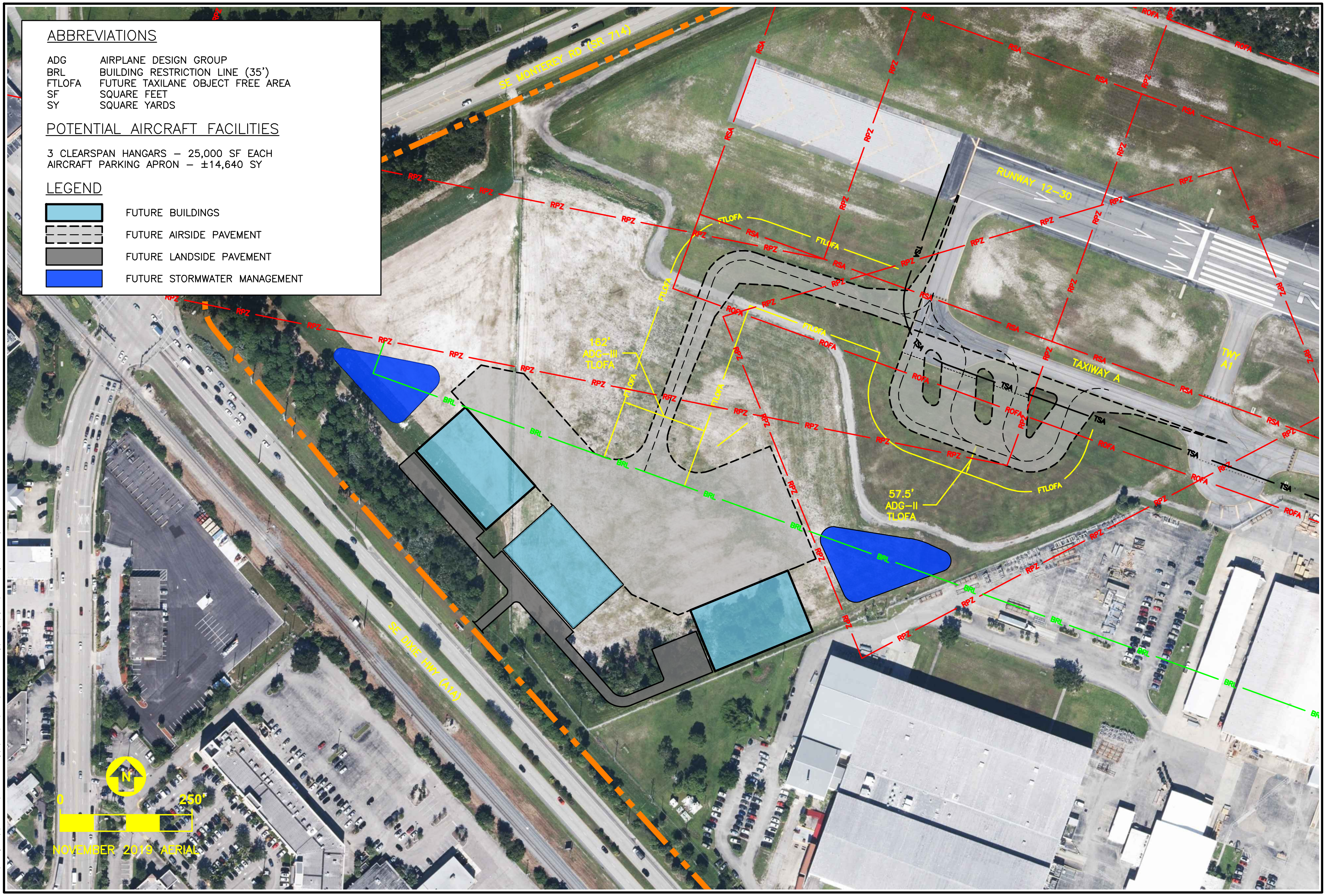

Source: ESA, 2022.

FIGURE 6-12
WEST AIRPORT FACILITIES - CONCEPT A

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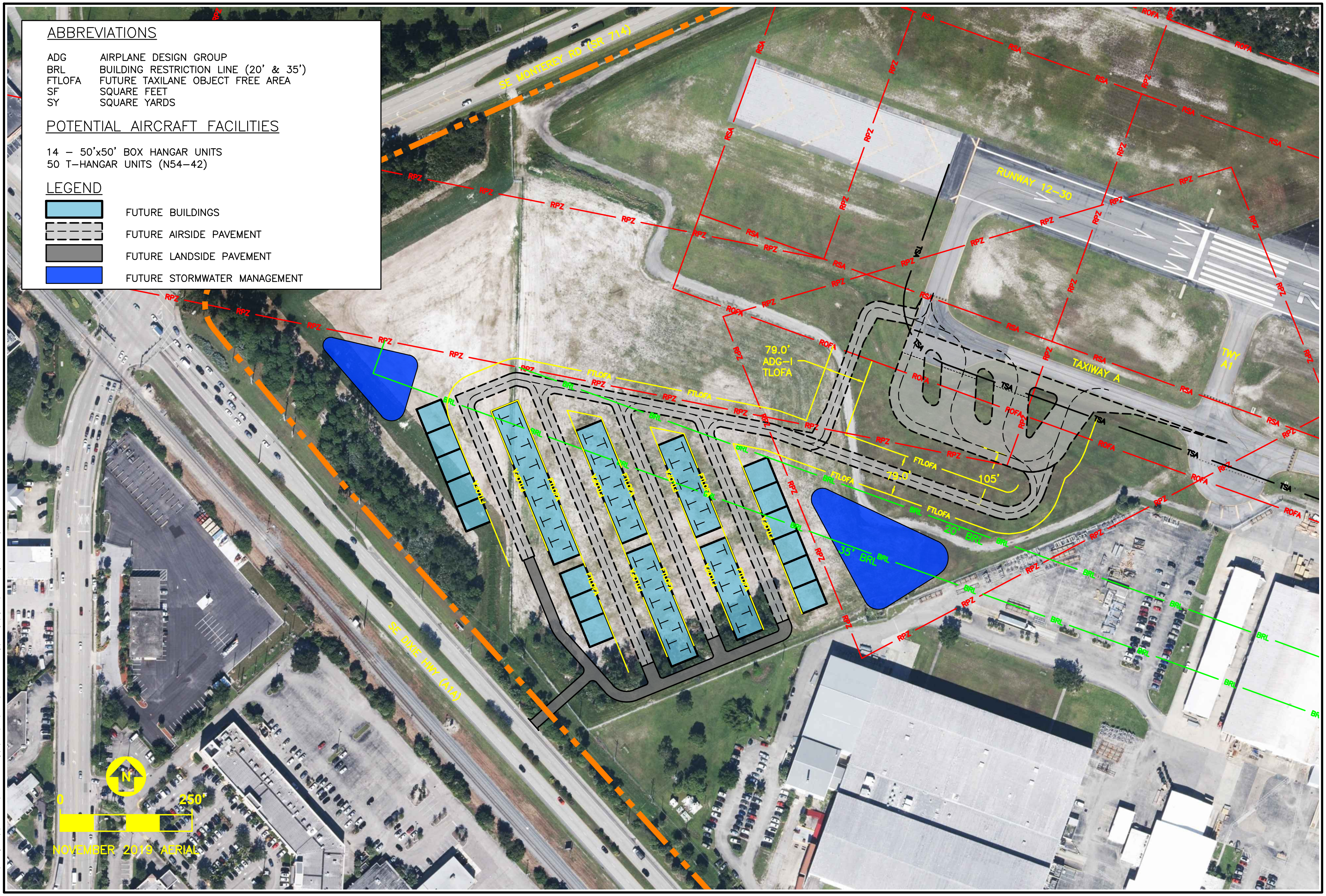

Source: ESA, 2022.

FIGURE 6-13
WEST AIRPORT FACILITIES - CONCEPT B

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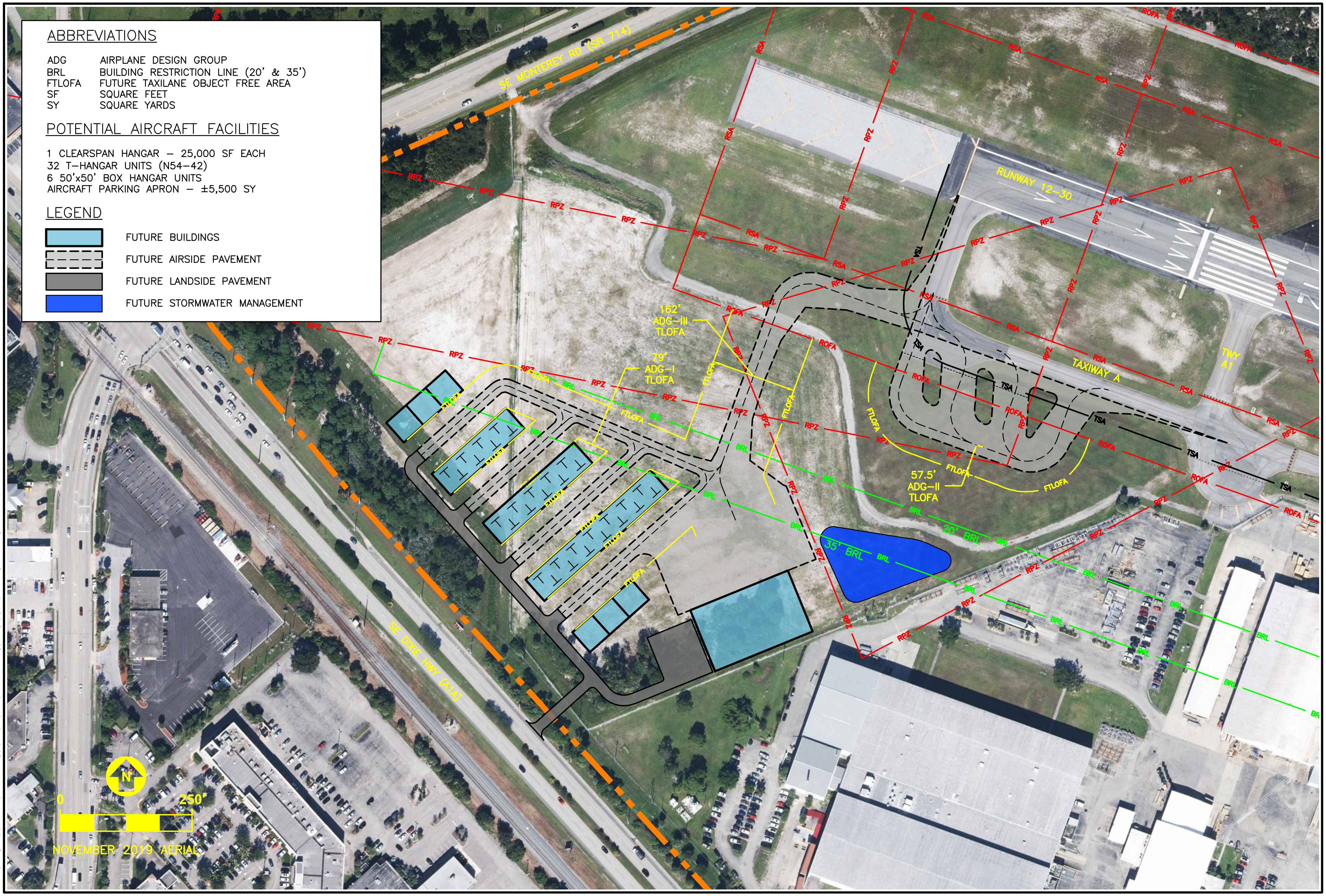

Source: ESA, 2022.

FIGURE 6-14
WEST AIRPORT FACILITIES - CONCEPT C

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C:\Users\jhalisky\Documents\Aviation Planning\Airports\SUA\05 Graphics-GIS-Modeling\Drawings\Figures\SUA MP Figure 6-15.dwg

Source: ESA, 2022.

FIGURE 6-15

RECOMMENDED AIRPORT IMPROVEMENT PLAN

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CHAPTER 7

Airport Layout Plan Drawing Set

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CHAPTER 7
Airport Layout Plan Drawing Set

7.1 General

This chapter describes the Airport Layout Plan (ALP) Drawing set developed for this master plan study. These drawings identify airfield enhancements required to accommodate both the current and future critical aircraft, as well as areas of Witham Field (SUA) needed for aviation related improvements during the 20-year planning horizon. They also serve as a reference for airport management and Martin County to evaluate existing and/or future obstruction disposition in conjunction with the Federal Aviation Administration (FAA) criteria. The ALP drawing set presented may be amended over time to reflect changes to the airport environment, demand affecting future facilities, or data related to the airfield surfaces.

7.2 Drawing Set

The ALP Drawing set consists of 25 sheets. Each sheet meets the criteria established in FAA Advisory Circular (AC) 150/5070-6B, Change 2, *Airport Master Plans*; FAA Office of the Associate Administrator for Airports (ARP) Standard Operating Procedure (SOP) 2.0, *Standard Procedure for FAA Review and Approval of Airport Layout Plans (ALPs)*, the Florida Department of Transportation (FDOT) *2021-2022 Guidebook for Airport Master Planning*, and FAA AC 150/5300-13B, *Airport Design*. It should be noted that while a majority of the airport master plan was completed before the release of AC 150/5300-13B in March 2022, the ALP Drawing set was prepared, reviewed, and submitted based on the new AC.

The ALP Drawing set was created using the airport survey, mapping, and imagery collected at the beginning of the master plan study as part of the FAA Airports Geographic Information System (AGIS) requirements. This data was collected in 2019 and the digital files were conditioned for compliance with the FAA AGIS program standards, then submitted, reviewed, and accepted by both the National Geodetic Survey (NGS) and FAA. The ALP drawing set includes the following sheets:

- Cover Sheet
- Airport and Runway Wind Data Sheets
- Existing Airport Layout
- Airport Layout Plan
- Terminal Area Drawing
- Airport Airspace Drawings
- Inner Portion of the Approach and Departure Surfaces
- Runway Centerline Profile and Analyses Drawings
- Land Use Drawing
- Exhibit “A” Airport Property Inventory Map

The recommended improvements address the needs identified in the assessment of facility requirements, which were then evaluated to determine the best alternatives to create a flexible plan meeting the County's goals. A reduced size set of the ALP Drawings is included at the end of this chapter while a full size version is on file at the airport management office as well as with both the FAA and FDOT.

7.2.1 Existing Airport Layout

The Existing Airport Layout drawing documents the current airfield layout and structures on the airport. Also shown are the key design standards, critical surfaces, as well as roads and buildings in the immediate vicinity of the airport. While this is not a required drawing for an ALP set, the separation of existing and future features simplifies the information provided on the actual ALP.

7.2.2 Airport Layout Plan

The ALP presents the proposed improvements for the airfield along with future design standards, critical surfaces, buildings, roads, and other features of the airport. Due to space constraints on the sheet, separate Airport Data and Runway Wind Data Sheets were developed which precede the Existing Airport Layout and ALP sheets in the set. Once approved by the FAA and FDOT, the ALP becomes the official guidance for pursuing funding for airport improvements since at a minimum projects must be included on the ALP to be eligible for federal and state grants. As such, the drawing should be updated as necessary to reflect the changes to the airfield conditions or future needs. Regardless, before any design or construction could commence, each project will require approval from Martin County. Afterwards, each will also be subject to any potential environmental clearance and/or airspace analysis by the FAA.

Most of the information presented on the ALP has been analyzed in preceding chapters, justifying the need for the improvements shown. However, the ALP and other sheets of the set also include some revisions from the recommended airport improvements presented in the alternatives chapter. In addition, a public open house was held on August 10, 2022 which focused primarily on the west side of the airport property since it has the potential for improvements during the short-term horizon. **Appendix G** documents the attendees of and written comments received during this open house. As a result of the open house, it was apparent that there were many competing interests for the types of aviation facilities envisioned on the west side of the airport. As such, there will likely be a request for proposals for the future aviation improvements in this area; therefore, the ALP Drawing set simply reflects the approximate 9.0 acres available for improvements that are outside the critical design and airspace surfaces associated with the airfield. The ALP sheet also reflects the potential for an outdoor aviation education center and observation area just north of Runway 7-25. This potential facility would have landside access off SE Monterey Road and a small aircraft parking apron on the airside as shown.

7.2.3 Terminal Area Drawing

The Terminal Area Plan depicts the same recommended improvements shown on the ALP at a larger scale so that additional features and greater detail of the proposed facilities can be discerned.

This drawing focuses primarily on the area around the U.S. Customs and Border Protection (CBP) facilities and new Airport Administration Building.

7.2.4 Airport Airspace Drawings

The future airspace surfaces were developed utilizing Title 14 Code of Federal Regulations (CFR) Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace*. In order to protect the airspace and approaches to each runway from hazards that could affect the safe and efficient operation of the airport, the full extent of the proposed improvements are utilized on these drawings. The 14 CFR Part 77 criterion has been established for use by local planning and land use jurisdictions to control the height of objects in the vicinity of the airport.

The specific imaginary surfaces include the Primary, Horizontal, Conical, Approach, and Transitional Surfaces. A description and the corresponding dimensions for each surface were included in the facility requirements chapter. The future 14 CFR Part 77 airspace surfaces need to be adopted as part of the local ordinances in order for both Martin County and the City of Stuart to notify airport management if a proposed permanent or temporary structure penetrates any of the surfaces for SUA. This allows an analysis to be conducted which would determine what, if any impacts to the operational capability of SUA might be created by potential obstructions. Currently the 14 CFR Part 77 surfaces for SUA are included in *Martin County Code Volume 2 Land Development Regulations, Article 4 – Site Development Standards, Division 12 – Airport Area Height Restrictions and Safety Standards*. For the City of Stuart, the 14 CFR Part 77 surfaces should be incorporated into their development codes in order to comply with the *Transportation Element (Element 2)* of the City's Comprehensive Plan.

Critical structures and obstructions documented in the various data tables of the drawing sheets area based on the FAA AGIS data obtained at the onset of this master plan. While a number of objects penetrate the 14 CFR Part 77 surfaces, it should be noted that the primary function of these surfaces is to determine which potential penetrations need to be further evaluated to determine if they are in fact considered an obstruction to aircraft navigation to and from the airport.

7.2.5 Inner Portion of the Approach & Departure Surfaces

The Drawings for the Inner Portion of the Approach and Departure Surfaces illustrate the critical surfaces prior to the landing threshold for each runway end. Federally obligated airports like SUA are subject to Grant Assurances 20 and 21 which require the protection of these surfaces. The FAA reviews all published instrument approach procedures on a periodic basis (approximately every two years). Obstacles found within the critical surfaces will likely result in higher minima, loss of approaches, and/or loss of night operation capability.

For Runway 12-30 the Departure Surfaces were provided on a separate sheet in order to simply the information provided off of each end of the primary runway. For all of the sheets, while the 14 CFR Part 77 Approach Surfaces and Departure Surfaces are utilized as the reference for obstructions, these drawings also reflect the Approach (Threshold Siting) Surfaces, Runway Safety Areas (RSA), Runway Object Free Areas, and Runway Protection Zones. The sheets reflect those surfaces with a vertical component out to a height of 100 feet above the respective runway threshold elevation, as per FAA guidance for this type of drawing. Each of these sheets also depict the location of any roadways, structures, ground elevations, and other man-made or natural features within the limits of the various surfaces. The obstacle locations and heights were obtained from the FAA AGIS data obtained as part of this master plan study.

7.2.6 Runway Centerline Profile and Analyses Drawings

These sheets detail the longitudinal and transverse RSA grades for all three runways based on the FAA AGIS data obtained. Each demonstrates that the three runways have RSAs within the proper standards. The drawing also depicts the five-foot line-of-sight required for both the existing and future runway lengths.

7.2.7 Land Use Drawing

The Land Use Drawing depicts the on-airport land uses as well as the off-airport land uses in the areas immediately surrounding airport property. These were obtained from the interactive zoning maps for both Martin County and the City of Stuart. In addition to the airport property boundary, the drawing depicts the recommended airport facility improvements and related airfield design surfaces.

Superimposed over the airport and surrounding area are the future (2025) day-night average sound level (DNL) contours developed in 2021 and approved as part of the 14 CFR Part 150 Noise Study for SUA. These include the expected 60, 65, 70, and 75 DNL noise contours.

7.2.8 Exhibit “A” Airport Property Inventory Map

The Exhibit “A” Airport Property Inventory Map included at the end of the ALP Drawing set depicts the current airport property boundary and provides the required detail as to how the various parcels were either acquired or released. The information on this sheet is based on the *Witham Airport Jurisdictional Boundary Survey for Martin County*, completed on May 2, 2018 by GCY Incorporated.

CHAPTER 8

Capital Improvement Program

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CHAPTER 8
Capital Improvement Program

8.1 General

The analyses conducted in the previous chapters evaluated airport needs based upon current and forecast aviation activity, as well as the opportunities that will exist after new areas of the airfield are available for improvement. Once the needs of the airport are well defined and the alternatives have been vetted, the final step in the master planning process is to identify and prioritize the individual elements into a cohesive improvement program. This involves the application of strategic programming and financial management rationale to each recommended project so that a responsible and effective implementation process can be assured. The 20-year program outlining the schedule of proposed capital improvements and the associated costs are presented in this chapter.

The intent is to assist Martin County in achieving the primary goal of the master plan study, which is to maintain a safe, efficient, economical, and environmentally acceptable airport facility for the County and surrounding communities. Consequently, the timing of the recommended improvement projects have been structured to support this underlying goal. As the official Sponsor of the airport, Martin County needs a responsible and effective implementation plan so that the necessary improvements can be assured.

8.2 Sources of Funding for Improvements

Typically, airport improvement projects are not dependent solely on the Sponsor's resources for funding; rather they rely on a variety of available grants for financial assistance. The predominant sources of such grants are described in the following sections. It will be necessary for the airport to continue to pursue leveraging both state and federal grants for the improvements required over the 20-year planning horizon.

8.2.1 Federal Aviation Administration

At the federal level, the Federal Aviation Administration (FAA) manages the Airport Improvement Program (AIP). Since 1982, the AIP has provided grants for eligible airport planning, environmental, and improvement projects. AIP funds are generated exclusively through taxes on airline tickets, fuel sales, cargo waybills, and other fees for aviation users. These funds are distributed under appropriations set by Congress to all airports in the U.S. which are considered significant to the national air transportation system and thus considered eligible for grants. For SUA, AIP grants provide up to 90 percent of the funding for eligible projects.

AIP entitlement funds for non-primary (e.g., general aviation) airports are currently allocated at a set amount of $150,000 annually. Airports do not need to use all of their entitlements in a given year; however, they can only carry funds over for three years with a maximum entitlement grant of $450,000. The airport currently has the AIP entitlement funds from FAA fiscal year (FY) 2023 available. The existing and future year AIP entitlements available for SUA are summarized in **Table 8-1**.

AIP discretionary funds are distributed to airports based on specific projects that have been determined to rate high in the national priority ranking system. High national priority projects include those which enhance safety, security, and capacity in addition to the reconstruction of existing facilities (prior investments). Discretionary funds are distributed on a priority basis, which is established by each FAA Regional Office based upon the number and dollar amount of grant applications received. As such, SUA competes for discretionary grant funds with other airports in the region, as well as the entire country.

It is reasonable to assume that the airport will receive future discretionary funding in order to meet critical needs. However, the availability of AIP discretionary grants is never guaranteed since year-to-year funding levels are established by congressional appropriations and distributed on a national basis. It should be noted that any proposed projects where discretionary funds are anticipated as a funding source may need to be delayed until the funds actually become available. This of course assumes that the AIP program will continue to exist in its current form and that future AIP authorizations and appropriations will provide similar funding levels.

Another source of federal funding being managed by the FAA are those provided by the Bipartisan Infrastructure Law (BIL). For five years beginning in FAA FY2022, SUA will receive an additional annual entitlement for airport related projects. In the first year, $763,000 in entitlements was allocated to SUA through the BIL Airport Infrastructure program. In FY2023 the entitlements allocated were $844,000. Like the AIP entitlement dollars, these funds can be utilized for a number of airfield projects, especially those that increase safety and expand capacity. To date, none of the BIL monies have been utilized for projects at SUA. **Table 8-1** provides a summary of the existing BIL monies available, as well as those expected through the end of the program.

TABLE 8-1
AVAILABLE FAA ENTITLEMENT DOLLARS FOR SUA

Program	FY2022	FY2023	FY2024	FY2025	FY2026
Airport Improvement Program	$0	$150,000	$150,000	$150,000	$150,000
Bipartisan Infrastructure Law	$763,000	$844,000	$844,000	$844,000	$844,000
Rolling Total	$763,000	$1,757,000	$2,751,000	$3,745,000	$4,739,000

NOTES: Rolling total included to illustrate the overall amount of FAA entitlement dollars available; however, if monies are not used before they expire based on the program, the FAA will utilize them for other airport projects.

SOURCE: GAI and ESA, 2023.

8.2.2 Florida Department of Transportation

Each year the Florida Department of Transportation (FDOT) manages an aviation work program of state grants for planning, design, and construction projects. FDOT generally provides funding to match the local share of federal projects, which at SUA has traditionally represented 5 percent of federal projects funded at 90 percent. In addition, FDOT provides funds for certain non-federal projects. For non-revenue producing projects (e.g., airfield pavement, lighting, etc.), FDOT will provide up to 80 percent of the total cost. For certain revenue-producing projects (such as hangars), FDOT will fund up to 50 percent. It is anticipated FDOT will continue to assist in the airport's non-federal share of AIP projects as well as participate in non-federal projects at either the 80 or 50 percent level.

8.2.3 Economic Development

A number of state programs exist that enable the airport to obtain economic development grants. The most significant of which, specifically programmed for transportation projects, are the Economic Development Transportation Fund (EDTF) grants. These are typically tied to job creation and require different local and/or private contributions to the overall project. There are also grants available from the Transportation Regional Incentive Program (TRIP) which can fund up to 50 percent of a project when requested by an eligible group of local government sponsors; hence the regional aspect.

8.2.4 Private Investment

Certain airport projects may be funded through third-party resources. These cases are generally reserved for income-producing projects (such as hangars) where the costs are beyond the airport's ability to fund or simply where there is little interest in assuming risk. Typically, the private developer or investor will provide the funds to develop a facility while the airport receives rent through a long-term ground lease. The developer assumes the capital investment risks while the airport may provide airfield access, landside access, and/or infrastructure development; the costs of which may be included in the rate basis for the lease. At the termination of such leases, ownership of any improvements reverts to the airport.

Over the 20-year planning horizon, there are a number of projects to develop the additional hangar facilities needed. Since each are eligible for potential FDOT funding, they will all be programmed for such. This does not preclude the opportunity for private investment, rather it provides the airport with the flexibility to develop all, some, or none of the facilities.

8.3 Proposed Capital Improvements

The initial step in establishing a capital improvement program is to determine the cost of each recommended project. Cost data used in this study was collected from a variety of sources, including actual project estimates, published engineering indices, government agencies, and similar airport construction projects throughout the State of Florida. In addition, consideration was given to reflect costs related to testing, survey, inspection, and other unknown contingencies. While the cost estimates were based on 2023 dollars; an annual inflation factor was applied for each year after 2023 that a project is ultimately programmed. The inflation factor has been based on the most recent, 5-year rolling average of the Consumer Price Index published monthly by the Bureau of Labor Statistics. This average was 3.72 percent between February 2018 and January 2023.

The improvement program is divided into the short-term (2023 - 2027), intermediate-term (2028 - 2032), and long-term (2033 - 2042) horizons. These periods differ from those presented in the aviation activity forecasts, due to the time lag of the study and the grant cycles of the funding agencies. Regardless, it is important to note that a number of projects are based on demand and may need to be either pushed forward or delayed depending upon when certain activity levels or thresholds are expected to be met. This is particularly true for those projects beyond the initial five-year planning period.

Descriptions of the improvements for each period are included in the following sections and illustrated on **Figure 8-1** at the end of the chapter. The associated tables represent the culmination of comparative analysis of basic budget factors, demand for facilities, and priority of needs. Costs for the improvements have been broken down based on the previous funding experiences for similar projects. The allocation of funds from the agencies in no way guarantees funding from that particular source. They are simply potential sources used as part of the financial planning and phasing of projects.

The information in **Tables 8-2** through **8-4** will also be used to update the Joint Automated Capital Improvement Program (JACIP). The JACIP is a secure, internet-based program, which allows the FAA, FDOT, and airport management to interact on a real time basis as different funding needs and issues evolve.

8.3.1 Short-Term Capital Improvement Program

The improvements planned between 2023 and 2027 are listed in **Table 8-2** and included on **Figure 8-1**. The first short-term projects in 2023 are to replace the current Automated Weather Observing System (AWOS) and rehabilitate the Engineered Materials Arresting System (EMAS) beds installed at both ends of Runway 12-30. The EMAS project is intended to extend the useful life of the current beds while the projects to ultimately replace both have been programmed in the intermediate-term.

An airport business plan and the necessary improvements to the roofs on Buildings 29 and 30 are the first two projects in 2024. In addition, the design phase for three important airfield projects are programmed. These designs are for the run-up area at the westernmost end of Taxiway A, the rehabilitation of the non-movement area Taxilane B (south of Taxiway A), and a project to replace the airfield signage with light emitting diode (LED) units. Each of these projects are then programmed for construction in 2025. Also in 2025 is the design phase of the project to replace the Precision Approach Path Indicator (PAPI) systems on each end of Runway 12-30 with LED units.

The installation of the new Runway 12-30 PAPI units is the first of two projects in 2026. The second is to design and construct the first Public Safety Aviation Hangar in northeast portion of the airfield. For the final year of the short-term period, the first project in 2027 is the rehabilitation of

Runway 7-25, the design for which was funding by a grant in 2022. The second project is to replace the voice recording equipment in the airport traffic control tower (ATCT). The last project in 2027 would conduct the necessary environmental review for the proposed site for airport facilities on the south side of the airport off of SE Aviation Way. This site currently supports the Martin County Public Works department, but is slated to ultimately provide shade hangars, additional aircraft parking apron space, a 100LL self-serve fuel tank, a pilot's lounge, and an aircraft wash rack.

TABLE 8-2
SHORT-TERM CAPITAL IMPROVEMENT PROGRAM

Year	ID	Project	Total	FAA	FDOT	Local
2023	-	Replace AWOS System (Design & Construct)	$413,500	$372,150	$20,675	$20,675
2023	-	Rehabilitate Runway 12-30 EMAS Systems	$1,500,000	$1,350,000	$75,000	$75,000
2024	-	Airport Business Plan	$259,288	$0	$207,430	$51,858
2024	S-4	Building 29 and 30 Roof Improvements	$518,575	$0	$414,860	$103,715
2024	S-1	Hold Bay Extension (Design)	$155,573	$140,015	$7,779	$7,779
2024	S-3	Rehabilitation of MC Non-Movement Areas Phase IV - Taxilane B (Design)	$155,573	$140,015	$7,779	$7,779
2024	-	Replace Airfield Signage with LED Units (Design)	$103,715	$0	$82,972	$20,743
2025	S-1	Hold Bay Extension (Construct)	$1,505,952	$1,355,357	$75,298	$75,298
2025	S-3	Rehabilitation of MC Non-Movement Areas Phase IV - Taxilane B (Construct)	$1,839,413	$1,655,472	$91,971	$91,971
2025	-	Replace Airfield Signage with LED Units (Construct)	$623,894	$0	$499,116	$124,779
2025	-	Replace PAPIs on Runway 12-30 with LED Units (Design)	$53,784	$48,406	$0	$5,378
2026	-	Replace PAPIs on Runway 12-30 with LED Units (Construct)	$290,067	$261,060	$14,503	$14,503
2026	S-2	Public Safety Aviation Hangar 1	$3,235,361	$0	$2,588,289	$647,072
2027	-	Rehabilitate Runway 7-25 (Construct)	$4,599,424	$0	$3,679,539	$919,885
2027	-	Air Traffic Control Tower Equipment Upgrade (Recorder)	$115,709	$0	$92,567	$23,142
2027	-	Environmental Assessment (Short-Form) for South Airport Facilities	$173,563	$156,207	$8,678	$8,678
		Short-Term Totals	**$15,543,389**	**$5,478,682**	**$7,866,454**	**$2,198,253**

NOTES: Estimates for the local share are dependent upon the availability of funding from both FAA and FDOT. An inflation factor of 3.72 percent has been applied for each year a project is programmed beyond the 2023 cost estimate.

SOURCE: GAI and ESA, 2023.

8.3.2 Intermediate-Term Capital Improvement Program

As detailed in **Table 8-3** and shown on **Figure 8-1**, the intermediate-term primarily consist of three types of projects: additional hangar facilities; the rehabilitation of taxiway pavements; and the replacement of the Runway 12-30 EMAS beds. The hangar projects include the second Public Safety Aviation Hangar in northeast portion of the airfield. In addition the first phase for new airport facilities on the south side of the airport off of SE Aviation Way would be completed. This would include 60 shade hangars as well as the taxilanes and landside access necessary to support them.

The airfield pavement work starts with the rehabilitation of Taxiways C and C1, which is immediately followed by those for the rehabilitation of Taxiway D. Each of these projects include replacing the current Medium Intensity Taxiway Lights (MITLs) with LED fixtures. For the replacement of the Runway 12-30 EMAS beds, the first of three projects would be to conduct the necessary financial feasibility analysis and environmental review. The other two would be for the design and construction; however, it should be recognized that given the costs required for the project, it may be delayed due to the availability of funding.

The remaining projects in the intermediate-term planning period include replacing the radio equipment in the ATCT and an airport security project. The final project is for an Airplane Design Group (ADG) III taxilane off the westernmost end of Taxiway A to provide access into the west portion of the airfield. An ADG III taxilane would serve the larger aircraft that could potential have facilities on this side of the airfield; however, the area and taxilane may ultimately server smaller aircraft.

TABLE 8-3
INTERMEDIATE-TERM CAPITAL IMPROVEMENT PROGRAM

Year	ID	Project	Total	FAA	FDOT	Local
2028	I-1	Public Safety Aviation Hangar 2	$3,096,190	$0	$2,476,952	$619,238
2028	I-2	South Airport Facilities - Infrastructure (Design & Construct)	$4,440,272	$0	$3,552,218	$888,054
2028	none	Air Traffic Control Tower Equipment Upgrade (Radios)	$120,007	$0	$96,006	$24,001
2029	I-3	Rehabilitate Taxiways C and C1 with LED MITLs (Design)	$497,863	$0	$398,290	$99,573
2029	none	Airport Security Fence & Gates, Access Control and CCTV	$1,630,500	$0	$1,304,400	$326,100
2029	I-2	South Airport Facilities - 60 Shade Hangars (Design & Construct)	$2,240,381	$0	$1,792,305	$448,076
2029	I-5	Financial Feasibility & Categorical Exclusion for Replacing Runway 12-30 EMAS Systems	$124,466	$112,019	$6,223	$6,223
2030	I-3	Rehabilitate Taxiways C and C1 with LED MITLs (Construct)	$3,872,686	$0	$3,098,149	$774,537
2030	I-5	Replace Runway 12-30 EMAS Systems (Design)	$451,813	$406,632	$22,591	$22,591
2030	I-4	Rehabilitate Taxiway D with LED MITLs (Design)	$322,724	$0	$258,179	$64,545
2031	I-4	Rehabilitate Taxiway D with LED MITLs (Construct)	$3,226,633	$0	$2,581,307	$645,327
2031	I-5	Replace Runway 12-30 EMAS Systems (Construct)	$24,500,992	$22,050,893	$1,225,050	$1,225,050
2032	I-6	ADG III Access Taxiway To West Improvement Area (Design & Construct)	$1,138,644	$0	$910,915	$227,729
		Intermediate-Term Totals	**$45,663,170**	**$22,569,544**	**$17,722,583**	**$5,371,043**

NOTES: Estimates for the local share are dependent upon the availability of funding from both FAA and FDOT. An inflation factor of 3.72 percent has been applied for each year a project is programmed beyond the 2023 cost estimate.

SOURCE: GAI and ESA, 2023.

Long-Term Capital Improvement Program

Table 8-4 lists the various projects for the second half of the 20-year planning period which are also reflected on **Figure 8-1**. As shown, many of the projects would provide improvements to the airfield that were identified in previous sections of this study. These include corrections to the Runway 16-34 thresholds; rehabilitation of Runways 12-30 and 7-25; partial parallel Taxiways B and E; and connector taxiways between Taxiways D and E. The airfield projects also include relocating the airport's segmented circle and the necessary environmental reviews.

During the first part of the long-term planning period, the projects to complete the new airport facilities on the south side of the airport would be completed. These include additional aircraft parking apron space, a 100LL self-serve fuel tank, a pilot's lounge, and an aircraft wash rack. A project has also been programmed to provide a connection between SE Mohawk Lane and SE Airport Road to improve the internal movement of vehicles between different parts of the airport. The long-term planning period also includes an airport master plan. Finally, it should be noted that the project to re-align the east half of Taxiway A has not been included as the timeframe for that project is beyond the 20-year planning horizon.

TABLE 8-4
LONG-TERM CAPITAL IMPROVEMENT PROGRAM

Year	ID	Project	Total	FAA	FDOT	Local
2033	L-1	South Airport Facilities - 100LL Self-Serve Fuel Tank (Design & Construct)	$2,160,265	$0	$1,728,212	$432,053
2034	L-2	South Airport Facilities - Aircraft Apron and Pilot Lounge (Design & Construct)	$1,463,805	$0	$1,171,044	$292,761
2035	L-3	SE Mohawk Lane Connection (Design & Construct)	$2,013,920	$0	$1,611,136	$402,784
2036	None	Airport Master Plan	$803,360	$723,024	$40,168	$40,168
2036	L-4	Environmental Assessment (Short-Form) for Runway 16-34 Threshold Corrections	$241,008	$216,907	$12,050	$12,050
2037	L-4	Runway 16-34 Threshold Corrections with LED MIRLs, PAPIs, and REILs (Design & Construct)	$4,765,934	$4,289,341	$238,297	$238,297
2037	none	Rehabilitate Runway 12-30 and Replace REILs (Design)	$583,244	$524,919	$29,162	$29,162
2038	none	Rehabilitate Runway 12-30 and Replace REILs (Construct)	$8,641,588	$7,777,430	$432,079	$432,079
2038	L-6	Environmental Assessment (Short-Form) for Taxiway E Northeast Partial Parallel to 16-34	$172,832	$155,549	$8,642	$8,642
2039	L-6	Taxiway E Northeast Partial Parallel to 16-34 (Design)	$448,131	$0	$358,505	$89,626
2039	L-5	Relocate Segmented Circle (Design & Construct)	$197,178	$0	$157,742	$39,436
2039	L-7	Environmental Assessment (Short-Form) for North Partial Parallel Taxiway B	$179,252	$161,327	$8,963	$8,963
2040	L-6	Taxiway E Northeast Partial Parallel to 16-34 (Construct)	$4,275,969	$0	$3,420,775	$855,194
2040	L-7	Taxiway B North Partial Parallel to 12-30 (Design)	$929,558	$836,603	$46,478	$46,478
2040	L-8	Environmental Assessment (Short-Form) for Connector Taxiways Between Taxiways D and E	$185,912	$167,321	$9,296	$9,296
2041	L-7	Taxiway B North Partial Parallel to 12-30 (Construct)	$10,605,007	$9,544,507	$530,250	$530,250
2041	L-8	Connector Taxiways Between Taxiways D and E (Design)	$192,818	$0	$154,255	$38,564
2041	none	Rehabilitate Runway 7-25 (Design)	$385,637	$0	$308,509	$77,127
2042	L-8	Connector Taxiways Between Taxiways D and E (Construct)	$2,259,791	$0	$1,807,833	$451,958
2042	none	Rehabilitate Runway 7-25 (Construct)	$7,949,265	$0	$6,359,412	$1,589,853
		Long-Term Totals	**$48,454,476**	**$24,396,927**	**$18,432,809**	**$5,624,741**

NOTES: Estimates for the local share are dependent upon the availability of funding from both FAA and FDOT. An inflation factor of 3.72 percent has been applied for each year a project is programmed beyond the 2023 cost estimate.

SOURCE: GAI and ESA, 2023.

8.4 Improvement Program Summary

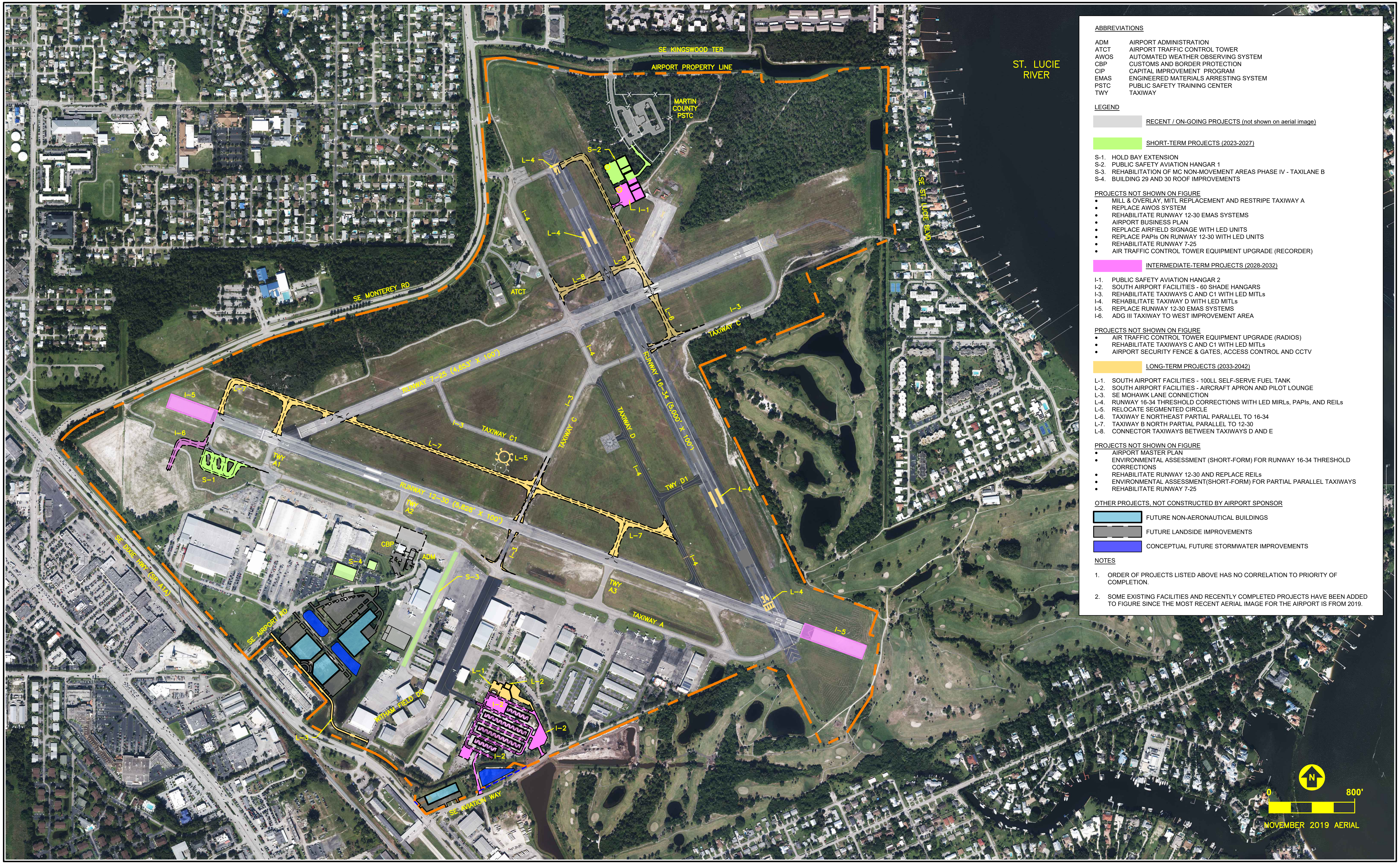
Table 8-5 provides a summary of the overall capital improvement program costs and the local share anticipated. Continued support from the FAA and FDOT is necessary to ensure the airport is able to meet the area's aviation needs in a safe, efficient, and timely manner. This support also ensures the airport will continue to be a key component of the economic growth for Martin County and the surrounding communities.

TABLE 8-5
SUMMARY OF CAPITAL IMPROVEMENT PROGRAM COSTS (IN MILLIONS OF DOLLARS)

Program Period	Total Project Costs	Local Share
Short-Term (2023 – 2027)	$15.5	$2.2
Intermediate-Term (2028 – 2032)	$45.7	$5.4
Long-Term (2033 – 2042)	$48.5	$5.6
Overall Total	**$109.7**	**$13.2**

NOTES: Estimates for the local share are dependent upon the availability of funding from both FAA and FDOT. An inflation factor of 3.72 percent has been applied for each year a project is programmed beyond the 2023 cost estimate.

SOURCE: GAI and ESA, 2023.



Source: ESA, 2023.

Witham Field Master Plan

FIGURE 8-1

CAPITAL IMPROVEMENT PROGRAM

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APPENDIX A
Correspondence

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U.S. Department
of Transportation
**Federal Aviation
Administration**

ORLANDO AIRPORTS DISTRICT OFFICE
8427 SouthPark Circle, Suite 524
Orlando, Florida 32819
Phone: (407) 487-7220 Fax: (407) 487-7135

January 20, 2021

Mr. Sam Carver
Airport Manager
Martin County Airport/Witham Field
2401 S.E. Monterey Road
Stuart, Florida 34996

Dear Mr. Carver:

RE: Martin County Airport/Witham Field (SUA)
Approval of Forecast of Aviation Activity for Master Plan Update

This letter responds to your submittal of revised Aviation Activity Forecasts for the Master Plan Update for Martin County Airport/Witham Field dated September, 2020. The based aircraft and operations forecasts shown in Table 3-27 of the report are approved to be used in master planning efforts. Please keep in mind that this forecast was prepared at the same time as the evolving impacts of the COVID-19 public health emergency. Forecast approval is based on the methodology, data, and conclusions at the time the document was prepared. However, consideration of the impacts of the COVID-19 public health emergency on aviation activity is warranted to acknowledge the reduced confidence in growth projections using currently-available data.

Accordingly, FAA approval of this forecast does not constitute justification for future projects. Justification for future projects will be made based on activity levels at the time the project is requested for development. Documentation of actual activity levels meeting planning activity levels will be necessary to justify AIP funding for eligible projects.

If you have any questions, please feel free to contact me at (407) 487-7231.

Sincerely,

Marisol C. Elliott
Community Planner

cc: Laurie McDermott, FDOT/4
Doug DiCarlo, ESA

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MARTIN COUNTY
BOARD OF COUNTY COMMISSIONERS
2401 S.E. MONTEREY ROAD • STUART, FL 34996

DOUG SMITH Commissioner, District 1
STACEY HETHERINGTON Commissioner, District 2
HAROLD E. JENKINS II Commissioner, District 3
SARAH HEARD Commissioner, District 4
EDWARD V. CIAMPI Commissioner, District 5

DON G. DONALDSON, P.E. County Administrator
SARAH W. WOODS County Attorney

TELEPHONE (772) 288-5400
WEBSITE www.martin.fl.us

August 4, 2023

Via U.S. Mail and email: Marisol.elliot@faa.gov

U.S. Department of Transportation
Orlando Airports District Office
Federal Aviation Administration
8427 South Park Circle
Suite 524
Orlando, FL 32819
ATTN: Marisol Elliot, Community Planner

Dear Ms. Elliot:

Martin County Board of County Commissioners (hereinafter referred to as the "Sponsor"), as owner of the Martin County Airport/Witham Field, pursuant to Section 47105(d) of the Federal Aviation Administration Authorization Act of 1994, hereby certifies that satisfactory property interest to the land indicated herein is vested in the Sponsor under the terms and conditions of a Grant Agreement with the Federal Aviation Administration, Master Plan AIP Grant Number 3-12-0076-022-2019.

In the opinion of Lee Baggett, Senior Assistant County Attorney for Sponsor, the Sponsor has full legal title to the property interest indicated below and, as shown on the Exhibit "1" as of the time and date stated in the title documents, has adequate title to satisfy local laws and ordinances:

1. Parcel ID# 10-38-41-000-001-00000-1;
2. Parcel ID# 10-38-41-000-001-00010-9; and
3. Parcel ID# 37-38-41-006-173-00000-5

Apparent Title Vested in:
Martin County, a political subdivision of the State of Florida by Deeds recorded in Deed Book 11, Page 590; Deed Book 11, Page 594; Deed Book 11, Page 595; Deed Book 11, Page 598; Deed Book 11, Page 599; Deed Book 12, Page 503; Deed Book 12, Page 505; Deed Book 12, Page 520; Deed Book 12, Page 549; Deed Book 12, Page 551; Deed Book 12, Page 586; Deed Book 15, Page 443; Deed Book 18, Page 383; Deed Book 32, Page 207; Deed Book 377, Page 18; Deed Book 37, Page 100; Deed Book 39, Page 551; O.R. Book 87, Page 439; O.R. Book 130, Page 299; O.R. Book 140, Page 398; O.R.

Book 1468, Page 295; O.R. Book 2939, Page 1714; O.R. Book 379, Page 2747, Public Records of Martin County, Florida.

The Sponsor's ownership in the above-referenced parcels is more particularly described in the Ownership and Encumbrance Property Information Report prepared by Attorney's Title Fund Services, LLC, under Fund File Number 1425539, dated July 21, 2023, attached hereto and made a part hereof. Although a Claim of Lien, pursuant to Florida Statutes § 713.08, was recorded twice by a subcontractor, the Florida construction lien law in inapplicable to the Sponsor because political subdivisions are expressly excluded in Florida Statutes § 713.01(23). Furthermore, the land interest acquired meets the requirements of the FAA except for encumbrances, including but not limited to easements, leases, development orders, resolutions, boundary survey, and site plan, all of which are identified in the above-referenced report. However, such encumbrances do not affect the use of the land for airport purposes.

The Sponsor recognizes and accepts full responsibility for the clearing of any outstanding encumbrances, defects and exceptions to the title that may in any way affect the future use and operation of the land for airport purposes as may be determined by the FAA. It is understood that the FAA reserves the right to cancel this certification at any time. Although specific title evidence documents are not submitted herewith, copies of deeds and other appropriate evidence of title for the land are on file with the Sponsor and are available for inspection by the FAA.

Sincerely,

Martin County Board of County Commissioners

Don Donaldson, County Administrator

Lee J. Baggett, Esquire
Senior Assistant County Attorney

Cc: Miguel Martinez and Juan Brown via email: Miguel.martinez@faa.gov juan.brown@faa.gov

EXHIBIT
1

Ownership and Encumbrance Property Information Report

Issuer: Attorneys' Title Fund Services, LLC
Recipient: Robert A. Burson, P.A.

Treasure Coast
590 NW Peacock Blvd., Suite 12
Port Saint Lucie, FL 34986
(800)344-6645
(866)303-4708

Fund File Number: 1425539

Agent's File Reference: Martin County

Effective Dates: ***From*** N/A

To June 21, 2023 at 11:00 PM

This title search commences from the date of the last outstanding institutional first mortgage on the property. If there is no outstanding mortgage, the search commences with the date record title vested in the current record owner.

Description of Real Property Situated in Martin County, Florida.

See Exhibit A

Apparent Title Vested in:

Martin County, a political subdivision of the State of Florida by Deeds recorded in Deed Book 11, Page 590; Deed Book 11, Page 594; Deed Book 11, Page 595; Deed Book 11, Page 598; Deed Book 11, Page 599; Deed Book 12, Page 503; Deed Book 12, Page 505; Deed Book 12, Page 520; Deed Book 12, Page 549; Deed Book 12, Page 551; Deed Book 12, Page 586; Deed Book 15, Page 443; Deed Book 18, Page 383; Deed Book 32, Page 207; Deed Book 377, Page 18; Deed Book 37, Page 100; Deed Book 39, Page 551; O.R. Book 87, Page 439; O.R. Book 130, Page 299; O.R. Book 140, Page 398; O.R. Book 1468, Page 295; O.R. Book 2939, Page 1714; O.R. Book 379, Page 2747, Public Records of Martin County, Florida.

This search does not cover matters other than those recorded in the Official Records Book of the county and does not assure the legality or validity of the referenced instruments.

Ad Valorem tax information is not provided.

Prepared Date: July 21, 2023

Prepared by: Nancy Ball

Phone Number: (800) 344-6645 x6506

Email Address: NBall@TheFund.com

Ownership and Encumbrance Property Information Report

Attorneys' Title Fund Services, LLC

Fund File Number: 1425539

ENCUMBRANCES

1. Easement in favor of Martin County recorded in Deed Book 12, Page 506, Public Records of Martin County, Florida.
2. Easement in favor of Florida Power and Light Company recorded in O.R. Book 333, Page 913, Public Records of Martin County, Florida.
3. Memorandum of Lease recorded in O.R. Book 1959, Page 76; O.R. Book 1565, Page 454, O. R. Book 3309, Page 1954, Public Records of Martin County, Florida.
4. Standard Development Order recorded in O.R. Book 1998, Page 1960, Public Records of Martin County, Florida.
5. Standard Development Order recorded in O.R. Book 2049, Page 2746, Public Records of Martin County, Florida.
6. Resolution No. 08-4.19 recorded in O.R. Book 2348, Page 35, Public Records of Martin County, Florida.
7. Development Order Change_ recorded in O.R. Book 2532, Page 2600, Public Records of Martin County, Florida.
8. Notice regarding Boundary Survey recorded in O.R. Book 2682, Page 544, Public Records of Martin County, Florida.
9. Final Site Plan Approval recorded in O.R. Book 2381, Page 2635, Public Records of Martin County, Florida.
10. Non Exclusive Water and Sewer Easement recorded in O.R. Book 2664, Page 1888, Public Records of Martin County, Florida.
11. Easement in favor of Florida Power and Light Company recorded in O.R. Book 2715, Page 544, Public Records of Martin County, Florida.
12. Development Order recorded in O.R. Book 2925, Page 1458, Public Records of Martin County, Florida.
13. Development Order recorded in O.R. Book 2194, Page 2532, Public Records of Martin County, Florida.
14. Easement in favor of Florida Power and Light Company recorded in O.R. Book 2183, Page 1632, Public Records of Martin County, Florida.
15. Development Order recorded in O.R. Book 2116, Page 2244, Public Records of Martin County, Florida.
16. Claim of Lien recorded in O.R. Book 3354, Page 2775, Public Records of Martin County, Florida.
17. Claim of Lien recorded in O.R. Book 3326, Page 1983, Public Records of Martin County, Florida.
18. Agreement of Lease recorded in O. R. Book 3124, Page 1715, First Amendment of Lease recorded in O.R. Book 3290, Page 2638, Public Records of Martin County, Florida.
19. Sixth Amendment to Commercial Lease recorded in O.R. Book 3191, Page 1381, Public Records of Martin County, Florida.

20. Any lien or claim of lien for services, labor or materials which may take priority over the estate or interest insured by reason of that certain Notice of Commencement recorded November 17, 2022, under O.R. Book 3346, Page 1458, Public Records of Martin County, Florida.
21. Any lien or claim of lien for services, labor or materials which may take priority over the estate or interest insured by reason of that certain Notice of Commencement recorded October 6, 2022, under O.R. Book 3339, Page 1087, Public Records of Martin County, Florida.
22. Any lien or claim of lien for services, labor or materials which may take priority over the estate or interest insured by reason of that certain Notice of Commencement recorded July 9, 2022, under O.R. Book 3327, Page 2480, re-recorded in O.R. Book 3335, Page 2352, Public Records of Martin County, Florida.
23. Any lien or claim of lien for services, labor or materials which may take priority over the estate or interest insured by reason of that certain Notice of Commencement recorded September 9, 2022, under O.R. Book 3335, Page 652, Public Records of Martin County, Florida.
24. Utility Easement recorded in O.R. Book 3283, Page 516, Public Records of Martin County, Florida.
25. Easement in favor of Florida Power and Light Company recorded in O.R. Book 3206, Page 2163; O.R. Book 3069, Page 2333; O.R. Book 3012, Page 1612; O.R. Book 2205, Page 1984, Public Records of Martin County, Florida.
26. Non Exclusive Sewage Force Main Easement recorded in O.R. Book 2949, Page 2262, Public Records of Martin County, Florida.

A 20-year name search has been performed on parties acquiring an interest within the time period covered by this search.

This Title Search is prepared and furnished for information only. It is not an opinion of title and may not be used as a title base for the issuance of a title insurance commitment and/or policy, nor should it be used for the preparation of foreclosure proceedings or other litigation.

This report is not title insurance. Pursuant to s. 627.7843, Florida Statutes, the maximum liability of the issuer of this property information report for errors or omissions in this property information report is limited to the amount paid for this property information report, and is further limited to the person(s) expressly identified by name in the property information report as the recipient(s) of the property information report.

Ownership and Encumbrance Property Information Report

Attorneys' Title Fund Services, LLC.

Exhibit A

Fund File Number: 1425539

A PARCEL OF LAND LYING IN SECTIONS 2, 3, 10 , 11 AND 15 TOWNSHIP 38 SOUTH, RANGE 41 EAST AND A PORTION OF THE HANSON GRANT, MARTIN COUNTY, FLORIDA, AS SHOW ON WITHAM AIRPORT JURISDICTIONAL BOUNDARY SURVEY PREPARD FOR MARTIN COUNTY BY GCY, INC., FILE AND DRAWING NO. 11-1018-08; MORE PARTICULARY DESCRIBED AS FOLLOWS:
COMMENCE AT THE SOUTHWEST CORNER OF SAID SECTION 2;
THENCE NORTH 00° 09' 39' EAST, ALONG THE WEST LINE OF SAID SECTION 2, A DISTANCE OF 279.26 FEET TO THE POINT OF BEGINNING; THENCE DEPARTING SAID WEST LINE NORTH 88° 59' 31" EAST, A DISTANCE OF 1471.04 FEET; THENCE SOUTH 02° 04' 47" EAST, A DISTANCE OF 96.27 FEET; THENCE SOUTH 89' 58' 53" EAST , A DISTANCE OF 271.20 FEET; THENCE NORTH 85°43' 50" EAST, A DISTANCE OF 220.91 FEET; THENCE NORTH 69°40' 43" EAST, A DISTANCE OF 293.96 FEET; THENCE NORTH 87'12' 37" EAST, A DISTANCE OF 417.98 FEET TO THE WEST LINE OF BAY ST. LUCIE, BLOCK 10, AS RECORDED IN PLAT BOOK 6, PAGE 57 PALM BEACH (NOW MARTIN COUNTY) FLORIDA; THENCE SOUTH 00'10' 24" WEST, ALONG SAID WEST LINE, A DISTANCE OF 355. 52 FEET TO SOUTH LINE OF SAID PLAT AND THE NORTH LINE OF

UNPLATTED PORTION OF BUENA PARK AS RECORDED IN PLAT BOOK 10, PAGE 19 PALM BEACH (NOW MARTIN COUNTY) FLORIDA; THENCE NORTH 89°49'56" WEST, ALONG SAID NORTH LINE, A DISTANCE OF 15.00 FEET; THENCE SOUTH 00° 02' 34" ,WEST ALONG THE CENTER OF THE ALLEY AS SHOWN IN BLOCK "C" AND BLOCK "B" OF SAID UNPLATTED PORTION OF BUENA PARK, A DISTANCE OF 596.00 FEET TO THE SOUTH LINE OF SAID UNPLATTED PROTION OF BUENA PARK; THENCE SOUTH 89' 49' 56" EAST, ALONG THE SOUTH LINE OF SAID UNPLATTED PORTION OF BUENA PARK, A DISTANCE OF 15.00 FEET TO THE WEST LINE OF GOVERNMENT LOT 1 SECTION 11, TOWNSHIP 38 SOUTH, RANGE 41 EAST; THENCE ALONG SAID WEST LINE OF GOVERNMENT LOT 1 SOUTH 00° 02' 34" WEST, A DISTANCE OF 469.65 FEET; THENCE SOUTH 89° 49' 56" EAST, ALONG THE SOUTH LINE OF THOSE LANDS AS DESCRIBED IN O.R.B. 1177, PAGE 786 PUBLIC RECORDS MARTIN COUNTY FLORIDA, A DISTANCE OF 49. 76 FEET; THENCE SOUTH 07°32' 11" EAST, ALONG THE WEST LINE OF THOSE LANDS AS DESCRIBED IN O.R.B. 1081, PAGE 1685, A DISTANCE OF 120. 59 FEET TO THE SOUTH LINE OF THOSE LANDS AS DESCRIBED IN O.R.B. 1081, PAGE 1685 PUBLIC RECORDS MARTIN COUNTY FLORIDA THENCE DEPARTING SAID SOUTH LINE SOUTH 11'31' 52" WEST, A DISTANCE OF 50.16 FEET; THENCE SOUTH 6749' 40" WEST. A DISTANCE OF 883.99 FEET; THENCE SOUTH 22'10' 27" EAST, A DISTANCE OF 424.95 FEET; THENCE SOUTH 67'50' 13" WEST, A DISTANCE OF 1252.37 FEET; THENCE SOUTH 25' 59' 23" EAST, A

DISTANCE OF 2281.49 FEET;; THENCE SOUTH 69° 58' 09" EAST, A DISTANCE OF 707.40 FEET; THENCE SOUTH 20° 01' 34" WEST. A DISTANCE OF 225.17 FEET: THENCE SOUTH 70' 05' 45" EAST. A DISTANCE OF 98.17 FEET; THENCE SOUTH 07° 46' 05" WEST, A DISTANCE OF 538.51 FEET; THENCE SOUTH 33° 17' 12" WEST, A DISTANCE OF 440.92 FEET; THENCE SOUTH 64' 00' 45" WEST, A DISTANCE OF 242.71 FEET; THENCE NORTH 25° 59' 15" WEST, A DISTANCE OF 740.31 FEET; THENCE NORTH 70° 24' 23" WEST, A DISTANCE OF 285.53 FEET; THENCE SOUTH 66° 16' 44" WEST, A DISTANCE OF 2367.92 FEET; THENCE NORTH 73°19' 38" WEST, A DISTANCE OF 121.10 FEET TO THE NORTHERLY LINE OF THOSE LANDS AS DESCRIBED IN O.R.B. 592, PAGE 1723 PUBLIC RECORDS MARTIN COUNTY FLORIDA; THENCE SOUTH 51°07' 17" WEST, ALONG SAID NORTHERLY LINE , A DISTANCE OF 418.01 FEET; THENCE SOUTH 66°17' 57" WEST, CONTINUING ALONG SAID NORTHERLY LINE, A DISTANCE OF 43.94 FEET; THENCE DEPARTING SAID NORTHERLY LINE, NORTH 18°10' 21 WEST, A DISTANCE OF 183.32 FEET; THENCE SOUTH 66°59' 10" WEST. A DISTANCE OF 386.58 FEET; THENCE NORTH 88'22' 48" WEST, A DISTANCE OF 138.20 FEET THENCE NORTH 41'5T 04" WEST, A DISTANCE OF 214. 64 FEET TO THE BEGINNING OF A CURVE CONCAVE TO THE SOUTHWEST HAVING A RADIUS OF 815.00 FEET; THENCE NORTHWESTERLY ALONG SAID CURVE THROUGH A CENTRAL ANGLE OF 25'

Exhibit A

Fund File Number: 1425539

22' 48' AN ARC DISTANCE OF 361.02 FEET; THENCE NORTH 67° 19' 52" WEST A DISTANCE OF 487.40 FEET TO THE BEGINNING OF A CURVE

CONCAVE NORTHERLY, HAVING A RADIUS OF 585.00 FEET, TO WHICH A RADIAL LINE BEARS NORTH 22° 40' 08" EAST; THENCE NORTHWESTERLY ALONG SAID CURVE THROUGH A CENTRAL ANGLE OF 17° 02' 44" AN ARC DISTANCE OF 174.04 FEET TO THE SOUTHEAST LINE OF THOSE LANDS AS DESCRIBED IN O.R.B 1276, PAGE 1653 PUBLIC RECORDS MARTIN COUNTY FLORIDA; THENCE NORTH 47° 59' 42" EAST ALONG SAID SOUTHEAST LINE, A DISTANCE OF 273.95 FEET; THENCE NORTH 42' 00' 18" WEST, ALONG THE NORTHEAST LINE OF SAID O.R.B. 1276, PAGE 1653, A DISTANCE OF 775.00 FEET; THENCE SOUTH 47° 59' 42" WEST, ALONG THE NORTHWEST LINE OF SAID
O.R.B. 1276, PAGE 1653, A DISTANCE OF 279.78 FEET THENCE DEPARTING SAID NORTHWEST LINE OF O.R.B. 1276, PAGE 1653 NORTH 42°00'23"WEST, A DISTANCE OF 2063.52 FEET; THENCE NORTH 41° 53' 15" WEST, A DISTANCE OF 157.81 FEET; THENCE NORTH 39° 44' 24" WEST, A DISTANCE OF 401.05 FEET TO THE BEGININNING OF A CURVE CONCAVE TO THE NORTHEAST HAVING A RADIUS OF 75.07 FEET; THENCE NORTHWESTERLY AND NORTHERLY ALONG SAID CURVE THROUGH A CENTERAL ANGLE OF 81° 49' 30" AN ARC DISTANCE OF 107.21 FEET TO THE POINT OF A COMPOUND CURVE HAVING A RADIUS OF 720.00 FEET, CONCAVE TO THE SOUTHEAST; THENCE NORTHEASTERLY ALONG SAID CURVE THROUGH A CENTERAL ANGLE OF 23 49' 30" AN ARC DISTANCE OF 299.39 TO A RADIAL LINE; THENCE ALONG THE EXTENTION OF SAID RADIAL LINE NORTH 23' 55' 29" WEST, A DISTANCE OF 13.56 FEET TO THE SOUTHERLY AND EASTERLY RIGHT OF WAY LINE OF STATE HIGHWAY 714 (SE MONTEREY ROAD) AS RECORED IN PLAT BOOK 17, PAGE 4, MARTIN COUNTY PUBLIC RECORDS; THENCE ALONG SAID SOUTHERLY AND EASTERLY RIGHT OF WAY NORTH 66° 04' 31" EAST, A DISTANCE OF 1722.44 FEET TO THE BEGNNING OF A CURVE CONCAVE SOUTHERLY HAVING A RADIUS OF 1935.00 FEET; THENCE EASTERLY AND SOUTHEASTERLY ALONG SAID CURVE THROUGH A CENTERAL ANGLE OF 9° 06' 16" AN ARC DISTANCE OF 307.48 FEET; THENCE NORTH 75° 10' 47" EAST, A DISTANCE OF 1273.03 FEET TO THE BEGINNING OF A CURVE CONCAVE NORTHWESTERLY HAVING A RADIUS OF 865.00 FEET; THENCE NORTHEASTERLY ALONG SAID CURVE THROUGH A CENTERAL ANGLE OF 79° 44' 23" AN ARC DISTANCE OF 1203.84 FEET; THENCE NORTH 04° 33' 36" EAST, A DISTANCE OF 729.32 FEET; THENCE NORTH 85° 26' 24" EAST, A DISTANCE OF 75.00 FEET; THENCE NORTH 04° 33' 36" WEST, A DISTANCE OF 591.80 FEET; THENCE DEPARTING SAID SOUTHEASTERLY AND EASTERLY RIGHT-OF-WAY LINE OF STATE ROAD 714 (S.E. MONTEREY ROAD), NORTH 82° 35' 38" EAST, A DISTANCE OF 99.49 FEET; THENCE NORTH 87° 15' 50" EAST, A DISTANCE OF 89.96 FEET; THENCE SOUTH 78° 53' 54" EAST, A DISTANCE OF 815.01 FEET; THENCE NORTH 88° 59' 06" EAST, A DISTANCE OF 121.23 FEET TO THE POINT OF BEGINNING.

U.S. Department
of Transportation
**Federal Aviation
Administration**

Orlando Airports District Office
8427 SouthPark Circle, Suite 524
Orlando, FL 32819-9058

Phone: (407) 487-7220

Fax: (407) 487-7135

August 24, 2023

Mr. Andrew McBean, C.M.
Interim Airport Manager
Witham Field Airport
2011 SE Airport Road
Stuart, FL 34996

Dear Mr. McBean:

RE: Exhibit "A" Property Inventory Map
Witham Field Airport, Stuart, Florida

This letter confirms the receipt and acceptance of your Exhibit "A" Property Inventory Map signed August 4, 2023. We will retain a copy of this Exhibit "A" Property Inventory Map in our files for future reference.

Sincerely,

Marisol C. Elliott
Community Planner

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U.S. Department
of Transportation
**Federal Aviation
Administration**

Orlando Airports District Office
8427 Southpark Circle, Suite 524
Orlando, FL 32819
Phone: (407) 487-7229
Fax: (407) 487-7135

August 24, 2023

Mr. Andrew McBean, C.M.
Interim Airport Manager
Witham Field Airport
2011 SE Airport Road
Stuart, FL 34996

Re: Witham Field Airport, Stuart, Florida
Airspace Case No. 2023-ASO-2013-NRA

Dear Mr. McBean:

The Federal Aviation Administration (FAA) has conducted an aeronautical study (2023-ASO-2013-NRA) on the proposed development and has conditionally approved the Airport Layout Plan (ALP). This determination does not constitute FAA approval or disapproval of the physical development involved in the proposal. It is the determination with respect to the safe and efficient use of navigable airspace and with respect to the safety of persons and property on the ground.

The FAA Reauthorization Act of 2018, section 163(d), has limited the FAA's review and approval authority for ALPs. The Act limits the FAA's authority to those portions of the ALP that:

- Materially impact the safe and efficient operation of aircraft at, to, or from the airport;
- Adversely affect the safety of people or property on the ground adjacent to the airport as a result of aircraft operations; or
- Adversely affect the value of prior Federal investments to a significant extent.

FAA's approval of this ALP is limited to existing facilities only (or those specific areas that FAA retains approval authority). The FAA has not made a determination on whether or not it retains review and approval authority for any proposed facilities depicted on the ALP associated with this letter (unless otherwise noted). Under Title 49 U.S.C. § 47107(a)(16) (as revised per section 163(d) of Pub.L. 115-254), FAA will separately determine whether it retains approval authority for each individual proposed facility depicted on an ALP before construction occurs.

Although section 163(d) has limited the FAA's review and approval authority of proposed projects depicted on an ALP, airport sponsors must continue to maintain an up-to-date ALP in accordance with Federal law, 49 U.S.C. § 47107(a)(16).

In making this determination, the FAA has considered matters such as the effects the proposal would have on existing or planned traffic patterns of neighboring airports, the effects it would have on the existing airspace structure and projected programs of the FAA, the effects it would have on the safety of persons and property on the ground, and the effects that existing or proposed manmade objects (on file with the FAA), and known natural objects within the affected area would have on the airport proposal.

The FAA has only limited means to prevent the construction of structures near an airport. The airport sponsor has the primary responsibility to protect the airport environs through such means as local zoning ordinances, property acquisition, aviation easements, letters of agreement or other means.

This ALP approval is conditioned on acknowledgement that any development on airport property requiring Federal environmental approval must receive such written approval from FAA prior to commencement of the subject development. This ALP approval is also conditioned on acceptance of the plan under local land use laws. We encourage appropriate agencies to adopt land use and height restrictive zoning based on the plan.

Approval of the plan does not indicate that the United States will participate in the cost of any development proposed. AIP funding requires evidence of eligibility and justification at the time a funding request is ripe for consideration. When construction of any proposed structure or development indicated on the plan is undertaken, such construction requires normal 45-day advance notification to FAA for review in accordance with applicable Federal Aviation Regulations (i.e., Parts 77, 157, 152, etc.). More notice is generally beneficial to ensure that all statutory, regulatory, technical and operational issues can be addressed in a timely manner.

Please attach this letter to the Airport Layout Plan and retain it in the airport. We wish you great success in your plans for the development of the airport.

Sincerely,

Marisol C. Elliott
Community Planner

cc:
AJV-E2 w/ALP sheet (via ADIP)
AJV-E24 w/ALP sheet (via ADIP)
AJW-E24B w/ALP sheet (via ADIP)
FDOT4 w/ALP set (via FAD)
Environmental Science Associates w/ALP sheet (via email)

APPENDIX B

Documentation for Aviation Activity Forecasts

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Selected Regression Model - Based Aircraft
Witham Field Airport Master Plan

Year	INDEPENDENT VARIABLES Martin County Employment	Martin County Households	Industry Fuel Acq Costs	DEPENDENT VARIABLE Based Aircraft
2000	72,454	55,532	26.70	216
2001	73,127	57,704	25.79	216
2002	72,723	58,883	21.98	235
2003	74,439	60,816	28.01	242
2004	76,549	61,828	33.65	235
2005	82,372	62,723	47.21	235
2006	85,352	62,428	59.95	235
2007	86,835	63,263	60.62	235
2008	83,496	63,229	101.52	230
2009	80,335	63,272	54.68	203
2010	81,437	63,977	74.61	195
2011	81,639	65,218	96.00	199
2012	82,590	66,177	102.81	195
2013	84,569	67,247	100.78	200
2014	88,777	68,069	97.79	197
2015	92,824	69,307	56.69	192
2016	96,445	70,581	39.12	295
2017	98,462	71,423	48.16	284
2018	100,895	72,881	63.72	315
2019	103,125	74,236	59.71	333
2020	105,247	75,472	53.02	311
2021	107,507	76,618	44.87	326
2022	109,853	77,629	49.89	330
2023	112,093	78,581	54.99	334
2024	114,398	79,488	59.42	339
2025	116,765	80,361	64.02	344
2026	119,198	81,213	68.47	350
2027	121,653	82,051	72.51	355
2028	124,126	82,876	76.31	362
2029	126,629	83,676	80.08	368
2030	129,159	84,453	83.51	374
2031	131,712	85,217	85.75	382
2032	134,259	85,966	87.60	390
2033	136,810	86,708	89.56	398
2034	139,370	87,452	91.57	406
2035	141,942	88,198	93.65	414
2036	144,524	88,952	95.78	422
2037	147,120	89,722	97.97	430
2038	149,727	90,511	100.27	437
2039	152,348	91,321	102.30	446
2040	154,990	92,161	104.20	454

Average Annual Growth Rates	
2019-25	1.006
2025-30	1.017
2030-40	1.019
2019-40	1.015

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.830866296
R Square	0.690338802
Adjusted R Squar	0.632277328
Standard Error	25.20707667
Observations	20

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	22664.20257	7554.73419	11.88979108	0.000240237
Residual	16	10166.34743	635.3967144		
Total	19	32830.55			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-0.84536384	102.9878595	-0.008208383	0.993552207	-219.169873	217.4791453	-219.169873	217.4791453
Employment	0.003938809	0.002091316	1.883411437	0.077952629	-0.000494584	0.008372202	-0.000494584	0.008372202
Households	-0.000808163	0.004069173	-0.198606312	0.845072393	-0.009434424	0.007818097	-0.009434424	0.007818097
Fuel Acq Costs	-0.780582378	0.245885741	-3.174573578	0.005883734	-1.301836864	-0.259327892	-1.301836864	-0.259327892

U.S. Department
of Transportation
**Federal Aviation
Administration**

ORLANDO AIRPORTS DISTRICT OFFICE
8427 SouthPark Circle, Suite 524
Orlando, Florida 32819
Phone: (407) 487-7220 Fax: (407) 487-7135

August 26, 2019

Mr. Sam Carver
Airport Manager
Martin County Airport/Witham Field
2401 S.E. Monterey Road
Stuart, Florida 34996

Dear Mr. Carver:

RE: Martin County Airport/Witham Field (SUA)
Approval of Forecast of Aviation Activity for NEM Update

This letter responds to your submittal of revised Aviation Activity Forecasts for the Noise Expsoure Maps (NEMs) for Martin County Airport/Witham Field submitted July 31, 2019. The operations forecasts shown in Table 5 of the report are approved to be used in update to the NEMs.

If you have any questions, please feel free to contact me at (407) 487-7231.

Sincerely,

Marisol C. Elliott

Marisol C. Elliott
Community Planner

cc: Laurie McDermott, FDOT/4
Mike Arnold, ESA
Peter Green, FAA Orlando ADO

APPENDIX A
SUA NEM Update Forecast

This document outlines a future activity estimate for use in updating the Noise Exposure Maps (NEMs) for Martin County Airport/Witham Field (SUA). The following sections review the trends and factors influencing aircraft activity at the airport and current agency activity projections. Based on this information, a reasonable estimate of future activity was developed for use in the NEM update.

1.0 Historic Activity and Current Trends

Aircraft activity at SUA was reviewed over the past 20 years to provide insight into historic and current trends (**Table 1**). It was noted that the airport experienced its highest activity levels during the 20-year period in 2002 with nearly 125,000 operations. Subsequently, aircraft operations experienced a decline across every category of activity to a low of just under 56,000 operations in 2011. This decline, following the events of September 11, 2001 and the subsequent Great Recession, fueled similar activity changes at other GA airports nationally. The largest change at SUA on a percentage basis through 2011 was in the local activity category with a decrease of nearly 68 percent.

In 2012, activity began to rebound as a result of an improving economy and has continued an upward trend over the last eight years. For the recent 12-month period ending June 2019, the airport experienced 114,291 operations, a 9.7 percent increase over FY2018. With three months left in FY2019, the airport is tracking at 12.4 percent growth relative to the same 9-month period in FY 2018. Every category of aircraft activity has doubled at the airport since 2011 with air taxi outpacing GA local and itinerant operations on a percentage basis.

TABLE 1
HISTORIC AIRCRAFT OPERATIONS
MARTIN COUNTY AIRPORT/WITHAM FIELD

Fiscal Year[1]	Historic Aircraft Operations								Total Operations	Annual Change
	Itinerant Operations					Local Operations				
	Air Carrier	Air Taxi & Commuter	GA	Military	Total	Civil	Military	Total		
2000	0	3,568	58,527	739	62,834	52,366	135	52,501	115,335	
2001	1	4,325	63,367	629	68,322	51,562	237	51,799	120,121	4.1%
2002	0	6,197	66,979	717	73,893	50,752	320	51,072	124,965	4.0%
2003	0	7,217	65,777	736	73,730	43,024	530	43,554	117,284	-6.1%
2004	0	7,079	67,925	574	75,578	36,480	457	36,937	112,515	-4.1%
2005	0	6,790	58,555	531	65,876	30,395	367	30,762	96,638	-14.1%
2006	176	6,172	54,292	433	61,073	23,694	479	24,173	85,246	-11.8%

2007	0	6,487	52,090	446	59,023	18,900	220	19,120	78,143	-8.3%
2008	1	5,616	42,882	136	48,635	18,775	44	18,819	67,454	-13.7%
2009	0	3,890	39,262	91	43,243	15,995	364	16,359	59,602	-11.6%
2010	0	4,917	40,550	145	45,612	16,939	305	17,244	62,856	5.5%
2011	0	4,113	35,076	169	39,358	16,440	122	16,562	55,920	-11.0%
2012	0	4,260	32,558	83	36,901	19,247	30	19,277	56,178	0.5%
2013	0	4,485	35,669	148	40,302	23,550	50	23,600	63,902	13.7%
2014	9	4,981	42,749	86	47,825	31,925	24	31,949	79,774	24.8%
2015	4	4,380	45,517	241	50,142	33,523	92	33,615	83,757	5.0%
2016	0	5,700	48,470	272	54,442	34,949	136	35,085	89,527	6.9%
2017	0	7,066	58,219	157	65,442	38,607	58	38,665	104,107	16.3%
2018	0	8,775	60,732	401	69,908	34,247	96	34,343	104,251	0.1%
2019[2]	0	9,466	65,711	361	75,538	38,701	152	38,853	114,391	**9.7%**
2009-2019 CAAGR	**0**	**9.3%**	**5.3%**	**14.8%**	**5.7%**	**9.2%**	**-8.4%**	**9.0%**	**6.7%**	

Source: FAA 2018 TAF, Issued February 2019,
Notes: 1. The TAF report's data based on the FAA's fiscal year (October 1 through September 30) – not calendar year.
2. Preliminary 2019 data reflect 12-month period ending June 2019, FAA Air Traffic Data Activity System (ATADS)
CAAGR = Compound Annual Average Growth Rate

In addition to the strong national and regional economies, demand by high end users in northern Palm Beach County and Martin County has also resulted in the sustained growth. The airport and fixed based operators, Atlantic Aviation and Stuart Jet Center, continue to make significant investments in new facilities and services that make the airport increasingly attractive for aircraft operators. Recent changes contributing to continued growth include:

- 2015 - Stuart Jet Center completed construction of a new LEED certified green FBO building
- 2016 – Stuart Jet Center completed construction of a 24,000 square foot hangar (6-8 aircraft)
- 2018 - Treasure Coast Flight Training expanded fleet from 15 to 30 based aircraft
- February 2019 – SUA opened a new US Customs and Border Protection Facility
- March 2019 –The Dassault Aircraft Service Center was relocated from Palm Beach International into a new 25,000-square-foot facility at SUA (double the hangar capacity of PBI facility)
- April 2019 – Stuart Jet Center was ranked among the top 4,500 FBO's in the world by Aviation International News including No. 1 for line service, No 3 for customer service representatives and number 9 for most improved FBO.
- 2019 - Atlantic Aviation, which took over Galaxy Aviation in 2014, is adding a 25,000 square-foot hangar (6-8 aircraft) at the same time it's renovating its main customer-service center.
- 2019 - Stuart Jet Center is currently constructing a new 20,000 square foot storage hangar (5-6 aircraft)

Other projects underway or planned during the next five years which will continue to drive growth include two additional 20,000 square foot hangars (5-6 aircraft each).

2.0 Aircraft Operations – Forecast Activity

Based on discussions with airport management, SUA will continue to generate moderate growth in activity. However, this growth is expected to be somewhat less than the 6.7 percent annual average growth rate that the airport experienced over the last 10 years. Agency forecasts were reviewed and an alternative forecast was developed based on current and ongoing development at the airport.

2.1 FAA and FDOT Forecasts

The FAA Terminal Area Forecast (TAF) is the official forecast of aviation activity used by the FAA for airports in the National Plan of Integrated Airport Systems (NPIAS). TAF forecasts are prepared for both towered and non-towered facilities to meet the budget and planning needs of FAA. These forecasts are issued annually by the FAA (in this case, February 2019) and reflect the FAA's forecast of aircraft operations based on the FAA's fiscal year (October 1 through September 30). For towered airports, the TAF projects activity based on the historic air traffic control tower (ATCT) counts included in FAA's Air Traffic Data Activity System (ATADS).

The Florida Department of Transportation (FDOT) Aviation and Spaceports Office supports aviation planning efforts through various programs including the development of several aviation forecasts for airports within the state System Plan. This includes development of activity forecasts for operations at SUA.

The projected annual aircraft operations for SUA, as published in the 2018 TAF and in the 2015 FDOT forecast, are presented in **Table 2**.

TABLE 2
2018 TERMINAL AREA FORECAST (TAF) – PROJECTED AIRCRAFT OPERATIONS
FDOT GENERAL AVIATION OPERATIONS FORECAST – PROJECTED AIRCRAFT OPERATIONS
MARTIN COUNTY AIRPORT/WITHAM FIELD

Fiscal Year[1]	FAA 2018 TAF Forecasted Aircraft Operations								Total Operations	FDOT 2015 Forecasted Total Operations
	Itinerant Operations					Local Operations				
	Air Carrier	Air Taxi & Commuter	GA	Military	Total	Civil	Military	Total		
2018	0	8,775	60,732	401	69,908	34,247	96	34,343	104,251	90,677
2019	0	8,775	63,165	401	72,341	33,136	96	33,232	105,573	92,109
2020	0	8,775	63,370	401	72,546	33,302	96	33,398	105,944	93,565
2021	0	8,775	63,576	401	72,752	33,469	96	33,565	106,317	95,043
2022	0	8,775	63,783	401	72,959	33,637	96	33,733	106,692	96,545
2023	0	8,775	63,990	401	73,166	33,805	96	33,901	107,067	98,070
2024	0	8,775	64,198	401	73,374	33,974	96	34,070	107,444	99,620
2025	0	8,775	64,407	401	73,583	34,144	96	34,240	107,823	101,194
2018-2025 CAAGR	0%	0.0%	0.8%	0.0%	0.7%	0.0%	0.0%	0.0%	0.5%	1.6%

Notes: 1. The TAF report's data based on the FAA's fiscal year (October 1 through September 30) – not calendar year.
2. 2018 TAF values are historical data while 2019 and future dates are forecasted. All FDOT value are forecasted.
Source: FAA 2018 TAF issued February 2019, FDOT 2015 General Aviation Operations Forecast.

While the FAA and FDOT's forecasts both project increases in operations in the future years, neither is suitable for direct use in this analysis. The FAA forecast reflects a relatively low annual growth rate of 0.5 percent throughout the planning period. When comparing the TAF to the current operational levels, it can be determined that SUA is already exceeding the activity level projected by the FAA for the airport in 2041.

While the FDOT average annual growth rate of 1.6 percent is higher than the FAA's rate , the FDOT forecast is not re-indexed annually (unlike the TAF) to adjust the projected growth from current levels. As a result, its projection is dated and does not reflect current activity levels or trends at the airport.

2.2 Alternative Forecast Approach

Since neither the FAA TAF or FDOT forecasts appear suitable for use for the NEM update, an alternative approach was taken for the purposes of estimating the future operational conditions. This approach used the most recent 12-month period as the 2019 activity baseline and estimated growth based on ongoing and expected improvements at the airport. Facilities including the Dassault Aircraft Service Center and the US Customs and Border Protection Facility were completed in early 2019 and are not currently reflected in the 2019 baseline. Additionally, while Treasure Coast Flight Training doubled its fleet in 2018, it will take some time before the training operation reaches its potential and the aircraft are fully utilized. Ongoing improvements and the world class ranking of the FBOs has potential to attract additional demand to the airport. The FBOs continue to respond to demand by higher end business and recreational aircraft with ongoing and planned construction of bulk hangar facilities. **Table 3** estimates the potential additional activity that might be expected at the airport if demand is consistent with current and planned improvements.

TABLE 3
POTENTIAL INCREASE RESULTING FROM CHANGES
MARTIN COUNTY AIRPORT/WITHAM FIELD

Fiscal Year	Year Completed	Estimated Increase in Operations through 2025[1]	Average Operations
Dassault Aircraft Service Center	2019	1,200-1,800	1,500
US Customs and Border Protection facility[2]	2019	3,000-4,000	3,500
FBO Upgrades and improvements	Ongoing	2,000-3,000	2,500
Training fleet expansion	2018	6,000-10,000	8,000
Hangar (20,000)	2019/2020	1,000-1,200	1,100
Hangar (25,000)	2019/2020	1,200-1,600	1,400
Hangar (20,000)	2023	1,000-1,200	1,100
Hangar (20,000)	2024	1,000-1,200	1,100
TOTALS		**16,400—24,000**	**20,200**

Sources: ESA, estimated.
[1] Reflects anticipated range of additional induced operations either not or only partially reflected in current 2019 baseline.
[2] Feasibility study estimates an increase in airport activity of 3-5 percent (Witham Field – US Customs Program Feasibility Study, July 29,2014

Table 3 indicates that an additional 20,200 operations might be reasonably expected by 2025 if demand is consistent with improvements. This equates to an annual average growth rate of 2.75 percent. For the purposes of this analysis, the growth was assumed to be consistent throughout the period as facilities come on line and transition toward full utilization. Given the recent growth trends at the airport and the types of facilities that are being developed, it is expected that growth will be higher in the air taxi and GA itinerant categories of activity versus the local activity. **Table 4** reflects the projected growth in operations based on recent and expected trends.

TABLE 4
FORECAST AIRCRAFT OPERATIONS
MARTIN COUNTY AIRPORT/WITHAM FIELD

Fiscal Year[1]	Historic Aircraft Operations								Total Operations	Annual Change
	Itinerant Operations					Local Operations				
	Air Carrier	Air Taxi & Commuter	GA	Military	Total	Civil	Military	Total		
2019[1]	0	9,466	65,711	361	75,538	38,701	152	38,853	114,391	
2020	0	9,736	67,682	374	77,792	39,599	136	39,735	117,527	2.74%
2021	0	10,013	69,713	374	80,100	40,518	136	40,654	120,755	2.75%
2022	0	10,299	71,804	374	82,477	41,459	136	41,595	124,072	2.75%
2023	0	10,593	73,958	374	84,925	42,421	136	42,557	127,482	2.75%
2024	0	10,895	76,177	374	87,446	43,406	136	43,542	130,987	2.75%
2025	0	11,205	78,462	374	90,042	44,413	136	44,549	134,591	2.75%
2019-2025 CAAGR	0%	2.85%	3.00%	0%	2.97%	2.32%	0%	2.31%	2.75%	

Source: FAA 2018 TAF, Issued February 2019,
1. Preliminary 2019 data reflect 12-month period ending June 2019, FAA Air Traffic Data Activity System (ATADS)

3.0 Forecast Comparison

If an airport is included in the FAA TAF, any new forecasts need to be reviewed and approved by the agency before they can be applied to further analyses. During this review the FAA looks to see if the passenger enplanements, annual operations, or based aircraft forecasts differ from the TAF by more than 10 percent in the five-year and/or 15 percent in the ten-year planning periods.

When compared to the 2018 TAF (**Table 5**), the alternative forecast differs by 8.4 percent in the base year (2019) and 24.8 percent in 2025. While these forecasts vary more than 10 percent from the TAF in 2025, the TAF does not reflect current activity and existing and planned improvement at the airport and would therefore, underestimate the noise exposure relative to the community. For informational purposes, the 2018 TAF was adjusted to reflect a revised 2019 baseline using the actual activity experienced during the 12-month period ending June 2019. The alternative forecast developed for the SUA NEM Update varies by 14.2 percent in 2025 relative to this adjusted 2018 TAF. Because the alternative forecasts better represent both recent activity at the airport and the anticipated activity that would result from ongoing improvements, use of the activity levels outlined in Table 4 is recommended for the purposes of the Part 150 NEM Update.

TABLE 5
COMPARISON OF FORECASTS
MARTIN COUNTY AIRPORT/WITHAM FIELD

Fiscal Year	2018 TAF	Recommended Activity Forecast	Difference	TAF adjusted for 2019 Baseline	Adjusted Difference
2019	105,573	114,391	8.4%	114,391	0.0%
2020	105,944	117,527	10.9%	114,963	2.2%
2021	106,317	120,755	13.6%	115,538	4.5%
2022	106,692	124,072	16.3%	116,115	6.9%
2023	107,067	127,482	19.1%	116,696	9.2%
2024	107,444	130,987	21.9%	117,280	11.7%
2025	107,823	134,591	24.8%	117,866	14.2%

Sources: FAA 2018 TAF, published February 2019 and ESA, 2019.
Adjusted TAF has been re-indexed to a new 2019 baseline based on activity during the 12-month period ending June 2019.

APPENDIX C

Recycling, Reuse, and Waste Reduction Plan

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APPENDIX C
Recycling, Reuse, and Waste Reduction Plan

Per FAA Order 5100.38D, Change 1 *Airport Improvement Program Handbook*, master plans funded with Airport Improvement Program (AIP) dollars must address issues related to the airport's recycling, reuse, and waste reduction programs. This includes:

- Assessing the feasibility of solid waste recycling at the airport;
- Minimizing the generation of waste at the airport;
- Identifying operations and maintenance requirements;
- Reviewing waste management contracts; and
- Identifying the potential for cost savings or generation of revenue.

This Recycling, Reuse, and Waste Reduction Plan provides information regarding the Witham Field (SUA) waste and recycling programs, based on a review of the current practices by the airport and its major tenants.

C.1 Airport Description and Background

SUA is owned and operated as a department of Martin County and as such receives waste handling services through the County's contract with Waste Management. To date, there is no airport-wide recycling program.

Most of the airport's tenants do not recycle and most of the waste at the airport is generated by general aviation pilots, passengers, tenants, and other airport users. Common waste disposed at SUA includes:

- General office waste: paper, plastic (hard plastic containers and film plastics), cans and bottles, and cardboard boxes.
- Small-scale in-flight service related waste such as food, food packaging, paper products, and cardboard.
- Construction and demolition waste from construction projects.
- Hazardous waste such as batteries, fluorescent light bulbs, solvents, and paint.

C.2 Waste Review

Due to concerns regarding the ongoing COVID-19 pandemic at the time of this study, an in-person waste walk-through was not completed through all airport tenants and facilities. In its place, in-person meetings were held with the airport and airport management, airport traffic control tower staff, and the fixed base operator (FBO) tenants. Other tenants and stakeholders were contacted by telephone.

Figure C-1: 4 Yard Dumpster at SUA Airport Maintenance Facility

There are numerous dumpsters located around the airfield and accessible by all tenants and businesses. As noted previously, waste removal and disposal services for the airport are provided by Waste Management. From tenant response, it was determined that the majority are also serviced by Waste Management. Only Triumph Aerospace Structures has programs in place to recycle waste and shipping materials related to their manufacturing operations. This includes recycling 100 percent of cardboard and the steel and aluminum shavings related to their manufacturing activities. Other tenants, operators, and airport departments (e.g. administration, operations, maintenance, etc..) would like to recycle, but there are no services currently offered.

While the City of Stuart does not currently provide waste collection services at the airport, it is worth noting that the City offers an incentive based program for commercial waste customers, allowing businesses to recycle at a reasonable rate, and reduce overall cost for waste and recycling removal.

C.3 Review of Recycling Feasibility

There are a number of factors which impact the airport's ability to recycle. The primary factor is that a recycling pick-up service is not currently provided in parallel with regularly scheduled solid waste pick-up across the airport.

While the airport footprint is relatively small, SUA has limited resources, which makes implementing a recycling program logistically challenging to coordinate with every tenant and subtenant at the airport. Additionally, discussions with airport tenants revealed that contamination due to airport users incorrectly disposing of trash (i.e., placing recyclables in trash receptacles) would possibly be one of the greatest barriers to an effective recycling program.

Annually, in partnership with sponsors, SUA hosts the Stuart Air Show which takes place at the airport utilizing a significant portion of the airfield. Spanning a long weekend, with several additional days for set-up and tear-down, the air show typically draws a crowd in excess of 50,000 attendees. This provides an opportunity for a recycling stream from an event that generates a fair amount of recyclable waste (e.g., bottles and cans).

C.4 Operation and Maintenance Requirements

Each tenant is responsible for collecting in-house waste from their own facilities as well as transporting it to one of their marked disposal containers (dumpsters). Additionally, each tenant is responsible for tracking and paying bills related to waste management services at the airport.

The airport has a very limited number of staff and additional responsibilities could be a burden, specifically on the small janitorial staff responsible for maintaining the spaces and buildings managed by the airport. This could provide a barrier to the implementation of an airport-wide recycling program. Conversely, there are airport tenants that have considerably more staff than the airport and would be less burdened by initiating an in-house recycling program.

C.5 Potential for Cost Savings or Revenue Generation

The airport may be able to sell scrap metal, particularly from construction and demolition projects. However, the low volume of waste limits the potential for savings or a reliable revenue generation source.

C.6 Plan to Minimize Solid Waste Generation

SUA does not have a formalized recycling or waste reduction program. Therefore, the following potential initiatives were identified that could advance SUA's recycling and waste reduction efforts which can be implemented individually, based on staff resources.

- **Develop a Waste Reduction Program:** Develop and implement a waste reduction program and encourage employee participation. The program should incentivize waste reduction, diversion, and recycling. Identify relevant waste reduction goals as well as office wide recycling methods (e.g., reusable toner cartridges, rechargeable batteries, reusable packaging, etc.) and individual participation (e.g., reusable water bottles, etc.) to further this program. The *City of Stuart Sustainability Action Plan* (November 2020) provides a number of targets and goals which could be considered when developing a plan.

- **Provide Airport-Wide Recycling:** Work with the County to establish recycling service and co-locate recycling receptacles with waste receptacles throughout the offices and facilities and use same-sized receptacles where practical.

- **Develop Environmentally Preferable Purchasing Procedures:** Work with the County to establish procedures for purchasing materials with recycled/bio-based content, low toxicity, or other environmentally friendly products. Consider Green Label equipment in purchasing guidelines or other equipment that has low emissions and/or low sound levels.

- **Develop an Awareness Campaign:** Once a recycling service has been provided, educate employees, tenants, and customer about proper recycling practices; this could include posters and additional signage.

- **Provide Hand Dryers:** Install high-efficiency hand dryers in all restrooms that do not currently have them installed and reposition towel dispensers to reduce paper towel use.

- **Enhance Tenant Engagement:** Coordinate with tenants to consolidate materials, improve economies of scale, and expand awareness about recycling practices.

- **Host a Periodic Universal Waste Collection Day:** Coordinate with Martin County and/or the City of Stuart Sanitation Services to host a periodic (recommend quarterly or semi-annually) collection day for universal waste. Provide an opportunity to airport employees, tenants, and the local community to drop off materials such as batteries, lightbulbs, electronics, pesticides, and more. Potentially create the opportunity to coordinate with the City of Stuart to expand their annual electronics recycling drive.

APPENDIX D

2020 and 2025 Noise Exposure Maps

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U.S. Department
of Transportation
Federal Aviation Administration

Orlando Airports District Office
8427 SouthPark Circle, Suite 524
Orlando, FL 32819
Phone: (407) 487-7720
Fax: (407) 487-7135

December 14, 2021

Mr. Sam Carver
Airport Manager
Witham Field / Martin County Airport
2011 Southeast Airport Road
Stuart, Florida 34996

Dear Mr. Carver:

Re: Noise Exposure Maps Compliance Determination
Witham Field / Martin County Airport (SUA)

This is to notify you that the Federal Aviation Administration (FAA) has evaluated the final Noise Exposure Maps (NEMs) and supporting documentation submitted in accordance with Section 103(a)(1) of the Aviation Safety and Noise Abatement Act of 1979 (ASNA), (49 United States Code [U.S.C.] §47503). We have determined that the NEMs are in compliance with applicable requirements of Title 14 Code of Federal Regulations [CFR] Part 150. Further, we have determined that the maps submitted, including the existing conditions "2020 Noise Exposure Map (Map 1 of 5)" and "2025 Noise Exposure Map (Map 2 of 5)", fulfill the requirements for current year (2021) and the future year (2026) noise exposure maps.[1]

FAA's determination that the NEMs are in compliance is limited to a finding that the maps were developed in accordance with the procedures contained in Appendix A of 14 CFR Part 150. Such determination does not constitute approval of your data, information, or plans.

Should questions arise concerning the precise relationship of specific properties to noise exposure contours depicted on your NEMs, you should note that the FAA will not be involved in any way in determining the relative locations of specific properties with regard to the depicted noise exposure contours, or in interpreting the maps to resolve questions concerning, for example, which properties should be covered by the provisions of Section 107 of ASNA (49 U.S.C. §47506). These functions are inseparable from the ultimate land use control and planning responsibilities of local government. These local responsibilities are not changed in any way under Part 150 or through FAA's determination relative to your NEMs. Therefore, the responsibility for the detailed overlaying of noise exposure contours onto the maps depicting properties on the surface rests exclusively with you, the airport operator, or with those public

[1] The draft 2020 and 2025 NEMs were submitted to FAA for review in 2020. However, the review process, public involvement, and submittal and approval of the final NEMs incurred some delay during the pandemic, resulting in the submittal of the final NEMs in 2021. The Airport Sponsor has certified that the submitted NEMs reasonably represent current year (2021) activity and projected (2026) activity at the airport. The FAA independently reviewed the submitted information, and current forecasts and data for the airport, and concurred that the submitted NEMs reasonably reflect current and projected activity at the airport.

agencies and planning agencies with which consultation is required under Section 103 of ASNA (49 U.S.C. §47503). The FAA relies on the certification by you, under 14 CFR §150.21, that the statutorily required consultation has been accomplished.

The FAA will publish a notice in the Federal Register announcing its determination on the NEMs for Witham Field / Martin County Airport.

Your local notice of this determination and the availability of the NEMs, when published at least three times in a newspaper of general circulation in the county or counties where affected parties are located, will satisfy the requirements of Section 107 of the ASNA Act (49 U.S.C. §47506).

Your attention is also called to the requirements of 14 CFR §150.21(d), involving the prompt preparation and submission of revisions to these maps of any actual or proposed change in the operation of Witham Field / Martin County Airport which might create any substantial, new noncompatible use in any areas depicted on the NEMs, or significant reduction in noise over noncompatible land uses that were previously included in the NEM contour.

Sincerely,

Bart Vernace, P.E.
Manager

cc: APP-400
ASO-610
ASO-7

CHAPTER 5
2020 and 2025 Noise Exposure

5.1 Introduction

This chapter presents the 2020 Existing Conditions and 2025 Future Conditions DNL contours for SUA. As discussed in **Chapter 4**, the contours show how noise from aircraft operations is distributed over the surrounding area. This chapter identifies land use compatibility using FAA guidelines, identifies noise sensitive locations, and quantifies the types of land uses and population within the DNL 60 and higher contours.

14 CFR Part 150 requires that the aircraft noise exposure for the year of submittal (2020) and for a future year (2025) be developed. The DNL 65, DNL 70, and DNL 75 contours are the only contours required by the FAA for inclusion in a 14 CFR Part 150 Study and for the agency's acceptance of the NEMs. However, Martin County has adopted the DNL 60 for land use compatibility as reflected in local zoning ordinances; therefore, the DNL 60 is included in the NEMs in accordance with 14 CFR Part 150, which allows for lower standards adopted by municipalities. The City of Stuart has not adopted a lower threshold so the DNL 65 will be used for land use compatibility purposes within the City. This approach for determining land use compatibility is in line with the approach used in the prior Part 150 Study conducted at SUA. The subtotals within the DNL 60 in unincorporated Martin County are provided in each table throughout the following sections. Specific elements that are required to be included on the existing and future NEMs and required supplemental graphics are identified in 14 CFR Part 150. These include depictions of noise sensitive sites within the DNL 60 contour. The official SUA 2020 and 2025 NEMs are included in **Appendix K** of this report.

5.2 2020 Noise Exposure

Figure 5-1 depicts the 2020 Existing Conditions DNL contours superimposed on an existing land use map. In accordance with 14 CFR Part 150, the DNL 60, DNL 65, DNL 70, and DNL 75 contours are shown. Furthermore, the contours accurately represent noise based on airport and operational data that are representative of the year 2020, as described in **Section 4.3**. The figure also depicts community and geographic reference points, such as SUA's boundary and runways, political boundaries, area roads and highways, and waterbodies. This figure assists in understanding the geographic relationship of SUA's DNL contours to the surrounding community.

The largest portions of the contours extend off of Runway 12-30, which is consistent with this being the primary runway at SUA. While the DNL 60 contour extends off airport, the DNL 65 contour is nearly completely on airport property. The DNL 70 and 75 contours remain entirely on Airport property.

5.2.1 Land Use Compatibility – 2020

The total area encompassed by the 2020 DNL 60 and greater contour is approximately 323 acres. Land uses located within the 2020 DNL 60 and higher contours were identified by overlaying the contours on parcel-level land use data provided by Martin County. Using geographic information system (GIS) software, the types and amount of land uses were calculated. The total acres for each land use category within the DNL 60 and higher contours are shown in **Table 5-1.**

The FAA's Land Use Compatibility Guidelines discussed in Section 3.3 show that noise-sensitive land uses such as residential, mobile home parks, transient lodging (e.g., hotels and motels), schools, and outdoor music venues are not compatible with noise levels of DNL 65 or higher. Other noise-sensitive land uses such as hospitals, nursing homes, churches, auditoriums, and concert halls are generally compatible with noise levels between DNL 65 and DNL 75 when measures that achieve an outdoor-to-indoor Noise Level Reduction (NLR) of 25 to 30 decibels are incorporated into the structures.[24] Commercial, manufacturing, and recreational land (parks, amusement parks, zoos, etc.) are generally less sensitive to noise and considered compatible with noise levels up to DNL 70 (parks are compatible up to DNL 75). Commercial and manufacturing properties are compatible with noise levels up to DNL 80 with NLR of 25 to 30 decibels.

As shown in **Table 5-1**, the 2020 NEM DNL 60 and higher contours contain approximately 40 acres of Single Family & Duplex residential land use. Aside from water (approximately 4 acres), the majority of the non-residential land uses exposed to aircraft noise of DNL 60 and higher in 2020 are classified as Transportation & Utilities (approximately 416 acres), Industrial & Manufacturing (approximately 37 acres), and Public Facilities and Institutions (approximately 28 acres). There are approximately 72 acres of Recreation areas within the 2020 DNL 60 contour located to the southeast of SUA. Land uses within the DNL 65 and greater contours are limited to four land use categories: Recreation, Industrial & Manufacturing, Transportation & Utilities, and Public Facilities and Institutions.

[24] Normal residential construction can be expected to provide an outdoor to indoor NLR of 20 dB.

TABLE 5-1
LAND USES EXPOSED TO DNL 60 AND HIGHER - 2020

Land Use Category[1]	Land Uses exposed to DNL 60 and Higher (acres)[2]							Housing Units[1]	Population[3]
	DNL 60-65	DNL *60-65 (Unincorporated Martin County)*	DNL *60-65 (Stuart Only))*	DNL 65-70	DNL 70-75	DNL 75+	Total		
Recreation	72.49	*72.49*	*0.00*	13.09	1.62	0.07	**87.28**	0	0
Single Family & Duplex	39.85	*23.34*	*16.52*	0.00	0.00	0.00	**39.85**	139	316
Retail and Office	0.90	*0.00*	*0.90*	0.00	0.00	0.00	**0.90**	0	0
Mixed Use	0.30	*0.00*	*0.30*	0.00	0.00	0.00	**0.30**	0	0
Industrial & Manufacturing	27.90	*18.83*	*9.07*	8.68	0.13	0.00	**36.72**	0	0
Transportation & Utilities	169.62	*144.28*	*25.34*	118.16	73.67	54.69	**416.15**	0	0
Public Facilities and Institutions	24.78	*4.55*	*20.23*	3.41	0.00	0.00	**28.18**	0	0
Vacant	1.32	*0.57*	*0.74*	0.00	0.00	0.00	**1.32**	0	0
Water Bodies	3.86	*3.86*	*0.00*	0.00	0.00	0.00	**3.86**	0	0
Total	**341.03**	*267.93*	***73.11***	**143.34**	**75.43**	**54.76**	**614.56**	**153**	**351**

SOURCES:
[1] Housing unit counts and Land Use Categories derived from Martin County Property Appraiser (Aug. 2018) and St. Lucie County Property Appraiser (Aug. 2018). It should be noted that 97 of these units fall within the DNL 60 within the City of Stuart. Because the City of Stuart has not adopted the DNL 60 as its level of significance, they are not considered noncompatible.
[2] Noise contours from Environmental Science Associates (ESA)
[3] Population estimates derived from 2013-2017 American Community Survey 5-Year Estimate (Population per Occupied Housing Units): 2.18 (City of Stuart); 2.49 (Unincorporated Martin County)

5.2.2 Population within 2020 DNL Contours

Table 5-2 presents the estimated number of households, population, and the noise sensitive sites exposed to DNL 60 and higher in noncompatible areas in 2020. Based on demographic data by census block from the U.S. Census Bureau's 2010 Decennial Census and parcel data gathered through the Florida Geographic Data Library (FGDL), 139 housing units are exposed to aircraft noise of DNL 60 and higher in 2020 with 43 of these units in unincorporated Martin County. A housing unit was considered within a contour if any portion of the parcel boundary fell within that contour.

The population exposed to aircraft noise of DNL 60 and higher was determined by calculating the average number of persons per household in each individual census block within the DNL 60-65 and higher contours and multiplying that number by the number of households within each census block (or portion thereof located within the DNL 60-65 and higher contours). The population within each individual block (or portion thereof) was then summed to quantify the total number of persons within the DNL 60 and higher contours. The total population exposed to aircraft noise of DNL 60 and higher was estimated to be approximately 316 persons. However, since Martin County has adopted the DNL 60 while Stuart has not, only the housing units and population within unincorporated Martin County are considered noncompatible. Within unincorporated Martin County, the total population exposed to aircraft noise of DNL 60 and higher was estimated to be approximately 107 persons. There is no estimated population exposed to aircraft noise of DNL 65 and higher in 2020.

TABLE 5-2
NOISE SENSITIVE SITES EXPOSED TO DNL 60 AND HIGHER - 2020

Noise Level[1]	Total Area of Contours (Acres)	Housing Units[2]	Population[3]	Religious	Schools[4]	Hospitals	Historic Resources	Day Cares	Group Care	Libraries	Nursing Homes
DNL 60-65	341.03	139	316	0	0	0	0	0	0	0	0
DNL 60-65 (Unincorporated Martin County)	*267.93*	*43*	*107*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
DNL 65-70	143.34	0	0	0	0	0	0	0	0	0	0
DNL 70-75	75.43	0	0	0	0	0	0	0	0	0	0
DNL 75+	54.76	0	0	0	0	0	0	0	0	0	0
Total in Noncompatible Areas	**267.93**	**43**	**107**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

SOURCES:
[1] Noise contours from Environmental Science Associates (ESA)
[2] Housing unit counts derived from Martin County Property Appraiser (Aug. 2018) and St. Lucie County Property Appraiser (Aug. 2018)
[3] Population estimates derived from 2013-2017 American Community Survey 5-Year Estimate (Population per Occupied Housing Units): 2.18 (City of Stuart); 2.49 (Unincorporated Martin County)
[4] School locations obtained from Martin County School Board and St. Lucie County School Board

Figure 5-2 depicts the 2020 Existing Conditions DNL contour off of Runway 30 relative to each of the residential parcel boundaries. Residential parcels included in the previous NCP sound insulation program are identified. Of the 43 housing units in unincorporated Martin County exposed to aircraft noise of DNL 60 and higher in 2020,[25] 16 housing units (population 40) were already considered as part of Phase 2 of the sound insulation program implemented under the previous NCP. The remaining 27- housing units (population 67) within the DNL 60-65 contour have not been considered or addressed previously and are therefore considered noncompatible (see **Section 2.6.1**).

TABLE 5-3
HOUSING UNITS AND POPULATION NOT PREVIOUSLY SOUND INSULATED[1] - 2020

Noise Level[2]	Housing Units[3]	Population[3]
DNL 60-65	**27**	**67**
DNL 65-70	**0**	**0**
DNL 70-75	**0**	**0**
DNL 75+	**0**	**0**
TOTAL:	**27**	**67**

SOURCES:
[1] SUA Sound Insulation Program housing unit data from Martin County Airport. All housing units within the existing Sound Insulation boundary were excluded from this table regardless if they received treatment, elected to not participate or were deemed compatible through interior testing or determined ineligible.
[2] Noise contours from Environmental Science Associates (ESA)
[3] Housing units and population estimates derived from 2010 Census block-level data.

[25] A housing unit was included in the counts if any part of the related parcel is located within the DNL 65 dB contour boundary. These counts may include residences that are part of the existing sound insulation program as well as those deemed compatible due to noise testing. Potential eligibility for any future noise program consideration will depend on the specific recommendations of the NCP and may include increases in the number of units due to block rounding (etc.), and decreases due to testing and consideration of other factors (year of construction, etc.).

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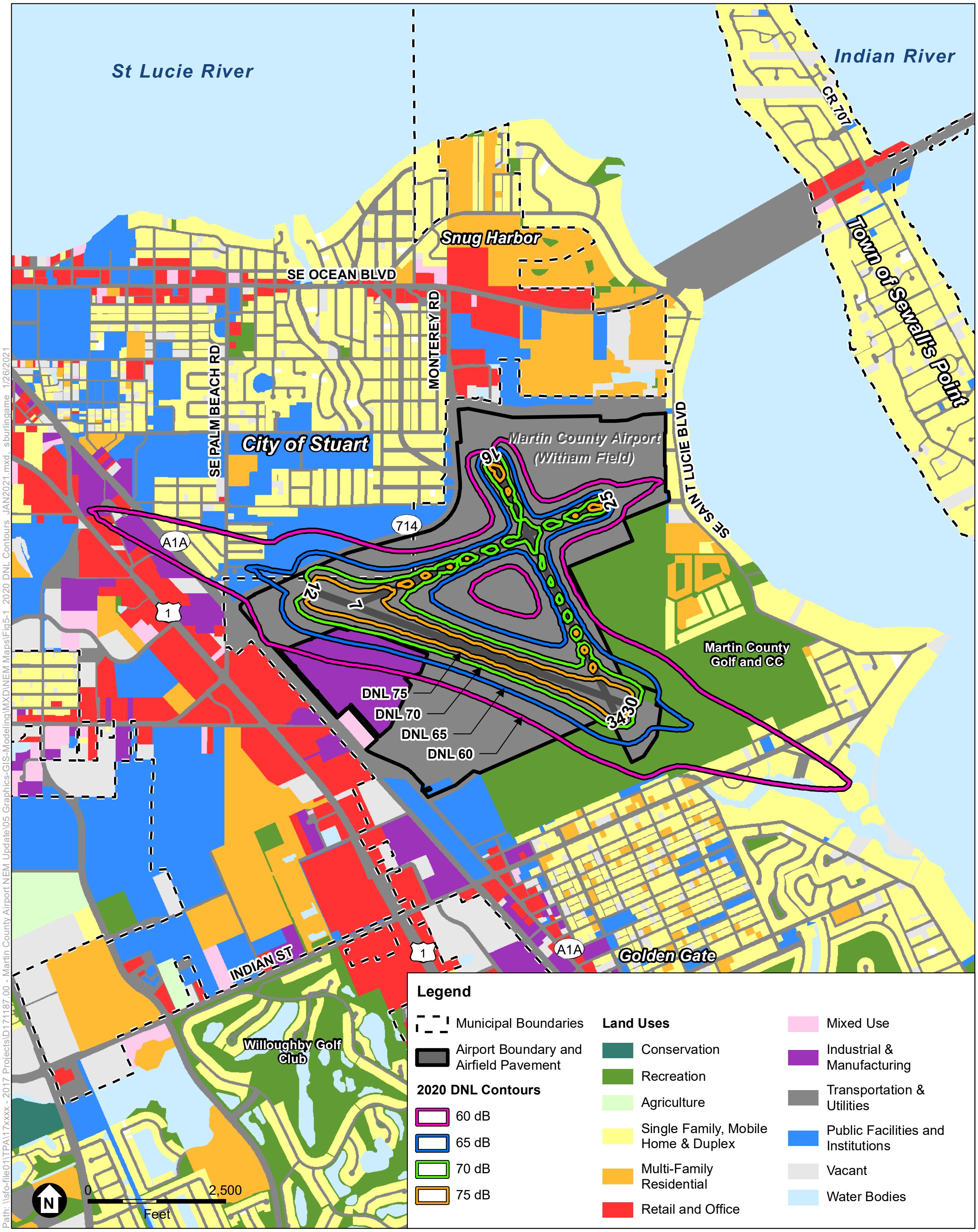

SOURCE: Esri; AEDT 3b; Martin County Property Appraiser, 8/2018; GAI, 2020, ESA, 2020
DNL = Day-Night Average Sound Level

Martin County Airport NEM Update

Figure 5-1
2020 DNL Contours
Martin County Airport (Witham Field)

ESA

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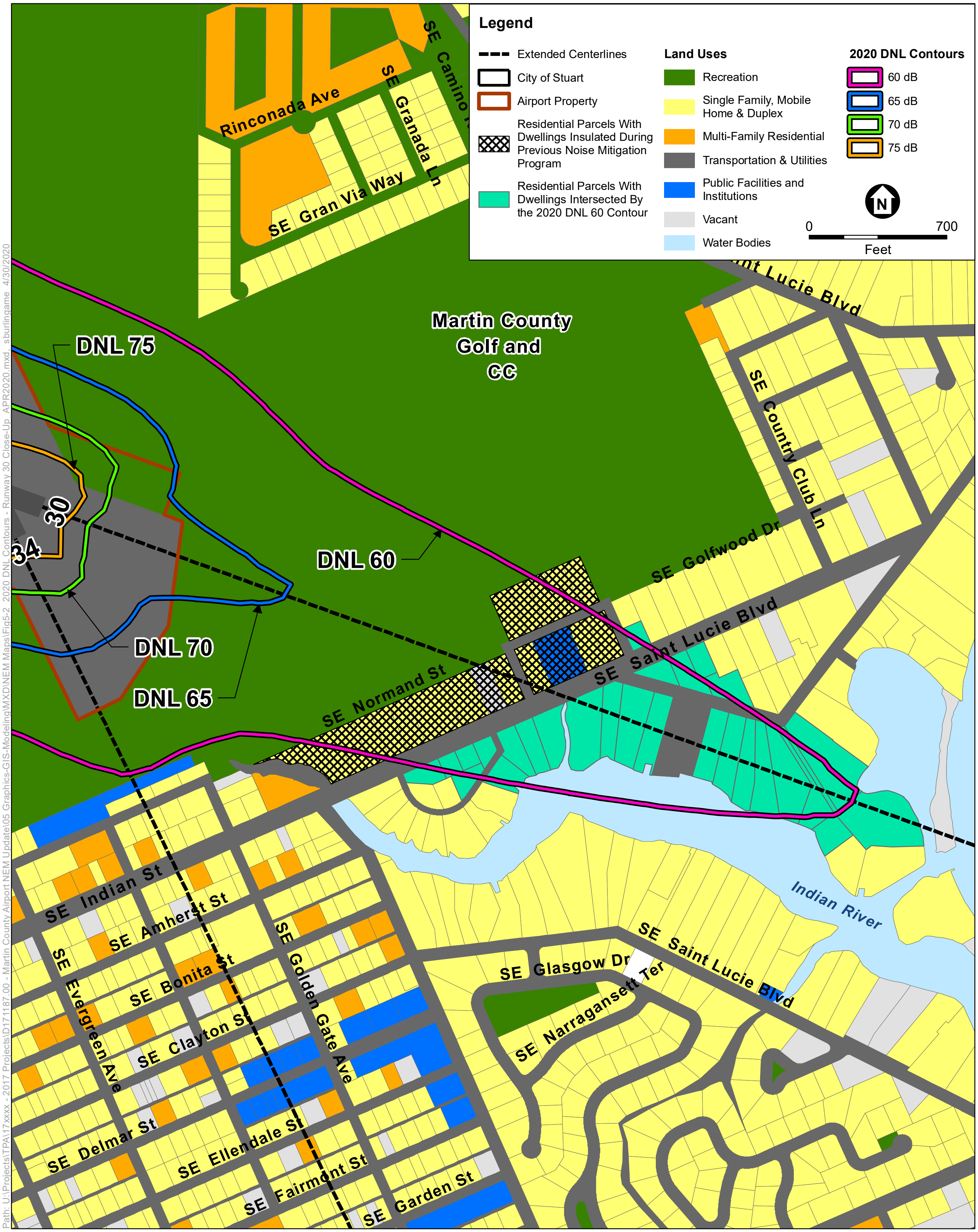

SOURCE: Esri; AEDT 3b; Martin County Property Appraiser, 8/2018; GAI, 2020, ESA, 2020
DNL = Day-Night Average Sound Level

Martin County Airport NEM Update

Figure 5-2
2020 DNL Contours and Residential Dwellings Within the Contours
Runway 30 Close-Up
Martin County Airport (Witham Field)

ESA

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5.3 2025 Noise Exposure

The 2025 Future Conditions DNL contours are depicted on **Figure 5-3**. Similar to **Figure 5-1**, the 2025 contours are superimposed over a future land use map. In accordance with 14 CFR Part 150, the 2025 contours reflect the anticipated noise conditions based on airport and operational data that are representative of the year 2025, as described in **Section 4.3**. Compared to the 2020 contours, the size and shape of the 2025 contours are similar, but reflect an increase in noise exposure due to the relative increase in aircraft operations compared to 2020. This is the only change between the 2020 and 2025 contours so the general shape is expected to remain similar.

5.3.1 Land Use Compatibility – 2025

The total area encompassed by the 2025 DNL 60 and higher noise contours is approximately 388 acres. The type and amount of land uses within the DNL 60 and higher contours are provided in **Table 5-4**. As shown the table, the 2025 DNL 60 and higher contours contain approximately 51 acres of Single Family and Two-Family Residential land use, and no acres of Multi-Family Residential.

The majority of the non-residential land uses exposed to aircraft noise of DNL 60 and higher in 2025 are Transportation & Utilities (approximately 442 acres), Recreation (approximately 97 acres), Industrial and Manufacturing (approximately 50 acres) and Public Facilities and Institutions (approximately 33 acres). There are approximately 9 acres of Water Bodies, 3 acres of Retail & Office, and 0.6 acres of Mixed Use. There is additionally approximately 2 acres of Vacant space within the DNL 60 and higher contours.

TABLE 5-4
LAND USES EXPOSED TO DNL 60 AND HIGHER - 2025

Land Use Category[1]	Land Uses exposed to DNL 60 and Higher (acres)[2]							Housing Units[1]	Population[3]
	DNL 60-65	DNL *60-65 (Unincorporated Martin County)*	DNL *60-65 (Stuart Only)*	DNL 65-70	DNL 70-75	DNL 75+	Total		
Recreation	77.11	*77.11*	*0.00*	17.91	2.10	0.14	**97.26**	0	0
Single Family & Duplex	50.99	*32.62*	*18.36*	0.00	0.00	0.00	**50.99**	167	384
Retail and Office	3.00	*0.00*	*3.00*	0.00	0.00	0.00	**3.00**	0	0
Mixed Use	0.59	*0.00*	*0.59*	0.00	0.00	0.00	**0.59**	0	0
Industrial & Manufacturing	39.22	*20.02*	*19.19*	10.14	0.36	0.00	**49.72**	0	0
Transportation & Utilities	179.87	*151.32*	*28.55*	121.90	79.95	60.70	**442.42**	0	0
Public Facilities and Institutions	26.98	*5.30*	*21.68*	5.64	0.00	0.00	**32.62**	0	0
Vacant	1.54	*0.60*	*0.94*	0.00	0.00	0.00	**1.54**	0	0
Water Bodies	8.56	*8.56*	*0.00*	0.00	0.00	0.00	**8.56**	0	0
Total	**387.84**	*295.53*	***92.31***	**155.59**	**82.40**	**60.85**	**686.69**	**167**	**384**

SOURCES:
[1] Housing unit counts and Land Use Categories derived from Martin County Property Appraiser (Aug. 2018) and St. Lucie County Property Appraiser (Aug. 2018). It should be noted that 104 of these units fall within the DNL 60 within the City of Stuart. Because the City of Stuart has not adopted the DNL 60 as its level of significance, they are not considered noncompatible.
[2] Noise contours from Environmental Science Associates (ESA)
[3] Population estimates derived from 2013-2017 American Community Survey 5-Year Estimate (Population per Occupied Housing Units): 2.18 (City of Stuart); 2.49 (Unincorporated Martin County)

5.3.2 Population within 2025 DNL Contours

Table 5-5 presents the estimated number of households, population and the noise sensitive sites exposed to DNL 60 and higher in 2025. Based on demographic data by census block from the U.S. Census Bureau's 2010 Decennial Census and parcel data gathered through the FGDL, the total population exposed to aircraft noise of DNL 60-65 is estimated to be 384. However, since Martin County has adopted the adopted the DNL 60 standard for significance while Stuart maintains the DNL 65 standard, only the housing units and population within unincorporated Martin County are considered noncompatible. Within unincorporated Martin County, the total housing units and population exposed to aircraft noise of DNL 60-65 was estimated to be 63 housing units and 157 persons. The majority of the noncompatible housing units (97%) in the DNL 60-65 are located off of Runway 30 with 2 residential units located off of Runway 25. When compared to 2020, this represents an increase of approximately 20 housing units and 50 people.

TABLE 5-5
NOISE SENSITIVE SITES EXPOSED TO DNL 60 AND HIGHER - 2025

Noise Level[1]	Total Area of Contours (Acres)	Housing Units[2]	Population[2]	Religious	Schools[3]	Hospitals	Historic Resources	Day Cares	Group Care	Libraries	Nursing Homes
DNL 60-65	387.84	167	384	0	0	0	0	0	0	0	0
DNL 60-65 (Unincorporated Martin County)	*295.53*	*63*	*157*	0	0	0	0	0	0	0	0
DNL 65-70	155.59	0	0	0	0	0	0	0	0	0	0
DNL 70-75	82.40	0	0	0	0	0	0	0	0	0	0
DNL 75+	60.85	0	0	0	0	0	0	0	0	0	0
Total in Noncompatible Areas	**295.53**	**63**	**157**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

SOURCES:
[1] Noise contours from Environmental Science Associates (ESA)
[2] Housing unit counts derived from Martin County Property Appraiser (Aug. 2018) and St. Lucie County Property Appraiser (Aug. 2018)
[3] Population estimates derived from 2013-2017 American Community Survey 5-Year Estimate (Population per Occupied Housing Units): 2.18 (City of Stuart); 2.49 (Unincorporated Martin County)
[4] School locations obtained from Martin County School Board and St. Lucie County School Board

Figures 5-4, 5-5, and 5-6 depict the 2025 Future Conditions DNL contour off of Runway 12, Runway 30, and Runway 25 respectively. The same 16 housing units off of Runway 30 (population 40) that were considered as part of Phase 2 of the previous sound insulation program are included in the overall counts. This leaves 47 total residential units (population 117) within the DNL 60-65 contour that are considered noncompatible (**Section 2.6.1**). There are 2 noncompatible residential units within the DNL 60 contour directly off the Runway 25 approach end. The remaining noncompatible residential units within the DNL 60 contour are located within unincorporated Martin County near the Runway 30 approach end.

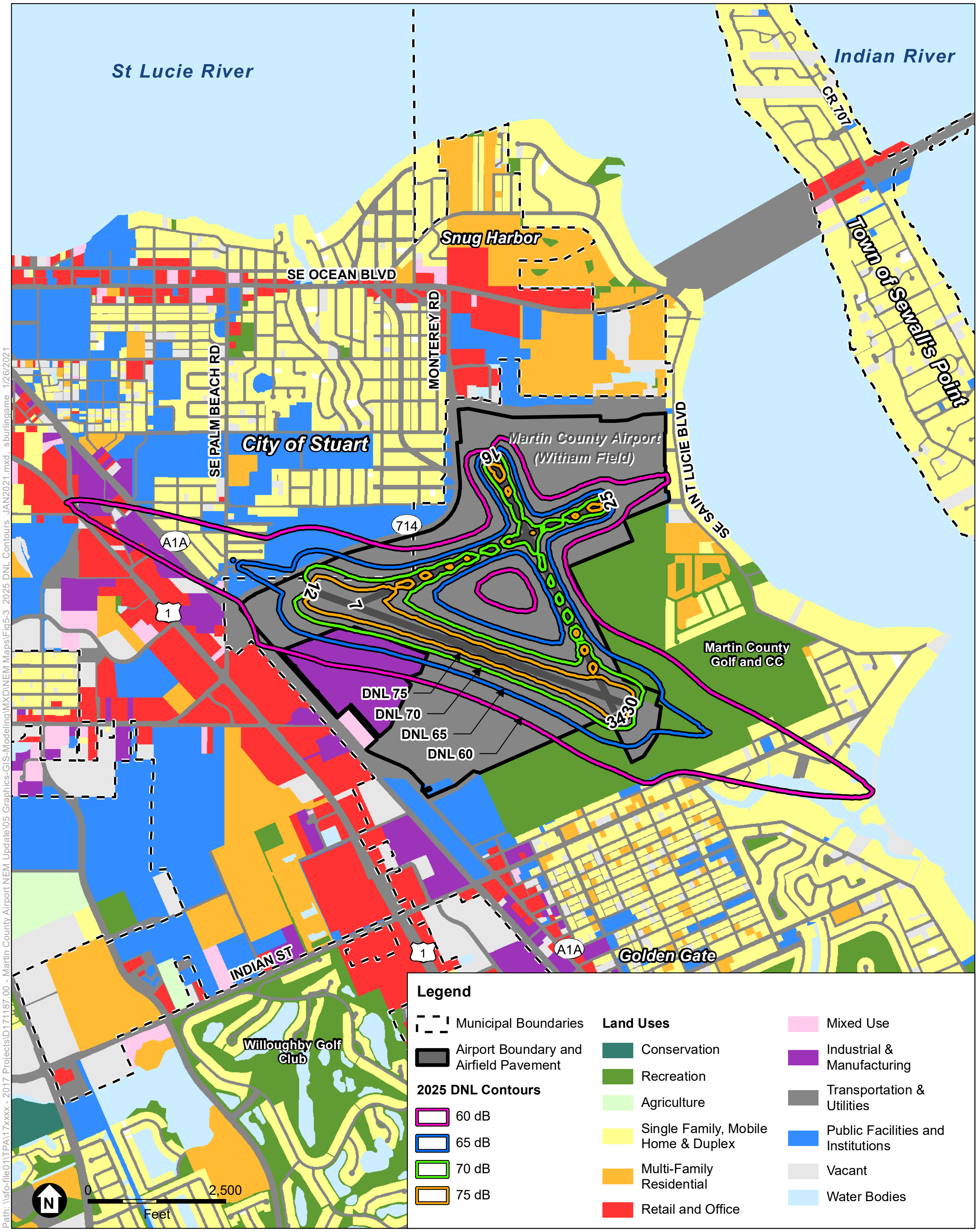
TABLE 5-6
HOUSING UNITS AND POPULATION NOT PREVIOUSLY SOUND INSULATED [1] - 2025

Noise Level[2]	Housing Units[3]	Population[3]
DNL 60-65	47	117
DNL 65-70	0	0
DNL 70-75	0	0
DNL 75+	0	0
TOTAL:	47	117

SOURCES:
[1] SUA Sound Insulation Program housing unit data from Martin County Airport. All housing units within the existing Sound Insulation boundary were excluded from this table regardless if they received treatment, elected to not participate or were deemed compatible through interior testing or determined ineligible.
[2] Noise contours from Environmental Science Associates (ESA)
[3] Housing units and population estimates derived from 2010 Census block-level data.

5.4 Noise Sensitive Sites Within the DNL Contours

There are no noise sensitive facilities (e.g., schools, religious facilities, hospitals, and structures listed in the National Register of Historic Places) exposed to noise levels of DNL 60 and higher in either the 2020 or 2025 contours.



SOURCE: Esri; AEDT 3b; Martin County Property Appraiser, 8/2018; GAI, 2020, ESA, 2020
DNL = Day-Night Average Sound Level

Martin County Airport NEM Update

Figure 5-3
2025 DNL Contours
Martin County Airport (Witham Field)

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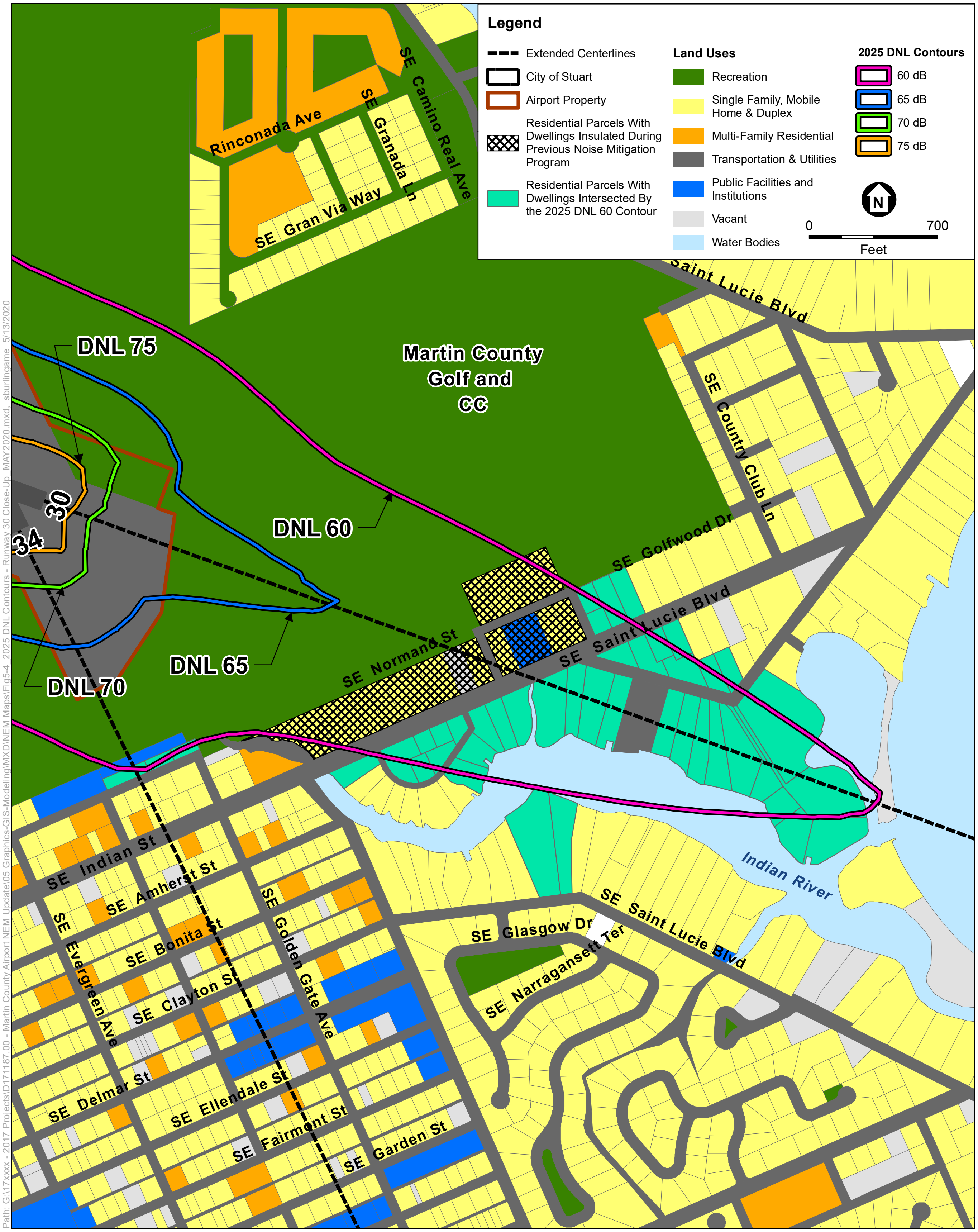

Path: G:\17xxxx - 2017 Projects\D171187.00 - Martin County Airport NEM Update\05 Graphics-GIS-Modeling\MXD\NEM Maps\Fig5-4 2025 DNL Contours - Runway 30 Close-Up MAY2020.mxd, sburlingame 5/13/2020

SOURCE: Esri; AEDT 3b; Martin County Property Appraiser, 8/2018; GAI, 2020, ESA, 2020
DNL = Day-Night Average Sound Level

Martin County Airport NEM Update

Figure 5-4
2025 DNL Contours and Residential Dwellings Within the Contours
Runway 30 Close-Up
Martin County Airport (Witham Field)

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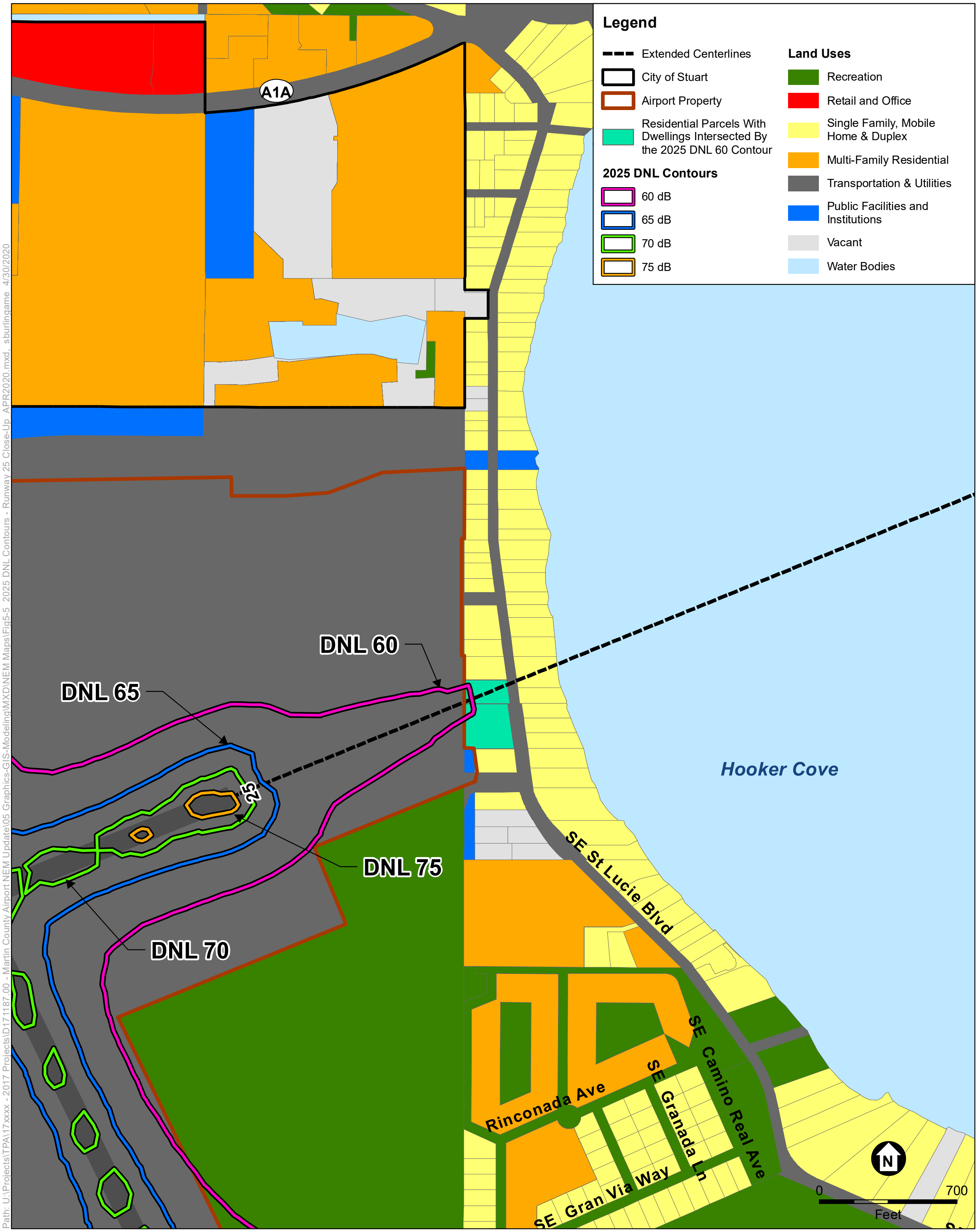

SOURCE: Esri; AEDT 3b; Martin County Property Appraiser, 8/2018; GAI, 2020, ESA, 2020
DNL = Day-Night Average Sound Level

Martin County Airport NEM Update

Figure 5-5
2025 DNL Contours and Residential Dwellings Within the Contours
Runway 25 Close-Up
Martin County Airport (Witham Field)

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5.5 Comparison of 2020 and 2025 NEMs

A comparison of the 2025 to the 2020 contours shows that the land area encompassed by the DNL 60-65 contours is projected to increase by 46 acres (see **Table 5-7**). Within that contour, 28 additional residential units and 67 people would be exposed to noise levels of DNL 60 or higher in 2025. When only considering the 60-65 contour in unincorporated Martin County, the area within contours are projected to increase by 27.8 acres by 2025. With respect to housing units, approximately 20 more units and 50 more people in noncompatible areas would be exposed to noise levels of DNL 60-65 in 2025, when compared to 2020 (see **Table 5-8**). **Figure 5-6** shows a comparison of the 2020 and 2025 DNL contours and the areas where sound exposure is expected to increase based on projected operating conditions. **Figures 5-7 and 5-8** show the 2020 and 2025 contours with a close-up of the Runway 30, and Runway 25 ends respectively.

TABLE 5-7
LAND USES EXPOSED TO DNL 60 AND HIGHER - 2020-2025 CHANGE

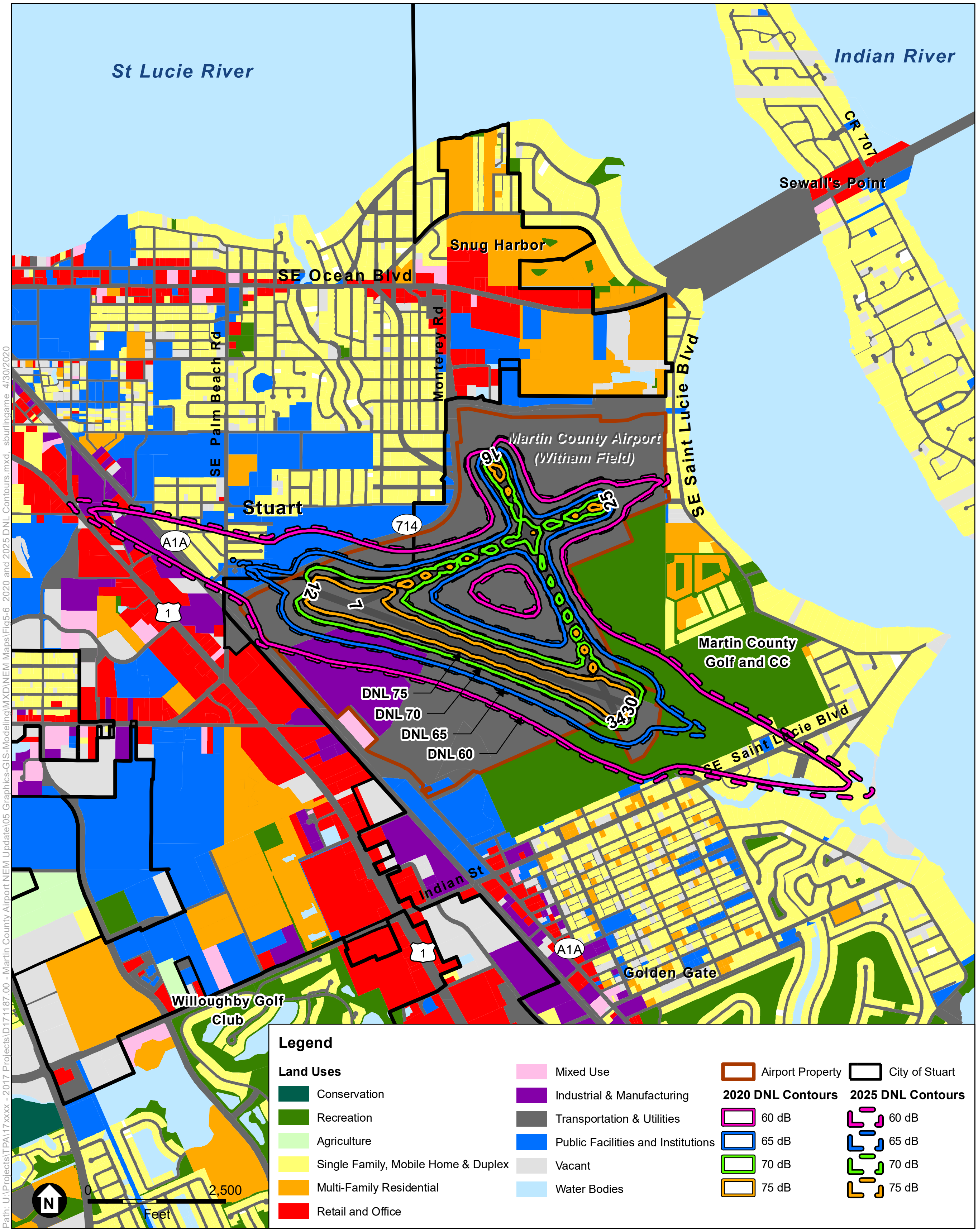
Land Use Category[1]	Land Uses exposed to DNL 65 and Higher (acres)[2]							Housing Units[1]	Population[3]
	DNL 60-65	DNL *60-65 (Unincorporated Martin County)*	DNL *60-65 (Stuart Only)*	DNL 65-70	DNL 70-75	DNL 75+	Total		
Recreation	4.62	*4.62*	*0.00*	4.82	0.48	0.07	**9.98**	0	0
Single Family & Duplex	11.13	*9.29*	*1.84*	0.00	0.00	0.00	**11.13**	28	67
Retail and Office	2.09	*0.00*	*2.09*	0.00	0.00	0.00	**2.09**	0	0
Mixed Use	0.29	*0.00*	*0.29*	0.00	0.00	0.00	**0.29**	0	0
Industrial & Manufacturing	11.31	*1.19*	*10.12*	1.46	0.23	0.00	**13.01**	0	0
Transportation & Utilities	10.25	*7.03*	*3.22*	3.73	6.27	6.01	**26.27**	0	0
Public Facilities and Institutions	2.20	*0.75*	*1.45*	2.24	0.00	0.00	**4.44**	0	0
Vacant	0.22	*0.03*	*0.19*	0.00	0.00	0.00	**0.22**	0	0
Water Bodies	4.70	*4.70*	*0.00*	0.00	0.00	0.00	**4.70**	0	0
Total	**46.81**	*27.61*	***19.20***	**12.25**	**6.98**	**6.08**	**72.13**	**28**	**67**

SOURCES:
[1] Housing unit counts and Land Use Categories derived from Martin County Property Appraiser (Aug. 2018) and St. Lucie County Property Appraiser (Aug. 2018). It should be noted that 104 of these units fall within the DNL 60 within the City of Stuart. Because the City of Stuart has not adopted the DNL 60 as its level of significance, they are not considered noncompatible.
[2] Noise contours from Environmental Science Associates (ESA)
[3] Population estimates derived from 2013-2017 American Community Survey 5-Year Estimate (Population per Occupied Housing Units): 2.18 (City of Stuart); 2.49 (Unincorporated Martin County)

TABLE 5-8
NOISE SENSITIVE SITES EXPOSED TO DNL 60 AND HIGHER – 2020-2025 CHANGE

Noise Level[1]	Total Area of Contours (Acres)	Housing Units[2]	Population[2]	Religious	Schools[3]	Hospitals	Historic Resources	Day Cares	Group Care	Libraries	Nursing Homes
DNL 60-65	46.81	28	67	0	0	0	0	0	0	0	0
DNL 60-65 (Unincorporated Martin County)	*27.61*	*20*	*50*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
DNL 65-70	12.25	0	0	0	0	0	0	0	0	0	0
DNL 70-75	6.98	0	0	0	0	0	0	0	0	0	0
DNL 75+	6.08	0	0	0	0	0	0	0	0	0	0
Total in Noncompatible Areas	**27.61**	**20**	**50**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

SOURCES:
[1] Noise contours from Environmental Science Associates (ESA)
[2] Housing unit counts derived from Martin County Property Appraiser (Aug. 2018) and St. Lucie County Property Appraiser (Aug. 2018)
[3] Population estimates derived from 2013-2017 American Community Survey 5-Year Estimate (Population per Occupied Housing Units): 2.18 (City of Stuart); 2.49 (Unincorporated Martin County)
[4] School locations obtained from Martin County School Board and St. Lucie County School Board



SOURCE: Esri; AEDT 3b; Martin County Property Appraiser, 8/2018; GAI, 2020, ESA, 2020
DNL = Day-Night Average Sound Level

Martin County Airport NEM Update

Figure 5-6
2020 and 2025 DNL Contours
Martin County Airport (Witham Field)

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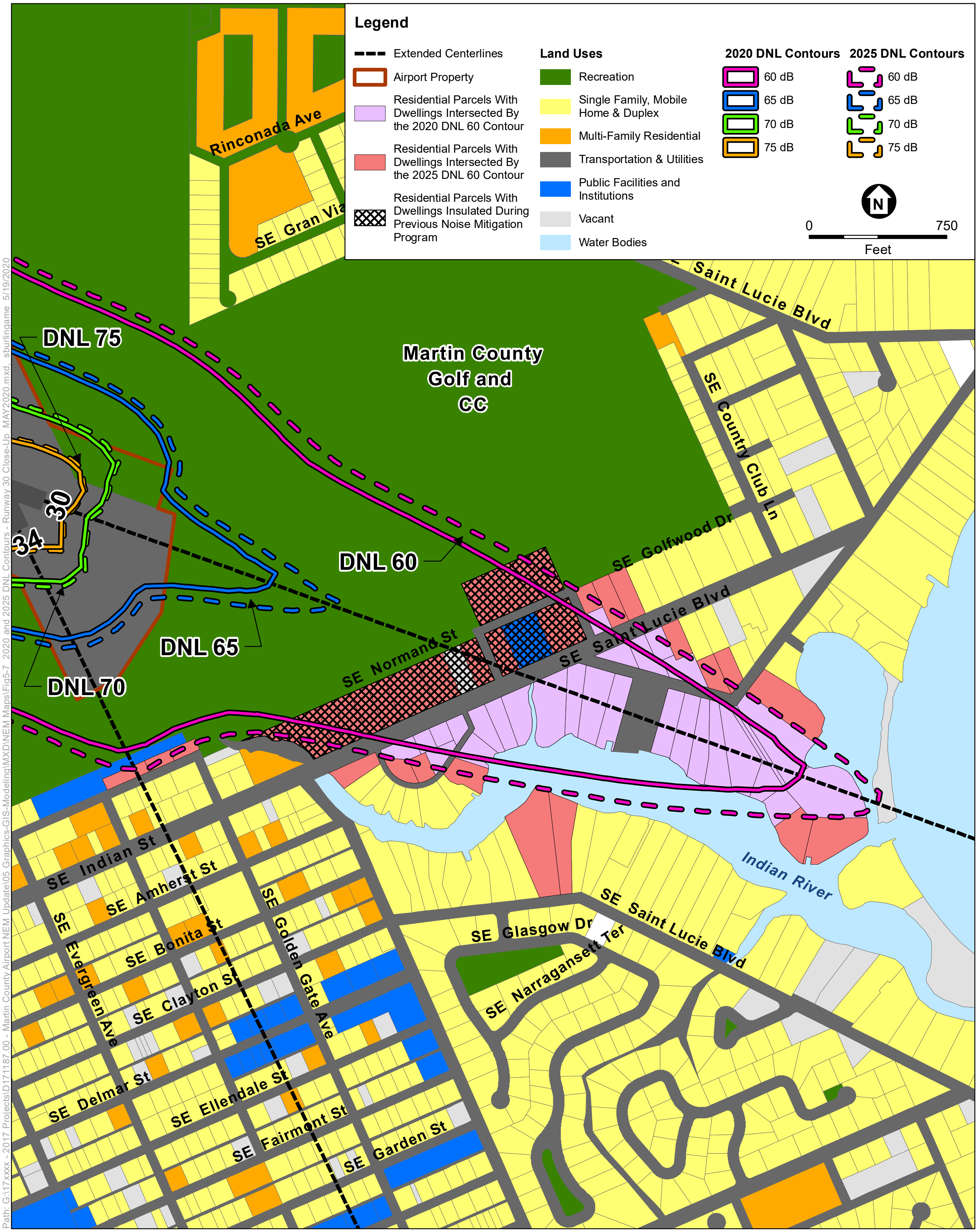

SOURCE: Esri; AEDT 3b; Martin County Property Appraiser, 8/2018; GAI, 2020, ESA, 2020
DNL = Day-Night Average Sound Level

Martin County Airport NEM Update

Figure 5-7
2020 and 2025 DNL Contours and Residential Dwellings Within the Contours
Runway 30 Close-Up
Martin County Airport (Witham Field)

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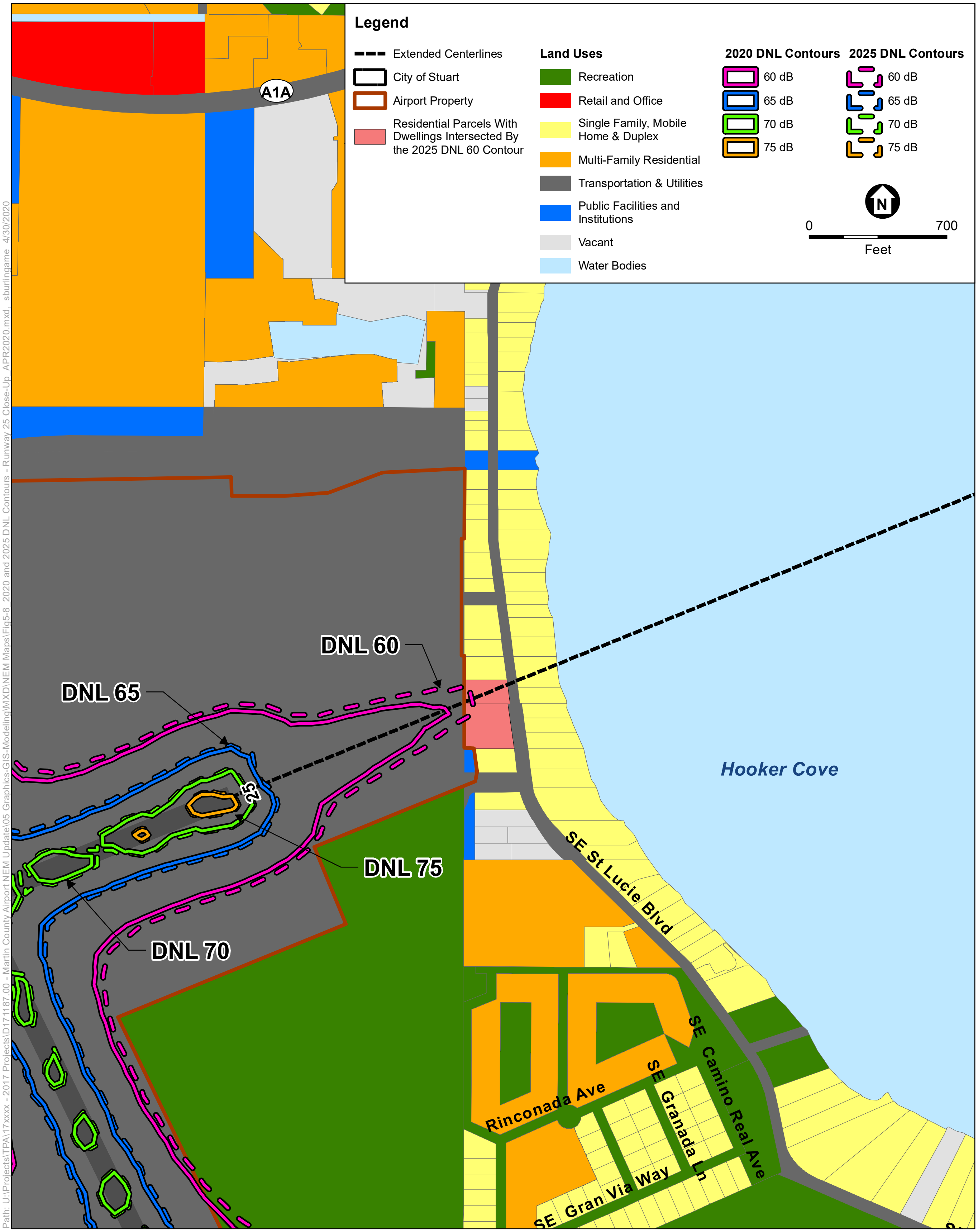

Path: U:\Projects\TPA\17xxxx - 2017 Projects\D171187.00 - Martin County Airport NEM Update\05 Graphics-GIS-Modeling\MXD\NEM Maps\Fig5-8 2020 and 2025 DNL Contours - Runway 25 Close-Up APR2020.mxd sburlingame 4/30/2020

SOURCE: Esri; AEDT 3b; Martin County Property Appraiser, 8/2018; GAI, 2020, ESA, 2020
DNL = Day-Night Average Sound Level

Martin County Airport NEM Update

Figure 5-8
2020 and 2025 DNL Contours and Residential Dwellings Within the Contours
Runway 25 Close-Up
Martin County Airport (Witham Field)

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APPENDIX E

Airport Sustainability Program

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APPENDIX E
Airport Sustainability Program

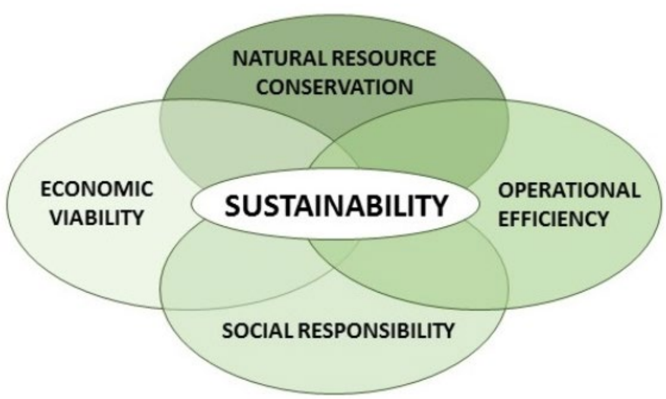
E.1 Introduction

This appendix begins the process of defining as sustainability program for Witham Field (SUA) so that sustainability is considered regularly as part of daily operations, long-term planning, and decision-making at the airport. The following sections define the relationship of SUA sustainability planning to Martin County's sustainability initiatives and Strategic Energy Master Plan (SEMP);[1] provide baseline information for six selected focus areas specific to the airport; and outline recommended next steps in the evolution of a program. When necessary, the City of Stuart's Sustainability Action Plan (SAP) is also considered in order to make recommendations on sustainability initiatives for the airport.[2]

As the SUA Sustainability Program continues to grow in its scope and success, further iterations may include identification of baseline tracking systems, the establishment of performance targets, inclusion of tenants and other onsite businesses, and the development of sustainability-focused initiatives within the airport footprint.

E.1.1 Definition of Sustainability

The Airports Council International – North America and Florida Airports Council define airports sustainability as "a holistic approach to managing an airport so as to ensure the integrity of the



1 Martin County, 2012. *Moving Martin Forward*. Accessed in December 2021 at https://www.martin.fl.us/sites/default/files/meta_page_files/GSD-SEMP-2012.pdf

2 City of Stuart, 2020. *Sustainability Action Plan*. November 2020. Accessed in October 2021 at https://cityofstuart.us/DocumentCenter/View/2978/Sustainability-Action-Plan---Adopted-Nov-2020

Economic viability, Operational efficiency, Natural resource conservation, and Social responsibility (EONS) of the airport." The SUA Sustainability Program is guided by the EONS approach, and incorporates lessons learned from other airport sustainability planning efforts.[3]

In general, the implementation of sustainability principles stimulates environmental and mission efficiencies, such as:

- Improved long-term environmental quality, resource availability, and prevention of environmental degradation.
- Improved worker health and safety.
- Reduced compliance costs, including reduced need for expensive environmental controls.
- Diminished risk of non-compliance and long-term liabilities.
- Reduced costs associated with the lifecycle management of raw materials, including procurement, storage, use, treatment, and disposal.
- Decreased operating costs, including energy and water use.
- Enhanced relations with federal, state, and local regulators, as well as the general public and neighboring communities.

Successful sustainability projects often result in cost savings that can be used to offset other program costs, fund the purchase of new equipment, provide additional training, and/or improve the quality of life for employees and the public.

Sustainability planning uses baseline assessments of an organization's environmental resource consumption and community outreach programs to identify short-term and long-term objectives to reduce environmental impacts and realize economic benefits and improved community relations in relation to those reduced impacts

E.1.2 SUA Sustainability Planning Vision and Objectives

The vision of the SUA Sustainability Program is to effectively tier from the Martin County and City of Stuart sustainability initiatives, highlighting priorities specific to the airport, and to provide an organizational structure that maintains sustainability as a uniting concept at the core of all SUA programs and decisions. This plan is linked to the SUA master plan process and includes the development of sustainability screening criteria for addition into the master plan and application as future improvements are implemented.

This initial effort is focused on developing a baseline program and data collection protocol. It is also anticipated that SUA will continue to grow this program, eventually expanding to include SUA tenants.

3 National Academies of Sciences, Engineering, and Medicine (NASEM), 2015. *Lessons Learned from Airport Sustainability Plans*. Washington, DC: The National Academies Press. https://doi.org/10.17226/22111

E.1.3 Sustainability Focus Areas

As determined by airport management, and in tandem with the master plan process, the following specific focus areas are targeted for the development of a sustainability baseline at SUA:

- Natural Resources
    - Energy
    - Water Use and Quality
    - Airport Fleet Fuels
- Social Responsibility
    - Noise and Compatible Land Use
    - Employee Wellness
    - Community Impact

Table E-1 identifies the elements of a typical EONS sustainability program, which may be considered in future iterations of the SUA Sustainability Program and sustainability planning initiatives.

TABLE E-1
RANGE OF EONS SUSTAINABILITY PROGRAM ELEMENTS

Economic Viability	**Natural Resource Conservation**	**Social Responsibility**
Airport Economic Contribution	*Water Use*	*Noise*
Business Partners	*Water Quality*	*Employee Wellness*
Customer Satisfaction	*Energy Consumption*	*Employee Satisfaction*
	Solid Waste and Recycling	*Community Impact*
Operational Efficiency	*Air Emissions*	
Airport Vehicle Fleet	*Hazardous Materials Procurement / Consumption / Disposal*	
Aviation Operations		
Airport Facilities Operations	*Fuels*	
Employee Training	*Green Procurement / Eco-purchasing*	

E.1.4 SUA Sustainability Program Management

The SUA Sustainability Program is an executive program, championed by the Airport Manager and led and managed through the airport's administration office. However, the SUA Sustainability Program is dependent on the integration of sustainability throughout all airport programs, and the operations, maintenance, and accounting departments all have particular tracking and implementation responsibilities detailed in the following sections.

E.2 Integration with Other Planning Efforts

The airport's sustainability program is tiered from and designed to support ongoing efforts at Martin County as well as the City of Stuart.

E.2.1 Martin County

Martin County does not have a centralized sustainability program; rather, the County has incorporated sustainability principles into their way of doing business across all activities and the existing job descriptions of their current workforce. They operate sustainability as an integrated cultural paradigm (as opposed to an isolated, stand-alone department). This structure fosters philosophical connectivity between departments on sustainability principles and enhances communication and buy-in of new initiatives and projects.

Martin County is committed to creating, applying, and promoting sustainable practices within the community and local government, and in 2010 the Martin County General Services Department achieved gold level certification as a Green Local Government from the Florida Green Building Coalition (FGBC). FGBC Green Local Government Standard designates Green Cities and Green Counties for outstanding environmental stewardship, showcasing the positive influence of sustainable practices in promoting efficient internal communication, cost reductions, and effective risk and asset management.[4]

Current County-wide initiatives and major projects focus on energy sustainability and efficiency. These initiatives are implemented in critical-function facilities as a priority, but will eventually spread to the whole Martin County system:

- Life-cycle and tangential cost assessment and integration into project decision making (e.g., when deciding to repair or invest in upgrade and replacement).
- Building hardening (hurricane hardening), including window replacement with impact-rated glass and moving functions and assets from trailers into hardened buildings.
- Adaptive reuse (buildings).
- End-of-lifecycle replacement of existing heating, ventilation, and air conditioning (HVAC) with 2-stage air conditioning systems.
- LED lighting conversion.
- Building and process adaptations to enhance air quality and reduce toxicity exposure in fire and emergency services.
- Reclaimed water for irrigation.

The Martin County SEMP is a detailed economic and environmental program to implement energy efficiency solutions in the County. The plan seeks to educate residents on water conservation, create a positive impact on the environment by creating local jobs, and significantly improve the health and quality of life in the Martin County. The SEMP established sustainability goals for the County in 2012 with the two overarching as: 1) measure and track energy usage throughout the County and

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[4] Martin County, 2021. *Green Government Sustainability*. Accessed in December 2021 at https://www.martin.fl.us/martin-county-services/green-government-sustainability

2) reduce the County's carbon footprint 20 percent before 2022. The SEMP plans to achieve its goals through energy reductions in transportation, renewable energy adoption, broader energy efficiency education, and reductions in water use and energy usage. However, at the time of writing this appendix, Martin County's progress towards its goals in the SEMP are not publicly available for tracking and reporting. It is therefore uncertain if the County has met its goal reducing 20 percent of its carbon footprint.

E.2.2 City of Stuart

The City of Stuart sustainability initiative addresses the City's environmental vulnerabilities and identifies opportunities to mitigate them through adaptation and resiliency measures. Although the City of Stuart SAP primarily focuses on City programs and policies, it also addresses the need to widely collaborate and coordinate sustainable practices and decisions with the greater community and other municipalities across the landscape. Broad goals and policy priorities related to sustainability are integrated into the City's Strategic Plan and Comprehensive Plan, while the SAP identifies seven focus areas and associated goals as follows (**Figure E-1**): [5]

Climate Resiliency
1. Mitigate human-driven causes of climate change.
2. Adapt to future conditions.
3. Lessen heat impacts to the community.

Natural Resources
4. Maintain and improve air and water quality.
5. Enhance greenspace utilization.
6. Reduce consumption of potable water.
7. Retrofit municipal facilities.

Renewable Energy
8. Reduce electricity used by the City.
9. Reduce electricity used in the community.
10. Increase electricity sourced from clean renewable energy.

Pollution and Waste Reduction
11. Reduce plastic pollution.
12. Reduce the amount of waste produced.
13. Increase waste diversion.

Built Environment
14. Promote green building.
15. Attract green businesses and sustainable industry.
16. Reduce light pollution.
17. Adapt the built environment to future conditions.

Transportation
18. Reduce energy use and cost.
19. Create safe, affordable, mobility/transportation.
20. Improve infrastructure to adapt to growing innovation and need.

Local Government
21. Incorporate sustainability into future city policymaking decisions.
22. Improve staff awareness of sustainability.
23. Bolster city advocacy of sustainability issues.

Figure E-1. City of Stuart Goals for the Seven Branches of Sustainability
Source: Reproduced from the City of Stuart SAP.

[5] City of Stuart, 2020. *Sustainability Action Plan*. November 2020. Accessed in October 2021 at https://cityofstuart.us/DocumentCenter/View/2978/Sustainability-Action-Plan---Adopted-Nov-2020

The City favors the implementation of actions that incorporate economic stability, social progress, and environmental stewardship for their triple bottom line impact to quality of life throughout the community. The City's sustainability strategy tools include policy changes, program initiatives, and a focus on infrastructure, including efficient buildings and renewable energy. Completed and ongoing initiatives include septic to sewer conversions; design and construction of an alternative water supply system; stormwater improvement and retrofit programs; wetlands projects for natural water filtration and water detention; Florida Friendly landscaping programs; a community garden; outdoor and indoor efficient light emitting diode (LED) lighting conversion; enhanced bicycle lanes; healthy walking trail; and a solar canopy with charging stations.

E.2.3 Master Plan Alternatives Screening Criteria

Sustainability-based alternative screening criteria were incorporated into the airport master plan. These criteria are intended to assist with identifying preferred alternatives that align with SUA's focus areas, sustainability goals, and other local sustainability initiatives. These criteria are relevant to the master plan's focus areas for improvement evaluated in the alternatives chapter.

- Energy Use:
  - Does the alternative include energy-efficient components?
  - Would the alternative induce increased consumption, have a neutral effect, or result in a net decrease of energy resource use at SUA?
  - If the alternative increases energy consumption, are there related opportunities to offset this increase by installing efficiencies or renewable technologies elsewhere at the airport?
- Water Use and Water Quality:
  - Does the alternative incorporate water conservation measures?
  - Would the alternative induce increased consumption, have a neutral effect, or result in a net decrease of water resource use at SUA?
  - Does the alternative incorporate methods to preserve and/or improve water quality?
  - Does the alternative effectively manage additional water that may be produced from increased impervious surfaces?
  - Does the alternative incorporate and implement green infrastructure, including (where possible) permeable pavement and reduction of urban heat island solutions?
  - Does the alternative incorporate best management practices or policies recommended in the Airport Infrastructure Resiliency plan (**Appendix F**)?
- Fuels:
  - Does the alternative provide measures to reduce fuel usage?
  - Does the alternative introduce the possibility for alternative fuels to be used rather than conventional fuels?
- Noise and Compatible Land Use:
  - Does the alternative have the ability to mitigate or reduce aircraft noise in the vicinity of the airport?
  - Does the alternative support the airport's noise abatement efforts?

  - o Does the alternative have the ability to increase the compatibility of land uses in the vicinity of the airport?
- ✈ Employee Wellness:
  - o Does the alternative include options that would increase employee well-being?
- ✈ Community Impact:
  - o Does the alternative provide a benefit to the community at large?
  - o Does the alternative provide additional revenue streams to help ensure the airport's financial security and stability as a community asset?
  - o Does the alternative support community justice, diversity, equity, and inclusion?
  - o Is the alternative compatible with other City, County, and Airport initiatives, such as the Airport Infrastructure Resiliency plan (**Appendix F**), Martin County Comprehensive Growth Management Plan, and/or the City's Comprehensive Plan?[6,7]

TABLE E-2
RELEVANCE TO MASTER PLAN FOCUS AREAS

Category	Runway System	Taxiway System	Aviation-Related Development	Support and Services Facilities	Non-Aeronautical Development
Energy Use	X	X	X	X	X
Water Use			X	X	X
Water Quality	X	X	X	X	X
Noise and Compatible Land Use	X	X	X		
Employee Wellness			X	X	X
Community Impact	X	X	X	X	X
Fuels (airport fleet)		X	X	X	

E.3 Focal Area Assessment

This section provides an assessment of the current and ongoing performance of resource use at SUA for each of the selected focal areas. At this time SUA has not developed baseline tracking databases or assigned a lead point-of-contact for the recommended sustainability metrics; however, this report provides tracking recommendations for the selected focal areas. Establishing a baseline assists with identifying opportunities for improvement and tracking performance metrics. Example targets and metrics, as well as specific initiatives for the resource focal areas reviewed in this baseline study are also provided for use and consideration as the SUA sustainability program evolves.

[6] City of Stuart, 2021. Comprehensive Plan. Accessed in December 2021 at https://cityofstuart.us/298/Comprehensive-Plan

[7] Martin County, 2021. Martin County Comprehensive Growth Management Plan. Accessed in December 2021 at https://www.martin.fl.us/CompPlan

E.3.1 Energy Use

E.3.1.1 Energy Background

All forms of electricity generation have an environmental impact on our air, water, and land. According to the U.S. Environmental Protection Agency, the average emission rate for carbon dioxide in Florida is 0.861 pounds per kilowatt-hour (kWh).[8] Producing and using electricity more efficiently has substantial environmental effects, including the reduction of both the amount of fossil fuel extracted and the amount of greenhouse gas and other air pollution emitted as a result of combustion. Efficient electricity use also reduces impacts to water resources, often used to produce steam or provide cooling, such as reduction in quantities extracted from a watershed as well as avoiding thermal pollution as cooling water is discharged to the ecosystem.

Energy consumption metrics are generally tracked per gross square foot of building space. Using this metric to track energy consumption between years highlights the relative efficiency of various buildings and can serve to normalize consumption between years given facility development or space utilization.[9] FAA Order 1053.1C, *Energy and Water Management Program for FAA Buildings and Facilities* (2017) and Executive Order 13693 *Implementing Instructions* (2015)[10] recommend that local energy managers develop measures customized to their organizations to better support the implementation of sustainable energy programs. For example, for internal measurement and benchmarking purposes, it may be helpful for energy managers to categorize the different types of facilities by use or adjust data as needed for weather influence.

Reducing energy intensity across an airport requires increasing the energy efficiency of appliances, fixtures, and equipment, and promoting energy conservation through behavioral change. There are several certification programs that memorialize the integration of sustainability practices into the design and engineering of airport facilities. Leadership in Energy and Environmental Design (LEED) is one of the more notable building certifications available governed by the U.S. Green Building Council. Other notable building certifications available to airports include Envision by the Institute for Sustainable Infrastructure (ISI) and WELL by the International WELL Building Institute (IWBI).[11,12,13] These certification programs recognize best building strategies and practices in design, construction, and maintenance of resource-efficient, cost-effective, and healthy buildings. Any new construction can be designed to achieve these certifications to aid in reducing energy consumption across the airport or promoting a healthy work-life for employees. Likewise,

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[8] U.S. Environmental Protection Agency, 2019. *eGRID: Power Profiler.* Accessed in November 2021 at https://www.epa.gov/egrid/power-profiler#/FRCC . This metric means that, each time a person uses one kWh of energy at their homes or businesses, there is an average emission of 0.861 pounds of carbon dioxide across the energy-producing plants in the state.

[9] Executive Order 13834; Energy Policy Act of 2005; Energy Efficiency Improvement Act of 2015/Energy Independence and Security Act of 2007.

[10] CEQ 2015. Executive Order 13693 *Implementing Instructions*

[11] U.S. Green Building Council, 2021. Accessed in December 2021 at https://www.usgbc.org/

[12] Institute for Sustainable Infrastructure, 2021. Accessed in December 2021 athttps://sustainableinfrastructure.org/

[13] International WELL Building Institute, 2021. Accessed in December 2021 at https://www.wellcertified.com/

some building certifications can be applied to existing infrastructure which can be retrofitted or redesigned with modern, durable, energy-efficient appliances and fixtures.[14]

In addition, increasing the use of clean and renewable materials sourced to produce the electricity consumed in airport facilities further reduces energy intensity. Electricity from clean or renewable resources generally reduce greenhouse gas emissions and improve local air quality because no fossil fuels are combusted in the process. Renewable energy sources include solar, wind, renewable biomass, landfill gas, ocean/tidal, geothermal, and hydroelectric. Renewable energy systems can be incorporated at a larger scale, serving entire communities or enhancing the electrical grid of a town, or they can be small-scale, serving a campus, single building, or individual use (i.e., streetlight).

The FAA is working to implement sustainable practices, including the reduction of electricity consumption, for the operation and maintenance of its buildings (Energy Policy Act 2005 §104(a), amending 42 USC §8259(b)). This includes ensuring equipment is replaced with the most energy- and water-efficient option that is life cycle cost-effective. FAA Order 1053.1C, *Energy and Water Management Program for FAA Buildings and Facilities* outlines FAA policies, procedures, organizational responsibilities, and goals for complying with national mandates for the efficient use of national resources. The FAA provides Airport Improvement Program discretionary funding for Airport Energy Efficiency Assessments to evaluate an airport's energy requirements or to implement an airport energy efficiency project for the purpose of increasing energy efficiency of airport power sources.

E.3.1.2 Energy Baseline

Electricity use at the airport is tracked by the SUA accounting department according to the airport's fiscal year (FY), which ends in September. Consumption data for FY 2017 through FY 2021 was obtained; however, caution should be taken for these data as a descriptive baseline since energy use at SUA has followed no discernable trends over the past five years due to improvement projects and the disruptive impacts of the COVID-19 pandemic on airport operations. As the new facilities come online (i.e., the new administration building and airfield electrical vault) and the airport returns to "business-as-usual," it is recommended that SUA continue to track energy consumption patterns across uses, facilities, and/or tenant activities. This effort will help establish a predictable baseline from which to monitor trends and identify priority facilities for consumption incentives or retrofitting with upgraded low impact development (LID) technology.

Only facilities for which the airport pays utility bills are included in this evaluation. Tenant consumption data was not included since they hold their own accounts with Florida Power and Light (FPL), SUA's energy provider. The airport maintains and pays for electricity service for four buildings and four outdoor sites, and airport electricity usage is recorded according to the meters associated with facilities as described in **Table E-3**.

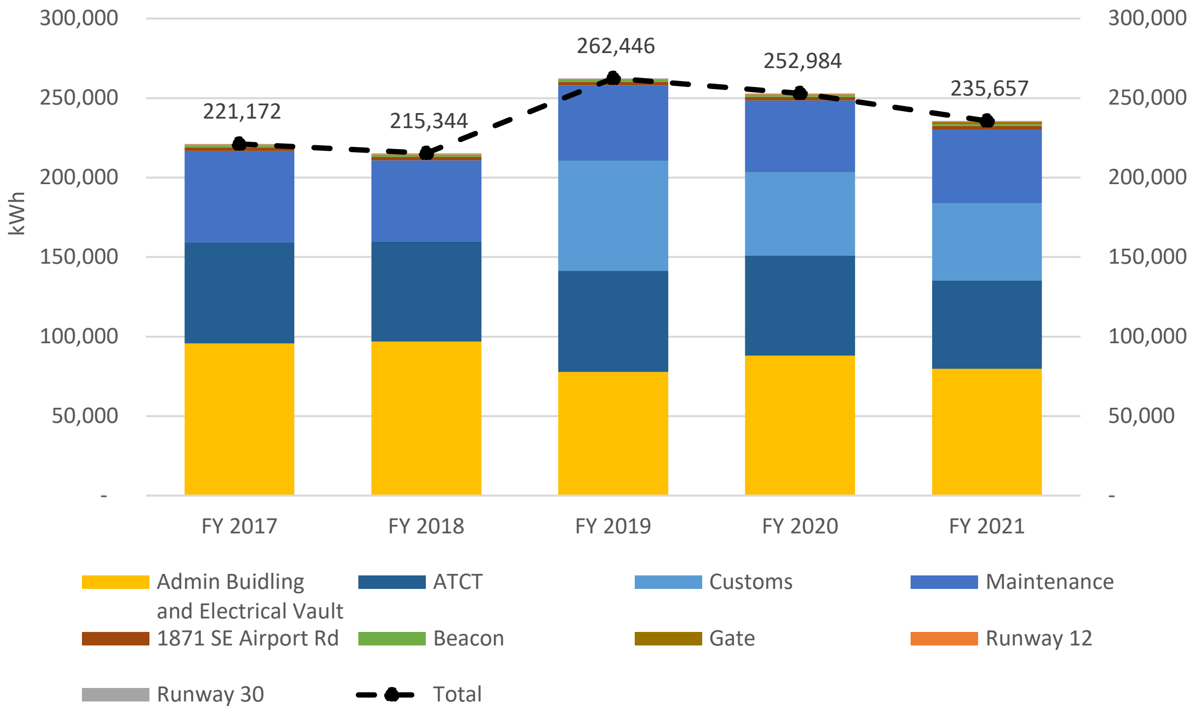
[14] LEED for Operations and Maintenance (O+M) offers existing buildings an opportunity to pay close attention to building operations, by supporting whole buildings and interior spaces that have been fully operational and occupied for at least one year. The project may be undergoing improvement work or little to no construction.

TABLE E-3
DESCRIPTION OF AIRPORT FACILITIES DRAWING ELECTRICAL SERVICE

Facility	Activities Served at this Location	Climate Controlled?
Admin Building and Electrical Vault	Office Space Airfield Electrical Vault	Yes
ATCT	Office Space	Yes
Maintenance Building	Office Space Equipment Storage Areas Shop Space	Yes
Customs	Office Space Public Space	Yes
Beacon	Operates perpetually in a steady, constant, and predictable pattern.	No (outdoors)
Runway 12	Lights and Navigational Aids	No (outdoors)
Runway 30	Lights and Navigational Aids	No (outdoors)
Southeast Airport Road Lights	Streetlights (others have been converted to solar). Automatically operates predictably from nightfall to sunrise.	No (outdoors)

Figure E-2 describes total energy consumption from FY 2017 through FY 2021. In general, airport electricity usage increased by an average of approximately five percent from FY 2017 to FY 2020. The highest recorded electricity consumption occurred in FY 2019, with 262,446 kWh of electricity use representing a 22 percent increase over the previous fiscal years. Although in FY 2020 the airport recorded a four percent decrease in total electricity consumption over the prior year, and another 7 percent decrease in FY 2021 over FY 2020, years FY 2020 and FY 2021 are considered nonstandard due to the COVID-19 pandemic; therefore, caution is recommended in assessing any consumption trends during this timeframe.

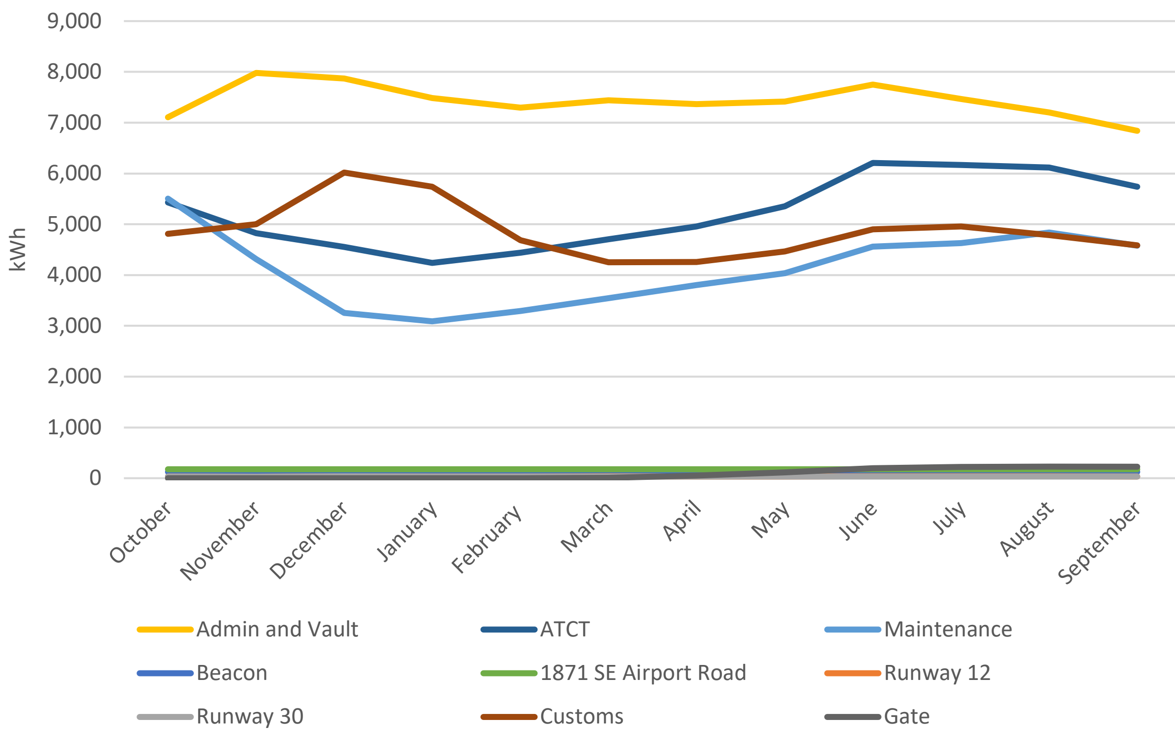
FIGURE E-2
TOTAL ELECTRICITY CONSUMPTION (FY 2017 THROUGH FY 2021)



Electricity usage is generally trending downward across the four main consumers: administrative building and airfield electrical vault; ATCT, customs, and maintenance building (see **Figure E-2**). The administrative building and electrical vault had the highest electricity use for all years, accounting for at least 30 percent of total consumption across the five-year period. The ATCT, customs, and maintenance buildings collectively account for at least 63 percent of electricity consumption. The ATCT has consistent electricity usage of around 63,300 kWh each FY and does not appear to vary by more than one percent any given year. The maintenance building also records a large percent of electricity use, reaching up to 26 percent of total electricity use in FY 2017 but decreasing steadily by an average of 8 percent since this high point. The beacon, Southeast Airport Road lights, Runway 12, and Runway 30 meters show steady electricity usage between years but account for less than two percent of total consumption across the five fiscal years.

Figure E-3 represents the monthly average electricity consumption at the nine tracked facilities. Generally, reviewing a monthly average across years can identify seasonal trends and the impact of heating, cooling, or increased travel on energy consumption at an airport.

FIGURE E-3
MONTHLY AVERAGE ELECTRICITY CONSUMPTION



Electricity usage at the ATCT decreases substantially in December and January and increased in the summer months, whereas electricity consumption in June at the ATCT is 46 percent higher than consumption in January. Due to airport improvement projects that occurred within the study timeframe, we do not recommend an applicable, ongoing trend for the administrative, customs, and maintenance buildings; however, the following patterns were noted with the data given: 1) the customs building experienced high usage during December and January and decreased by almost 30 percent in March; 2) at the maintenance facility, electricity use was 63 percent higher in August than consumption in January, and 3) electricity consumption at the administrative building and electrical vault may peak in November at about 8,000 kWh and gradually decrease by September to approximately 7,000 kWh. As these facilities are climate-controlled with HVAC systems, this seasonal variation can likely be explained by the increased Florida summer temperatures and corresponding need for cooling. The other tracked facilities (outdoor assets) have steady consumption rates that represent a small portion of overall electricity use at SUA on a month-to-month basis.

E.3.1.3 Energy Sustainability Program Recommendations

FAA Targets[15]*:* Reduce building energy intensity or overall kWh used across the airport 2.5 percent per year over 10 years, relative to a FY 2020 baseline, for a total of 25 percent energy use reduction by 2030. Increase use of clean energy sourced from renewable, low-impact technologies. Ensure all new construction is compliant with HPSB guiding principles and at minimum LEED Silver-level design criteria.

Sample SUA Target: Establish data tracking process, assign program responsibility, and establish SUA-appropriate energy reduction targets. Modeling the City of Stuart goals, ensure all facilities include energy efficient technologies by 2025 and reduce electricity use (kWh/SF) 10 percent by 2023.

Metrics: Energy intensity (kWh/SF) or gross energy use (kWh). Percent of renewable resources used to offset traditionally produced power sources.

Recommended Initiatives:

- ✈ Engage all onsite tenants in sustainability program and energy conservation strategies.
- ✈ Continue to integrate Martin County and City of Stuart sustainability initiatives, as appropriate. Align energy reduction goals with these local efforts.
- ✈ Develop a baseline energy consumption level and assign program responsibility. Track and report energy consumption data and cost savings for ensuing years relative to the established baseline.
- ✈ Purchase renewable/alternative energy generated off-site.
- ✈ Perform airport microgrid assessment and consider construction of onsite solar farm or install smaller-scale solar projects per individual facilities or assets (signs, parking lights, etc.).[16] Participate in City of Stuart SolSmart program for the installation of Solar photovoltaic panels as possible.
- ✈ Install separate meters for each activity or building in order to be able to track energy consumption across users and identify priority facilities for conservation incentives or retrofit for potential system upgrades.
- ✈ Pursue relevant initiatives as outlined by the U.S. Green Building Council LEED, HPSB, ISI Envision, IWBI, and Unified Florida Building Code:
  - o Install additional LED lighting and signals.
  - o Install window tinting/coating.
  - o Install motion/occupancy sensor lighting systems.
  - o Retrofit hot water system with tankless/on-demand water heaters.
  - o Use natural daylight options over artificial lighting in new construction.

[15] Recommendations are given in FAA Sustainability Planning – FAA Order 1053.1C (2017) *Energy and Water Management Program for FAA Buildings and Facilities*.

[16] Airport Cooperative Research Program and Rocky Mountain Institute, 2021. Report 228: Airport Microgrid Implementation Toolkit. Accessed in December 2021 at: https://acrpmicrogridtoolkit.xendee.com/

E.3.2 Water Use and Water Quality

E.3.2.1 Water Background

Water efficiency is defined as the sustainable use of freshwater resources for drinking and domestic purposes. Focusing on water efficiency as a sustainability goal ensures ongoing availability and accessibility of water resources but will also improve water quality and surrounding aquatic ecosystems. Water efficiency can be achieved through LID, improved landscaping practices, and retrofitting existing infrastructure. LID includes a variety of practices, including those that mimic natural draining processes to encourage the retention of rainwater, so it soaks into the ground rather than contributing to stormwater runoff and nonpoint source pollution. Identifying ways to reduce water usage in buildings and other built infrastructure decreases water consumption, while new construction and landscaping projects should incorporate strategies that conserve water supply, manage stormwater generation, and potentially reuse or recycle water resources. As with energy consumption, water consumption at FAA facilities is governed under FAA Order 1053.1C*, Energy and Water Management Program for FAA Buildings and Facilities*.

Water quality includes the chemical, physical, and biological characteristics of surface waters, groundwater, and coastal water resources with respect for its suitability for activities and purposes (e.g., swimming, fishing, drinking, etc.).[17] Poor water quality can pose a health risk for people and a risk to nearby ecosystems. Martin County's Utilities Department regularly monitors water supplies to ensure the highest quality is delivered to it residents. Water resources at Florida airports are affected by onsite and offsite airport activities, including aircraft and vehicle maintenance activities, landscaping, painting, and other operations. Stormwater runoff from the airport runways, taxiways, and aprons pick up contaminants from aircraft activities, and there is a risk those substances will contaminate surrounding water supplies resulting in poor water quality.

The City of Stuart provides water services to the airport, obtained from a surficial aquifer through 24 local production wells. The City's water treatment facility has the capacity to treat six million gallons of drinking water per day, but currently provides a daily average of 2.8 million gallons to its consumers.[18] According to the Martin County's Utilities Department 2020 Drinking Water Quality Report, the City's drinking water does not contain contaminants in concentrations above regulatory thresholds.[19]

E.3.2.2 Water Baseline

Water consumption data obtained for FY 2017 through FY 2021 is described below; however, as with energy use, caution should be taken for these data as a descriptive baseline since water use at SUA over the past five years was influenced by improvement projects and the disruptive impacts of the COVID-19 pandemic on airport operations. It is recommended that SUA continues to track water consumption patterns across uses, facilities, and/or tenant activities as the new facilities come

[17] National Oceanic and Atmospheric Administration, 2021. *Florida Keys National Marine Sanctuary.* Accessed in December 2021 at https://floridakeys.noaa.gov/ocean/waterquality.html.

[18] The City of Stuart, 2020. *Annual Water Quality Report: Reporting Year 2020*. Accessed in November 2021 at: https://www.cityofstuart.us/DocumentCenter/View/2628/Annual-Water-Quality-Report-2020-PDF

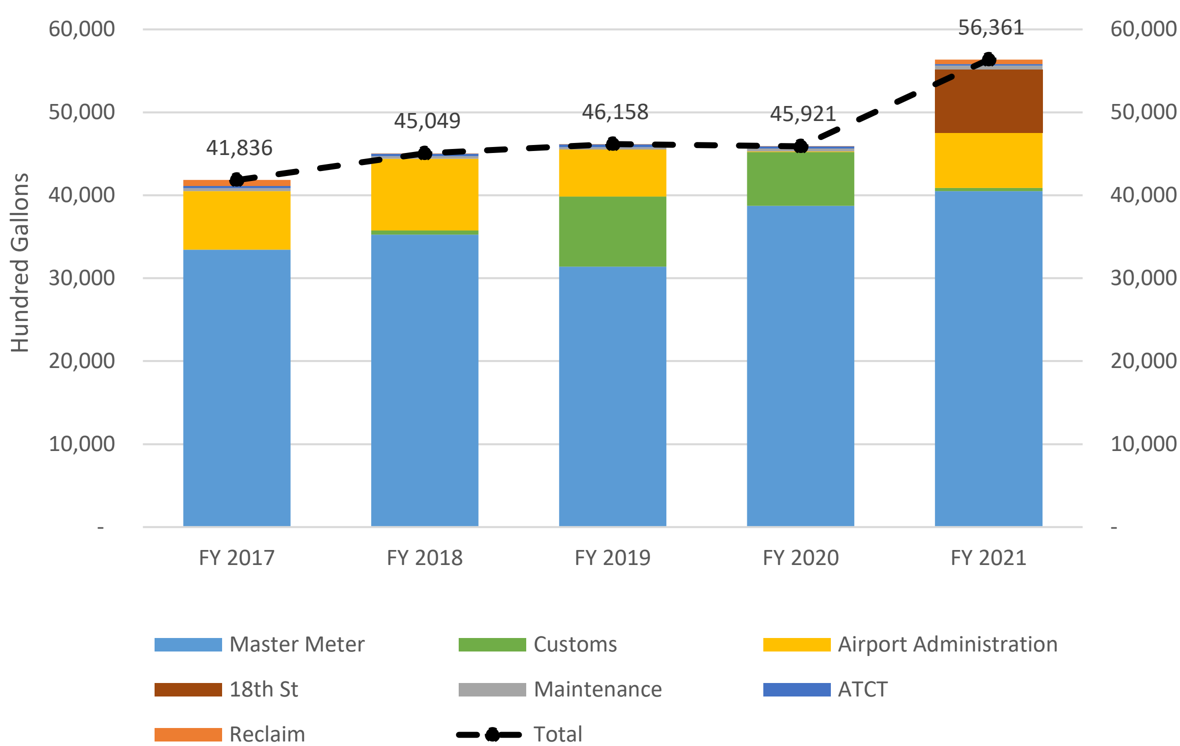
[19] Martin County Utilities Department, 2021. *2020 Drinking Water Quality Report.* Accessed in December 2021 at https://www.martin.fl.us/resources/2020-drinking-water-quality-report

online and the airport returns to "business-as-usual" to establish a predictable baseline from which to monitor trends and identify priority facilities for consumption incentives, retrofitting with upgraded LID technology, or monitoring for potential system leaks.

As with energy consumption, water use data is maintained by the SUA accounting department. There are seven separate meters associated with different SUA facilities and activities. **Figure E-4** illustrates total water consumption at SUA for FY 2017 through 2021. FY 2021 recorded 56,361 hundred gallons of water usage at the airport, which is 23 percent higher than the previous year and the highest recorded water usage to date at SUA. Water usage appears to be on an upward trend with each year slightly higher than the previous.

The master meter serves the entire airfield, including 16 airport tenants. It was installed by the County and includes separate tenant meters so that each tenant's water usage could be tracked and billed directly to them by the City of Stuart; however, data obtained for this sustainability baseline do not detail usage for each tenant, and this analysis only reviews the cumulative total water usage recorded at the master meter. Water consumption at the facilities connected to the master meter consistently represented at least 67 percent of the total water use at the airport between FY 2017 to FY 2021 (see **Figure E-4**). Water use at the master meter was relatively consistent until FY 2019 when a sharp (11 percent) decline in usage was recorded. After the sharp decrease, water use at the master meter increased to 40,494 gallons, which represents 72 percent of total water consumption at SUA and a 28 percent increase since FY 2019. The increase in usage is largely related to the use of airport water for concrete during construction activities.

FIGURE E-4
TOTAL WATER CONSUMPTION (FY 2017 THROUGH FY 2021)



Although water consumption at the master meter decreased sharply in FY 2019, the difference was nearly overcome by an uncharacteristic surge in usage at the customs building in FY 2019 and 2020. For this reason, the total water usage recorded at SUA in FY 2019 and FY 2020 differed by less than three percent (see **Figure E-4**). The surge in usage experienced at the customs facilities in FY 2019 was attributed to an unidentified irrigation leak. An irrigation meter has since been installed at the customs building to better track and manage water use at this location. Another sharp, temporary increase in water usage at the customs location in FY 2020 is attributed to its use by contractors during construction of the new administrative office building.

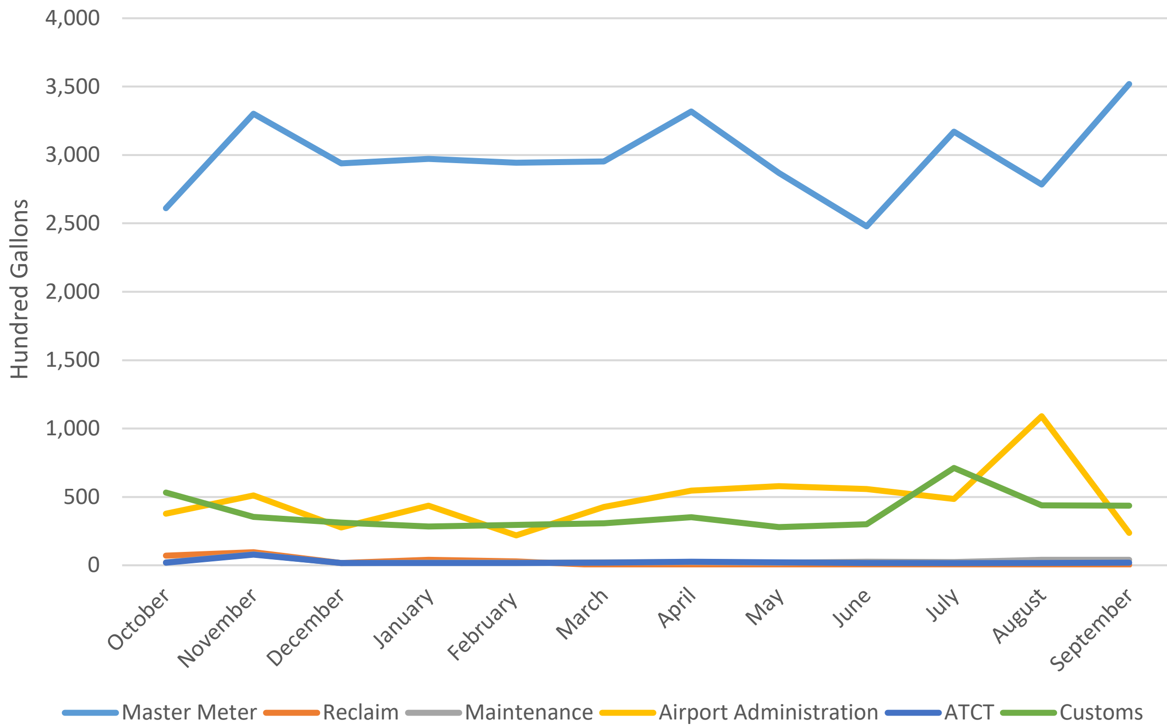
The administration building is regularly the second highest water consuming facility at the airport. Water usage at the administration building decreased by 99 percent in FY 2020 due to administrative staff moving out of the building in December 2020 and relocating to the airport maintenance building during construction of the new administration facility. During construction, contractors used water from both the customs and administration facilities, which explains the increase in FY 2021 after the building was vacated by administrative staff.

The reclaim, ATCT, maintenance, and 18th Street facilities are the lowest water consumers at the airport, collectively accounting for less than 3.2 percent of total water usage between FY 2017 and FY 2021. There is generally little fluctuation in usage between years for the reclaim, ATCT, and maintenance facilities, as the activities they serve are fairly constant. The surge in water usage at the 18th Street location was due to irrigation as a part of a beautification program and an anomaly in the electronic meter reading for the first few months of operation.

In general, water consumption for most facilities and uses at SUA did not show a strong seasonal consumption pattern over the years studied (**Figure E-5**), with the exception of the administrative and customs facilities. These facilities show relatively consistent average monthly usage until July and August when usage increases upwards of 50 percent, potentially attributed to the use of metered water for irrigation purposes. The 18th Street meter is not depicted in **Figure E-5** because water usage was not present at that meter until August 2021; therefore, a monthly average was unavailable.

The airport is approximately half a mile from the coastal resources of the St. Lucie River. There are a number of stormwater features draining airport surfaces in the northeast and southwestern areas of SUA with direct conveyance to nearby coastal waters. Due to this immediate hydrologic connection, the airport is cautious to prevent excess stormwater runoff and hazardous material spills that may impact adjacent natural surface water resources. Currently, the airport has an active Stormwater Pollution Prevention Plan (SWPPP) that is updated on an annual basis to help mitigate nonpoint source pollution from reaching nearby water resources.

FIGURE E-5
MONTHLY AVERAGE WATER CONSUMPTION



E.3.2.3 Water Sustainability Plan Recommendations

FAA Targets: Reduce potable water consumption intensity (gal/SF) 2.0 percent annually over 10 years, relative to a FY 2020 baseline, for a total of 20 percent water consumption reduction by 2030. Install appropriate green infrastructure features, including the requirement for all new construction to incorporate LID best practices for stormwater management.

Sample SUA Targets: Establish data tracking process, assign program responsibility, and establish SUA-appropriate targets. Support City of Stuart goals to reduce per-capita water consumption to 160 gallons per day by 2025.

Metric: Gross water consumption.

Recommended Initiatives:

- Engage all onsite tenants.
- Develop a baseline water consumption level and assign program responsibility. Track and report water use data and cost savings for ensuing years relative to the established baseline. Ensure all meters are enrolled in City's AquaHawk program to monitor water usage.
- Install metering in relevant, unmetered buildings that serve individual users or activities.
- Use low-volume, high pressure sprayer nozzles on water hoses used for vehicle washing.
- Test and repair water supply and wastewater conveyances to conserve water and stop leaks.

- Educate maintenance staff, employees, passengers, and customers on water conservation strategies.
- In coordination with the Martin County priority initiative, convert all irrigation to draw from City's separated, non-potable and non-sewered reclaimed water program.
- Collect and reuse stormwater for non-potable uses such as landscape irrigation and building flush systems, such as the installation of cisterns to capture rainwater from roof runoff for irrigation.
- Plant drought-tolerant and native plants that do not require excessive irrigation to maintain.
- Ensure airport turf surfaces are maintained according to the City of Stuart seasonal fertilization ban and any applicable water restrictions.
- Incorporate LID principles and practices into all facility design and placement.
- Continue to maintain the northeast area green space to mitigate the impacts of sea level rise from adjacent surface waters and the volume and purity of stormwater runoff generated at the airport (discussed further in **Appendix F**).
- Pursue relevant initiatives for new construction or renovations as outlined by the U.S. Green Building Council LEED and the Institute for Sustainable Infrastructure Envision:
  - Install motion sensors on sink faucets.
  - Install dual-flush toilets.

E.3.3 Airport Fleet Fuel

E.3.3.1 Fleet Fuels Background

The Energy Policy Act passed by Congress in 1992 defines an alternative fuel as methanol, ethanol, ethanol blends, natural gas, and other liquid fuels derived from natural gas, propane, hydrogen, electricity, biodiesel, coal-derived liquid fuels, and P-series fuels.[20] Alternative fuel use presents an opportunity for airports to reduce emissions, manage fuel costs, reduce petroleum dependence, increase energy security, potentially reduce maintenance efforts, and strengthen their public image. Although most transportation fuel used at airports is consumed by aircraft, airports operate various vehicles and often have sizable fleets at their service.

Currently the City of Stuart promotes the use of electric vehicles by supporting the installation of electric vehicle charging stations (EVCS) around the City. The City has published guidance to locating and installing EVCS.[21] In addition to the City, Martin County's SEMP promotes the use of electric vehicles and the widespread installation of EVCSs to reduce fuel usage and decrease vehicle-related air emissions.

E.3.3.2 Airport Fleet Fuel Baseline

The airport owns and operates a variety of diesel and gasoline powered equipment. This fleet includes eight maintenance vehicles (three tractors, two trucks, two mowers, and a golf cart), two

[20] U.S. Department of Energy,1997 Alternative Fuels Data Center. Accessed in December 2021 at https://afdc.energy.gov/fuels/.

[21] City of Stuart Guide for Accessible EVCS. Accessed in December 2021 at http://cityofstuart.us/DocumentCenter/View/2682/Electric-Vehicle-Charging-Stations-Guide

operations trucks, and two administration carts. These vehicles currently consume conventional fuels (e.g., gasoline or diesel).

The airport does not currently track the fuel usage of the airport owned vehicle fleet.

E.3.3.3 Airport Fleet Fuel Sustainability Program Recommendations

Sample SUA Targets: Replace aging vehicles and equipment with alternatively-fueled options. Establish fuel consumption data tracking process per vehicle, assign program responsibility, and establish SUA appropriate targets.

Metrics: Conventional versus alternatively fueled vehicles in fleet. Age of existing, conventional vehicles and equipment. Gross fuel consumption. Average efficiency of vehicles and equipment.

Proposed Initiatives:

- ✈ Incentivize the use of electric vehicles and install EVCS on airport property for both public and employee access.
- ✈ Purchase electrically-powered vehicles as existing vehicles and equipment in fleet near end of their efficient operational lifecycle and are retired.
- ✈ Purchase and use electrically-powered landscaping equipment instead of equipment powered by conventional fuels.
- ✈ Coordinate with FPL on possible revolving fund options to assisting in funding for EVCS infrastructure.

E.3.4 Employee Wellness

E.3.4.1 Employee Wellness Background

Airport employees can face a variety of inherent stressors in their daily work lives unique to the airport environment, including 24/7 operations, a focus on customer service in customer-facing jobs, rapidly changing technology, and potential security or personal safety concerns. If an employer does not identify and mitigate potential workplace stressors, employee attraction, productivity, health care costs, and retention could be affected. Identifying issues that are influencing employee stress can assist airports in prioritizing workforce development initiatives to create a work environment that supports total employee well-being.

Well-being includes the physical, mental, and emotional facets of employee health. The Airport Cooperative Research Program, *Airport Workforce Programs Supporting Employee Well-being* (2020), describes the following common components of well-being:[22]

- ✈ Physical Well-being—The ability to perform physical activities without limitations from physical ailments such as pain or biological health problems.

[22] Airport Cooperative Research Program, 2020. *Airport Workforce Programs Supporting Employee Well-being*. Accessed in December 2021 at https://www.nap.edu/read/25919/chapter/4.

- Psychological or Mental Well-being—The ability to cope with normal life stressors, be productive, and to think and act with a positive mindset.
- Social Well-being—The ability to coexist with others and develop social and personal relationships that benefit the individual.
- Financial Well-being—The ability to meet financial obligations and feel secure in one's financial future.

When compared to larger commercial service airports, general aviation airports typically have a much smaller staff and fewer resources to implement well-being programs; however, employees at these airports can still experience high levels of aviation industry related stress. **Table E-4** provides some examples of how airport sponsors can boost employee wellness in their organization. In addition to the items listed in **Table E-4**, there are building certifications that promote employee health and Well-being. For example, IWBI (WELL) certification is a performance-based system for measuring, certifying, and monitoring features of the built environment that impact human health and well-being, through air, water, nourishment, light, fitness, comfort and mind.

TABLE E-4
EXAMPLES OF EMPLOYEE WELL-BEING PROGRAM OFFERINGS

Well-being Component	Example Offerings
Physical Well-being	• Access to healthy food (e.g., cafeteria or vending machines) • Cessation programs • Exercise classes on-site • Fitness trackers and associated physical challenges (e.g., step challenges) • Nutritional counseling
Psychological or Mental Well-being	• Alternative transit options (e.g., transit use voucher) • Emotional-intelligence developmental training • Mental health counseling • Mindfulness training or counseling • New-parent career coaching or counseling • Parental leave • Vouchers for self-care or self-development (e.g., coupons or discounts for gyms, classes, or other activities that encourage employees to take care of themselves)
Social Well-being	• Community service or volunteer programs; time off to volunteer • Employee recognition programs • Wellness challenges or team competitions focus on well-being
Financial Well-being	• Financial education • Retirement planning or counseling
Overall or Multiple Facets	• Avoiding the extension of daily and weekly hourly work requirements; promoting work-life balance so employees can access activities that promote their physical, mental, and social well being • Employee assistance programs • Flexible work arrangements • Mobile wellness smartphone applications

	• Reimbursement for well-being expenses • Training and education (cost-free) • Wellness website with important information available • Wellness workshops

Source: Airport Cooperative Research Program, 2020. *Airport Workforce Programs Supporting Employee Well-being*. Adapted by ESA, 2022.

E.3.4.2 Employee Wellness Baseline

SUA does not currently track employee well-being or work satisfaction.

E.3.4.3 Employee Wellness Sustainability Program Recommendations

Sample SUA Targets: Establish an employee wellness program. Maintain attrition rate below national average. Maintain or decrease employee annual workdays lost each year over the year prior. Improve employee satisfaction metric (as measured by third-party survey) incrementally each year over the year prior.

Metrics: Number of workplace injuries to airport employees (per year or per 1,000 hours worked). Per employee average number of days away from work. Turnover rate (tracked as raw number or percent against corresponding annual workforce level).

Recommended Initiatives:

- ✈ Those included in **Table E-4**.
- ✈ Track satisfaction through periodic employee engagement surveys or a third-party comment system.
- ✈ Establish a comprehensive Wellness Program.
  - o Establish “Blue Zone Community” health and wellness program for employees.[23]
  - o Incentivize wellness programs with insurance providers.
- ✈ Consider employee wellness IWBI certification for future buildings.[24] Review program recommendations and retrofit workspace as appropriate.
- ✈ Establish a leadership development, mentorship, or other career-development, education, or skills-expansion program.

E.3.5 Community Impact

E.3.5.1 Community Background

As the first impression experienced by individuals coming to Martin County by air, the airport must maintain good stewardship and cooperation with the local community so that visitors and residents can enjoy the outdoor amenities that many people travel to the Treasure Coast. Although SUA does not offer commercial passenger airline service, the airport serves the public and strives to be a good

[23] https://southwestflorida.bluezonesproject.com/
[24] WELL, 2021. Accessed in December 2021 at https://www.wellcertified.com/.

neighbor to the surrounding communities. SUA is engaged with its neighbors both to ensure that the airport's benefits are communicated, its impacts are minimized, and it enhances the quality of life for Martin County and the City of Stuart.

E.3.5.2 Community Baseline

Airport Economic Impact. SUA is self-sustaining and does not use local tax dollars for operation. In 2019, Florida Department of Transportation estimated a total employment (direct and in-direct) of 3,222, total payroll of $204,000, and an economic output of approximately $780,000.[25] Capital improvement projects are generally funded through federal and state grants with the local share from the airport. Airport revenue is primarily derived from hangar, facility, and land leaseholds; aircraft fuel flowage fees; and overnight aircraft parking.

Tenant Services and Engagement. In addition to offering local general aviation services, a variety of local business and other tenants are supported by the facilities at SUA.

Community Connections. The airport is an active member in the local community. In particular, SUA hosts the Stuart Air Show, which is known as "the largest community event on the entire Treasure Coast of Florida."[26] The Stuart Air Show highlights the importance of aviation and the service of Veterans, providing hundreds of opportunities to schools and school-age children to learn about aviation, American history, and the Armed Forces. In addition to the air show, SUA maintains a number of programs which are intended to maintain good relationships in the community. These include:

- Airport education tours.
- Involvement in the Chamber of Commerce for the City of Stuart and Palm City.
- Attending Economic Committee meetings.
- Maintaining and promoting ANAC.
- Connecting with the Hibiscus Children's Center during the holidays.

E.3.5.3 Community Sustainability Program Recommendations

Sample SUA Targets: Operate the airport within approved budget. Achieve five percent annual growth in community economic impact. Implement at least two to three outreach events or programs with local community groups and local governments per year.

Metrics: Aeronautical revenue and overall annual economic impact to community. Non-aeronautical revenue as a percentage of total operating revenue. Diversity (quantity and relative quality/stability) of revenue streams. Number of outreach events, including community events, onsite tours, and on- or off-airport presentations.

Recommended Initiatives:

[25] Florida Department of Transportation, 2019. *Witham Field.* Accessed in December 2021 at file:///C:/Users/jcovert/Downloads/Witham_Field.pdf

[26] *Stuart Air Show*, 2021. Accessed in December 2021 at https://stuartairshow.com/.

- Make sustainability monitoring and reporting data available to the public.
- Highlight airport businesses in marketing material.
- Participate in local school career programs.
- Continue coordinating with Peak Harvest Services to allow for palmetto berry harvesting to provide funding for local charities.[27]
- Continue to provide/expand regular aviation-related and attend/actively participate in other community events (e.g., airshow, Hibiscus Children's Center, and airport tours).

E.3.6 Noise and Compatible Land Use

E.3.6.1 Noise Background

As with most airports around the country, encroachment of incompatible land uses is a major concern at SUA. Encroachment occurs as land is developed and communities establish services and residential areas closer to the airport. One result of encroachment is an increase in noise complaints, and as the population of Stuart and Martin County increases there is more pressure to develop areas adjacent to airport property.

E.3.6.2 Noise Baseline

The FAA has determined that most major land uses (as listed in *14 Code of Federal Regulations Part 150, Appendix A, Table* 1) are normally compatible with aircraft noise below day-night average sound level (DNL) 65 decibels. Therefore, when evaluating land use compatibility surrounding airports, attention is focused on uses within the DNL 65 noise contour. Although the City of Stuart uses the DNL 65 contour for planning purposes, Martin County adopted the DNL 60 as the threshold for compatibility planning in July 2002. Noise contour maps for SUA are included in the environmental overview chapter. SUA has been historically proactive in addressing aircraft noise concerns. The airport has implemented a number of programs, projects, and initiatives to improve noise and compatible land use, including:

- As part of the Noise Compatibility Program Update in 2013, there were 16 homes treated with sound insulation to mitigate aircraft noise impacts.
- The airport collects and manages noise complaint information related to airport activity through a noise comment hotline that was created in response to the increased complaints resulting from more aircraft activity at the airport.
- A Vector Airport System (VANTAGE) was implemented to track and map aircraft operations occurring at the airport.
- The establishment and communication of a voluntary nighttime curfew to reduce aircraft from flying during nighttime hours (10:00 p.m. to 7:00 a.m.). Using data from the VNOMS system, flights during the voluntary nighttime curfew are tracked and a notification of each flight occurring during the voluntary nighttime curfew period is mailed to the airplane

[27] Peak Harvest Services, 2021. Accessed in December 2021 at https://peak-harvest.com/.

owner as well as summarized in the monthly voluntary curfew reports. Currently, 98 percent of operations at SUA are in compliance with the voluntary curfew.[28]

- Voluntary turbojet aircraft participation in the National Business Aviation Association's Noise Abatement Program measures to provide "safe, standardized, and uncomplicated operating procedures that are effective in reducing noise exposure." Currently, less than eight percent of total violations were from non-exempt turboprop aircraft, representing less than 0.5 percent of total operations at SUA during the same time frame.[29]
- Continued coordination with Airport Noise Advisory Committee (ANAC), as appropriate.

E.3.6.3 Noise Sustainability Program Recommendations

Sample SUA Targets: Maintain 98 percent or greater compliance with established voluntary nighttime curfew. Maintain broad community representation and participation in the ANAC. Respond to and track all noise comments in a timely manner. Ensure no new incompatible land uses or adverse impacts to airspace.

Metrics: Number of noise complaints. Percentage of DNL 60 contour that contains incompatible uses. Number or homes affected by noise mitigation program. Number of noise complaints occurring in nighttime hours or related to jet aircraft operations (and whether those operators were participating in voluntary noise reduction programs).

Recommended Initiatives:

- Coordinate with stakeholders to align the City of Stuart's noise and land use compatibility policy to be congruent with Martin County's compatibility threshold.
- Ensure adjacent residential communities, and those located under average flight track patterns, are part of a real estate disclosure program.
- Continue to encourage the usage of National Business Aviation Association noise reduction procedures.
- Continue to advertise and promote participation the voluntary nighttime curfew.
- Continue to regularly support and attend ANAC meetings.

E.4 Sustainability Plan Development

Although this effort did not include the formal establishment of a sustainability program or plan for SUA, the following recommendations are generally pursued as the next steps in a sustainability program and may be considered for further program development:

- Continue to *communicate and integrate* sustainability efforts into City and County sustainability efforts.
- Establish *sustainability performance targets* for each focal area, including FAA recommended targets, federal Executive Orders, and/or City and County goals, as relevant.

[28] Voluntary curfew compliance is based on Martin County's Voluntary Curfew Reports from November 2020 to October 2021. Accessed in December 2021 at https://www.martin.fl.us/martin-county-services/voluntary-curfew-reports

[29] Ibid

These targets are intended to aim initiatives toward making measurable, meaningful changes in support of the airport's strategic sustainability goals. Tracking specific metrics will help measure success towards these targets.

- ✈ Envision program *initiatives and projects* to further advance targets. Continue to implement, promote, or enhance any existing, ongoing efforts.
- ✈ Develop a *project selection process* that qualitatively identifies the general resources required (financial and staff hours) and estimates an anticipated payback period for the implementation of selected or proposed sustainability initiatives.

Monitor progress. Integrate sustainability into *existing* SUA systems, such as utility bill payment, maintenance programs, contracts, and leases. Communicate annual progress monitoring and success with the greater community and maintain connection to the City SAP.

APPENDIX F

Airport Infrastructure Resiliency

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APPENDIX F
Airport Infrastructure Resiliency

This appendix is prepared for the purpose of identifying threats to Witham Field (SUA) within the context of changing climate trends, identifying the relative vulnerability of the airport's infrastructure, and prioritizing potential adaptation measures. Climate change related risks include but are not limited to sea-level rise (SLR), extreme temperatures and weather, droughts and heat waves, and changes to precipitation patterns.[1] A vulnerability ranking is prepared for SUA assets to help determine where vulnerability reduction resources should be allocated and where special considerations for future airport improvements are warranted.

F.1 Resiliency Planning Background

F.1.1 Climate Science Resources

The Intergovernmental Panel on Climate Change (IPCC) is a United Nations international body created to objectively assess the science related to climate change and to communicate agreement among the scientific community regarding climate change, its risks and implications, and adaptation and mitigation options to policymakers associated with the 195 member countries and beyond.[2] Conclusions from various IPCC reports and research are the primary sources referenced throughout this analysis. The IPCC defines resilience as:[3]

> *The ability of a system and its component parts to anticipate, absorb, accommodate, or recover from the effects of a hazardous event in a timely and efficient manner, including through ensuring the preservation, restoration, or improvement of its essential basic structures and functions.*

Note that later applications of this concept have expanded the consideration of resilience beyond a hazardous "event" to also include adaptability to climate trends and long-term changes.

The National Oceanic and Atmospheric Administration (NOAA) has emerged as a clearinghouse for reliable data associated with models and other studies that forecast various potential effects

1 National Aeronautics and Space Administration (NASA), 2021. *The Effects of Climate Change.* Accessed in November 2021 at https://climate.nasa.gov/effects/.

2 International Panel on Climate Change (IPCC), accessed in September 2021 at: https://www.ipcc.ch/

3 International Panel on Climate Change (IPCC), 2012, *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change, Glossary of Terms* [Field, C.B., V. Barros, T.F. Stocker, D. Qin, D.J. Dokken, K.L. Ebi, M.D. Mastrandrea, K.J. Mach, G.-K. Plattner, S.K. Allen, M. Tignor, and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, UK, and New York, NY, USA.

associated with climate change related risks, vulnerability, and resilience throughout the U.S.[4] The NOAA National Centers for Environmental Information provide digital access to comprehensive oceanic, atmospheric, and geophysical data. Data and analysis tools accessed from various NOAA archives, materials, and research are utilized throughout this analysis.

SUA resiliency planning incorporates the best available science and guidance and is generally prepared in conjunction with ongoing Federal Aviation Administration (FAA) and local resiliency planning efforts.

F.1.2 FAA Resiliency Planning

The Sustainable Aviation Guidance Alliance defines resiliency in terms of airport function as follows:[5]

> *Resilience includes effectively planning for, recovering from, and responding dynamically to hardship, change, or disasters with limited impact on airport operations. Resilience is about planning to meet rapidly changing conditions to prevent issues before they arise, being able to meet challenges effectively during events, and being able to recover effectively to prevent future disruptions. The integration of resilience considerations in new airport development projects can help ensure that climate change impacts are taken into account at the time that major investments are made. It is widely accepted that planning and designing for natural hazards is far more cost-effective than retrofitting existing facilities or recovering from extreme events. The integration of resilience in design guidance can effectively elevate climate change impacts during the design and development phase for new airport infrastructure, and can aid in the prevention of future weather-related disruptions at potentially minimal cost to the airport.*

Resiliency planning is not currently required by FAA as part of the master planning process. However, Airports Council International members adopted the Resolution on Resilience and Adaptation to Climate Change, advancing the determination that responsible airport sponsors should analyze potential vulnerabilities to infrastructure and operations and avoid or mitigate potential threats to existing assets and future airport improvement.[6] These considerations may help reduce the impact of climate-related threats, which otherwise would result in loss of revenue or require increased expenditure to retrofit airport assets to a new environment.[7, 8] While FAA climate change efforts at the national level to date have largely focused on the impact of the aviation industry on air quality, it is up to individual airports to identify related, site-specific threats and solutions.

4 National Oceanic and Atmospheric Administration (NOAA) and National Centers for Environmental Information (NCEI), accessed in September 2021 at: https://www.noaa.gov/climate

5 Sustainable Aviation Guidance Alliance, 2015. *Integrate Climate Resilience Considerations in Airport Development Projects, Case Studies: Port Authority of New York and New Jersey Airports*. 30 September.

6 Airports Council International (ACI), 2018. ACI Policy Brief: *Airports' Resilience and Adaptation to a Changing Climate*. September and *ACI Resolution* March, 2018.

7 National Academy of Sciences, Engineering, and Medicine, 2015. Transportation Research Board, Airport Cooperative Research Program Report 147- Climate Change Adaptation Planning: Risk Assessment for Airports.

8 National Academy of Sciences, Engineering, and Medicine, 2012. Transportation Research Board, Airport Cooperative Research Program Report 33- Airport Climate Adaptation and Resilience

F.1.3 County and City Resiliency Planning

Martin County and the City of Stuart both have independent resiliency programs, and both entities have been working to identify specific risks to the region from climate change and how to best address these risks. While the airport is owned by Martin County, the City of Stuart's resiliency planning efforts are also considered given that approximately half of the airport property is shares a border with the City.

Martin County has integrated resiliency into future planning and has already completed numerous projects to address key vulnerabilities to climate change related impacts. Martin County resilience projects have historically addressed climate and SLR impacts by protecting the County's vulnerable shorelines, natural habitats, and water resources. The projects that have been implemented by the County include shoreline stabilization and protection, water pollution prevention, vector-borne disease mitigation, flooding reduction, and SLR adaptation. For example, Martin County completed the shoreline stabilization of Bird Island to protect one of the most important bird nesting sites in Southeast Florida. The County also completed the Jensen Beach Impoundment Rescue Project, which revitalized existing infrastructure in a way that would protect coastal mangrove communities and control mosquitos. Other on-going projects include a routine beach maintenance program and various living shoreline projects to address erosion.

To expand on Martin County's past successes with resilience planning, the County received a grant in 2019 from the Florida Department of Environmental Protection to perform targeted analyses to develop a resiliency plan (referred to as the "Resilient Martin Program"). The Resilient Martin Program identifies and addresses future climate threats to both the natural and built environment by providing a coordinated approach to climate change resilience that can be clearly communicated to the public. As an initial step, the County developed a SLR Impact Analysis Report to review and analyze existing technical data, identify data gaps, and provide recommendations for data acquisition, adaptation steps, and policy development. The work summarized in the SLR Impact Analysis Report provides a centralized effort to deliver the changes needed to respond and adapt to the impacts of climate change in Martin County.[9, 10] Throughout the development of the SLR Report, Martin County relied heavily on members of an established Martin County Resilience Working Group to provide data and review and comment on the report as it was developed. The Resilience Working Group continues to meet on a routine basis.

The Martin County SLR Impact Analysis Report includes 48 recommendations spanning four essential topics: County Assets and Infrastructure, Land Development, Natural Resources, and Socioeconomics. The recommendations also include an implementation mechanism and project timeline of short (1-5 years), medium (5-10 years), and long (10+ years). Priority areas for project implementation to address climate change vulnerabilities were included and are based on the immediacy of their vulnerability impacts.[11] **Figure F-1** depicts priority areas identified in Martin

9 Martin County, Resilience. Accessed in September 2021 at: https://www.martin.fl.us/Resilience

10 Martin County, 2021. *Sea Level Rise Report: 2021 Impact Analysis.* Accessed in September 2021 at https://view.publitas.com/martin-county-board-of-county-commissioners/martin-county-sea-level-rise-report-2021-impact-analysis/page/1 Note: this reference is used throughout this document and here forward cited as: Martin County, 2021.

11 Martin County, 2021. *Sea Level Rise Report: 2021 Impact Analysis.*

County. The information that contributed to an area's identification was based on a compilation and analysis of all the County infrastructure and assets, including critical infrastructure, transportation, land use, potable water, sanitary sewer, and stormwater. The areas identified in **Figure F-1** have already experienced flooding either from seasonal tidal flooding or during heavy precipitation events. The Report determined that certain capital improvements, more detailed planning or modeling, and/or hazard mitigation projects would benefit these areas, and, as resiliency or mitigation grant funding becomes available, these areas may be a targeted for future pilot projects. Priority Area 9 surrounds the northeastern perimeter of the airport and includes areas prone to flooding.

In September 2019, the City of Stuart established a Sustainability Committee of staff representatives spanning multiple departments and disciplines to evaluate their operations for more sustainable alternatives while assessing any community vulnerabilities to climate change. The committee was also tasked with identifying opportunities for incorporating the concepts of sustainability and resiliency into City department-level decision making and policy goals for future development. In November 2020, the City publicly released its Sustainability Action Plan (SAP) to address its environmental vulnerability and to identify any opportunities to mitigate such vulnerabilities through adaptation and resiliency measures. The Committee's recommendations are summarized in the SAP and include seven branches of sustainability. One of those branches is climate and resiliency, which includes the actions and targets identified in **Figure F-2**. More information on the City's SAP can be found in **Appendix E**, Airport Sustainability Baseline.

Mitigate human-driven causes of climate change

- Complete a greenhouse gas emissions study for City operations by 2023
- Join as a party to a Regional Climate Compact

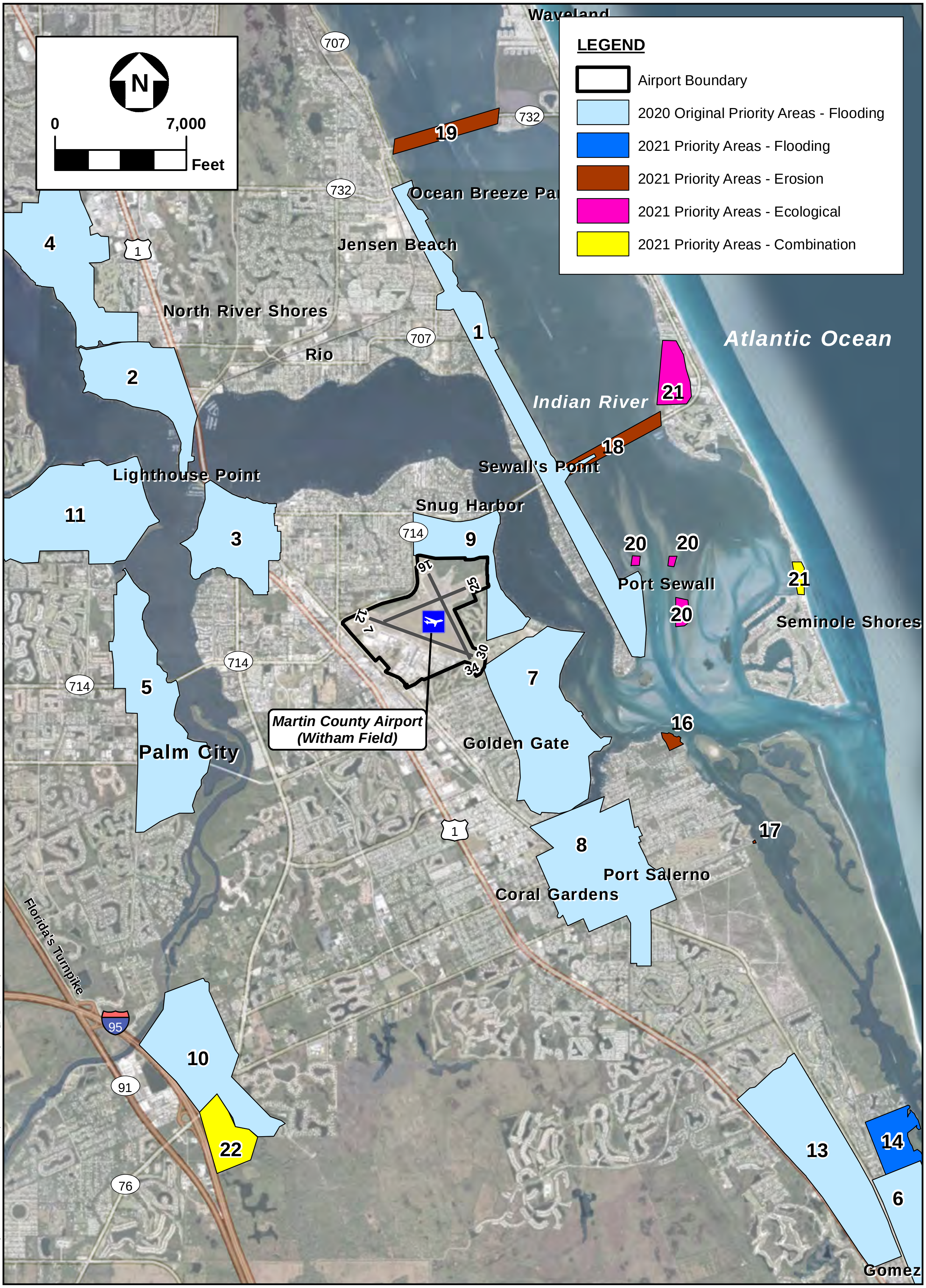
Adapt to future conditions

- Develop a vulnerability mitigation plan by 2023
- Perform a flooplain analysis
- Adopt building requirements in the zoning code that increase resilience

Lessen heat impacts on the community

- Draft a policy that incentivizes green-roof sustainable alternatives by 2023
- Promote shade trees

Figure F-2: City of Stuart Climate Resiliency Actions
SOURCE: City of Stuart, 2021. *Sustainability Action Plan.* Accessed in November 2021 at: https://cityofstuart.us/DocumentCenter/View/2978/Sustainability-Action-Plan---Adopted-Nov-2020



Source: Esri; Martin County, 2020/2021; ESA, 2022.

Witham Field Master Plan

FIGURE F-1
MARTIN COUNTY SEA LEVEL RISE REPORT - PRIORITY AREAS

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F.1.4 Airport Resiliency Planning

Martin County has many miles of ocean, estuary, freshwater, coastline, and marsh habitats, as well as constructed infrastructure, that are all fundamentally at risk to climate change impacts. Impacts of climate change in Martin County are already apparent through SLR and unpredictable weather patterns, which is manifested in flooding that is increasing in frequency and duration across the County.

Due to its proximity to the Atlantic Ocean, St Lucie River, and Willoughby Creek, SUA has determined that the inclusion of a resiliency-related perspective as part of their master planning process was crucial to the long-term success of the planning effort as well as the continued utility of the airport in the face of changing climatic circumstances. This report is intended to provide information pertinent to each existing asset at SUA as well as those that would be developed as future plans are executed. The information available through this effort may be used to program asset upgrades/retrofit, help site new facilities, or to appropriately scale any future airport improvement efforts to mitigate potential risks.

SUA is identified as a critical asset by Martin County and the City of Stuart due to its local economic influence; widespread utility to a diverse set of local users; and as a community asset as population, businesses, and demographics continue to grow and change. The Airport Master Plan provides further discussion regarding local demographic trends, airport use, and airport economic influence.

F.2 Climate-Related Threats and Risks at SUA

F.2.1 Identifying Climate-related Threats

Airport resiliency planning is organized around four elements associated with climate change predictions, including SLR, increased frequency of extreme temperature, altered rainfall patterns, and increased incidence of extreme storm events (including hurricanes). The potential impacts specific to protecting and maintaining airport function at SUA in light of these anticipated changes are outlined below.

As there are many variables that contribute to the effects of global climate change, predictive models describe a spectrum of greenhouse gas (GHG) related climate change scenarios between intermediate low, which relates to slow, incremental global temperature rise, and extreme, which is a more rapid and aggressive potential outcome.[12] The various possible futures are based on different combinations of assumptions, successes, or failures that may be associated with social, economic, political, and technological developments, including future GHG emissions and land-use patterns, etc.

[12] NOAA, 2021. *Sea Level Rise Viewer.* Accessed in September 2021 at: https://coast.noaa.gov/slr
[Note that the scenarios include "global mean SLR, regional changes in ocean circulation, changes in Earth's gravity field due to ice melt redistribution, and local vertical land motion."]

F.2.1.1 Sea Level Rise

Coastal and low-lying areas are particularly vulnerable to SLR, including localized flooding and associated infrastructure damage, the potential for increased saltwater intrusion into freshwater resources, and increased shoreline erosion or subsidence of coastal lands.[13] Due to higher sea levels, the occurrence of king tide flooding (also called sunny day flooding) is also expected to increase.[14]

The potential SLR scenarios in proximity to SUA are given in **Table F-1**.[15] For planning purposes at SUA, the range of intermediate to intermediate-high outcomes was assumed to be reasonably expected and was used to capture both potential vulnerabilities within the 20-year horizon of the Airport Master Plan as well as the lifespan of individual projects and planning objectives envisioned in the Plan. Note that, although this analysis utilized a moderately conservative scenario, the actual timeframe under which the threat of SLR would be realized is unknown and could follow high or extreme scenarios; thus, for projects with a longer lifespan or higher cost, it may be more suitable to plan under the high or extreme scenario.

TABLE F-1
SEA LEVEL RISE PREDICTIONS FOR THE TRIDENT PIER AT PORT CANAVERAL

Year	Sea Level Rise Estimates (feet)				
	Intermediate Low	Intermediate	Intermediate High	High	Extreme
2040	0.66	1.02	1.41	1.80	2.07
2070	1.21	2.20	3.28	4.46	5.38
2100	1.67	3.71	6.00	8.46	10.43

NOTE: These data correspond to local SLR scenarios developed for the Trident Pier at Port Canaveral, which represents the closest Local Scenario Location on NOAA's SLR Viewer, 2021. Figures F-3 through F-6 correspond with current mean higher high water (MHHW) elevations and a 2-foot, 3-foot, and 6-foot SLR scenario.

SOURCE: NOAA SLR Viewer, accessed in September 2021 at: https://coast.noaa.gov/slr/#/layer/sce/0/-8931311.117598966/3146334.2590602/14/satellite/81/0.8/2020/extreme/midAccretion.

SUA is immediately bordered to the east by the St. Lucie River, which flows directly to the Atlantic Ocean through the St. Lucie's Inlet, making these systems hydrologically connected to the Atlantic and thus susceptible to the effects of SLR. **Figures F-3** through **F-6** utilize predictive NOAA SLR modeling data to show the current environment at mean higher high water versus the anticipated

13 IPCC, 2021: *Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* [MassonDelmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press. In Press. Accessed in September 2021 at: https://www.ipcc.ch/report/ar6/wg1/#SPM
Note: this reference is used throughout this document and here forward cited as: IPCC, 2021.

14 National Oceanic and Atmospheric Administration (NOAA), 2021. *The State of U.S. High Tide Flooding and the Outlook through April 2022*. Accessed in September 2021 at https://tidesandcurrents.noaa.gov/HighTideFlooding_AnnualOutlook.html

15 NOAA, 2021. *Sea Level Rise Viewer.* Accessed in September 2021 at: https://coast.noaa.gov/slr
[Note that the scenarios include "global mean SLR, regional changes in ocean circulation, changes in Earth's gravity field due to ice melt redistribution, and local vertical land motion."]

inundation of SUA properties in a 2-foot, 3-foot, and 6-foot SLR scenario.[16] The 2-foot scenario was chosen for analysis as, based on NOAA SLR data for this location, it corresponds with the 20-year horizon of this Airport Master Plan. The 3-foot and 6-foot scenarios were chosen to correspond to the SLR projections for 2070 and 2100 included in the Martin County SLR Impact Analysis Report.[17]

As shown in **Figure F-3**, there is a low-lying area located on the north to northeast side of the airport property along Southeast Kingswood Terrace. Current geographic imagery indicates that this area is permanently inundated and is hydrologically connected to the Atlantic Ocean. Furthermore, this area borders Priority Area 9 as identified in Martin County's SLR Report as an area prone to flooding (see **Figure F-1**). Given these data, and those presented in **Figures F-4** through **F-6**, this low-lying area would be vulnerable to SLR and the area of inundation is likely to become increasingly larger as the SLR threat progresses. In the 2-foot and 3-foot scenario, the low-lying area would expand to the northeast (**Figure F-4** and **F-5**). In the 6-foot scenario, a portion of the airport perimeter road (just south of Kingswood Terrace) would likely become completely inundated (**Figure F-6**). Additionally, part of the Runway Protection Zone located to the east of Runway 7-25 would likely be underwater by the 6-foot scenario. Willoughby Creek, to the southeast of the airport, also increases in 2-foot, 3-foot, and 6-foot scenarios, potentially reducing the functionality of adjacent stormwater features (e.g., water conveyances and retention ponds) that are hydrologically connected to the Creek.

The IPCC reports with high certainty that global mean sea level will continue to rise over the 21st century. Relative to 1995-2014, the likely global mean SLR by 2100 could range from 1 foot under a low GHG emissions scenario to 3.3 feet under a high GHG emission scenario. There is also a possibility of global mean sea levels reaching 6.5 feet in 2100 under a high GHG emissions scenario due to uncertainty about ice sheet melting processes.[18]

Under extreme SLR projections, the airport could experience 2-foot SLR toward the end of the 20-year master plan horizon. Between 2070 and 2100, the airport could experience a 3-foot SLR scenario, but a 6-foot scenario is not expected to occur before 2070 (**Table F-1**). Six feet of SLR could occur before 2080 in the extreme scenario or by 2100 according to the intermediate scenario (**Figure F-6**).[19] These projections are meant to give the airport a "best case" and "worst case" scenario with regards to SLR. However, these data do not consider the impacts of king tides that are a frequent source of flooding experienced in Martin County. If king tides coincide with major precipitation events, local flooding can be exacerbated by SLR and result in water levels that are higher than the estimates presented in **Table F-1**. Thus, it is in the best interest of the airport to work closely with Martin County to adequately consider king tide events into future planning and prepare for possible extreme flooding.

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16 NOAA 2021. *SLR Viewer* accessed in September 2021 at: https://coast.noaa.gov/slr/#/layer/sce/1/-9106200.709775362/3018928.8570156926/14/satellite/90/0.8/2050/extreme/midAccretion

17 Martin County, 2021. *Sea Level Rise Report: 2021 Impact Analysis.*

18 IPCC, 2021.

19 Martin County, 2021. *Sea Level Rise Report: 2021 Impact Analysis*. NOAA Intermediate-High SLR projections presented in the Martin County *Sea Level Rise Report: 2021 Impact Analysis*

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Source: National Oceanic and Atmospheric Administration (NOAA) Sea Level Rise Viewer and ESA, 2022.

FIGURE F-3
EXISTING MEAN HIGHER HIGH WATER LEVEL

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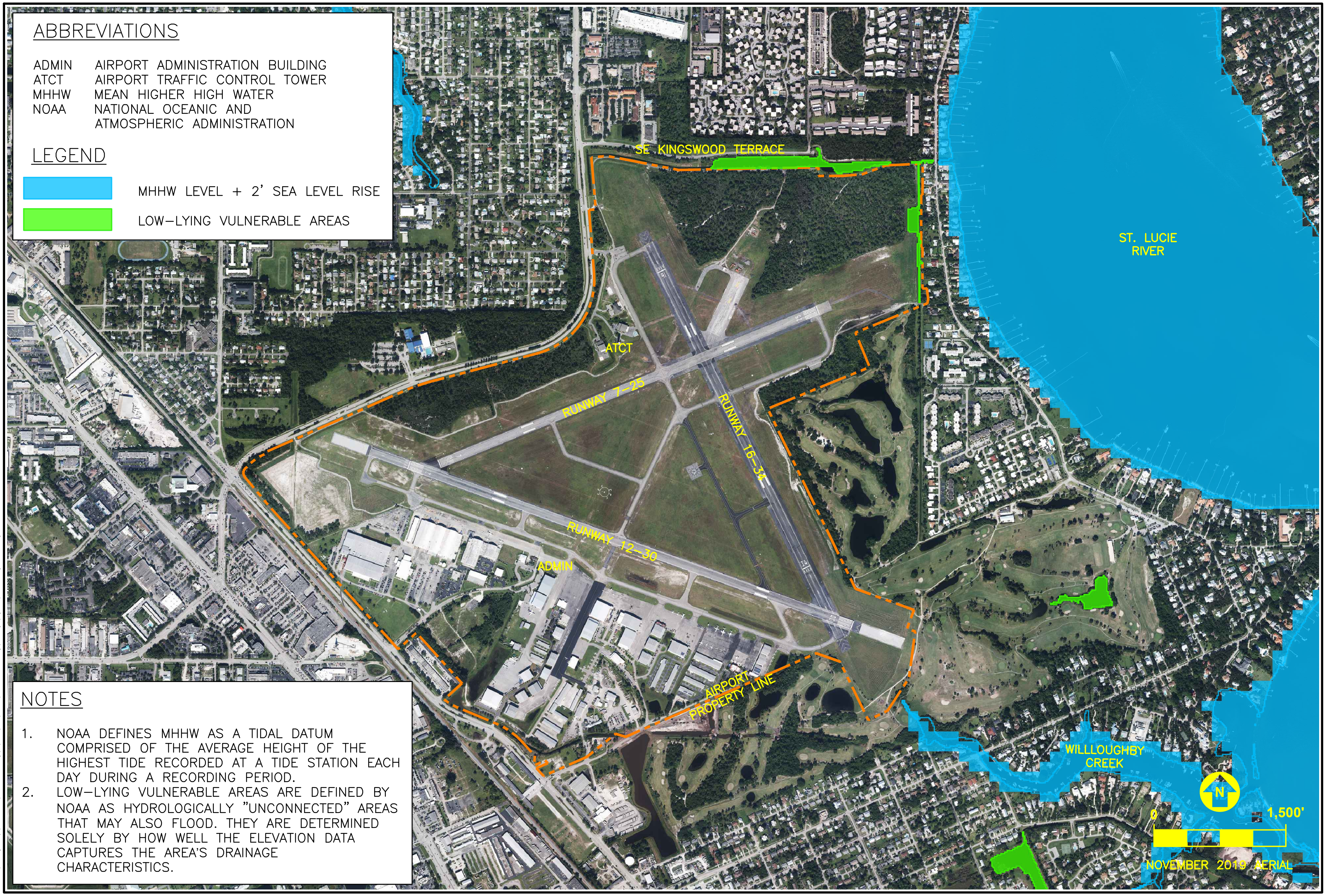

ABBREVIATIONS

ADMIN AIRPORT ADMINISTRATION BUILDING
ATCT AIRPORT TRAFFIC CONTROL TOWER
MHHW MEAN HIGHER HIGH WATER
NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

LEGEND

MHHW LEVEL + 2' SEA LEVEL RISE
LOW-LYING VULNERABLE AREAS

NOTES

1. NOAA DEFINES MHHW AS A TIDAL DATUM COMPRISED OF THE AVERAGE HEIGHT OF THE HIGHEST TIDE RECORDED AT A TIDE STATION EACH DAY DURING A RECORDING PERIOD.
2. LOW-LYING VULNERABLE AREAS ARE DEFINED BY NOAA AS HYDROLOGICALLY "UNCONNECTED" AREAS THAT MAY ALSO FLOOD. THEY ARE DETERMINED SOLELY BY HOW WELL THE ELEVATION DATA CAPTURES THE AREA'S DRAINAGE CHARACTERISTICS.

Source: National Oceanic and Atmospheric Administration (NOAA) Sea Level Rise Viewer and ESA, 2022.

FIGURE F-4
POTENTIAL EFFECTS OF 2 FOOT SEA LEVEL RISE

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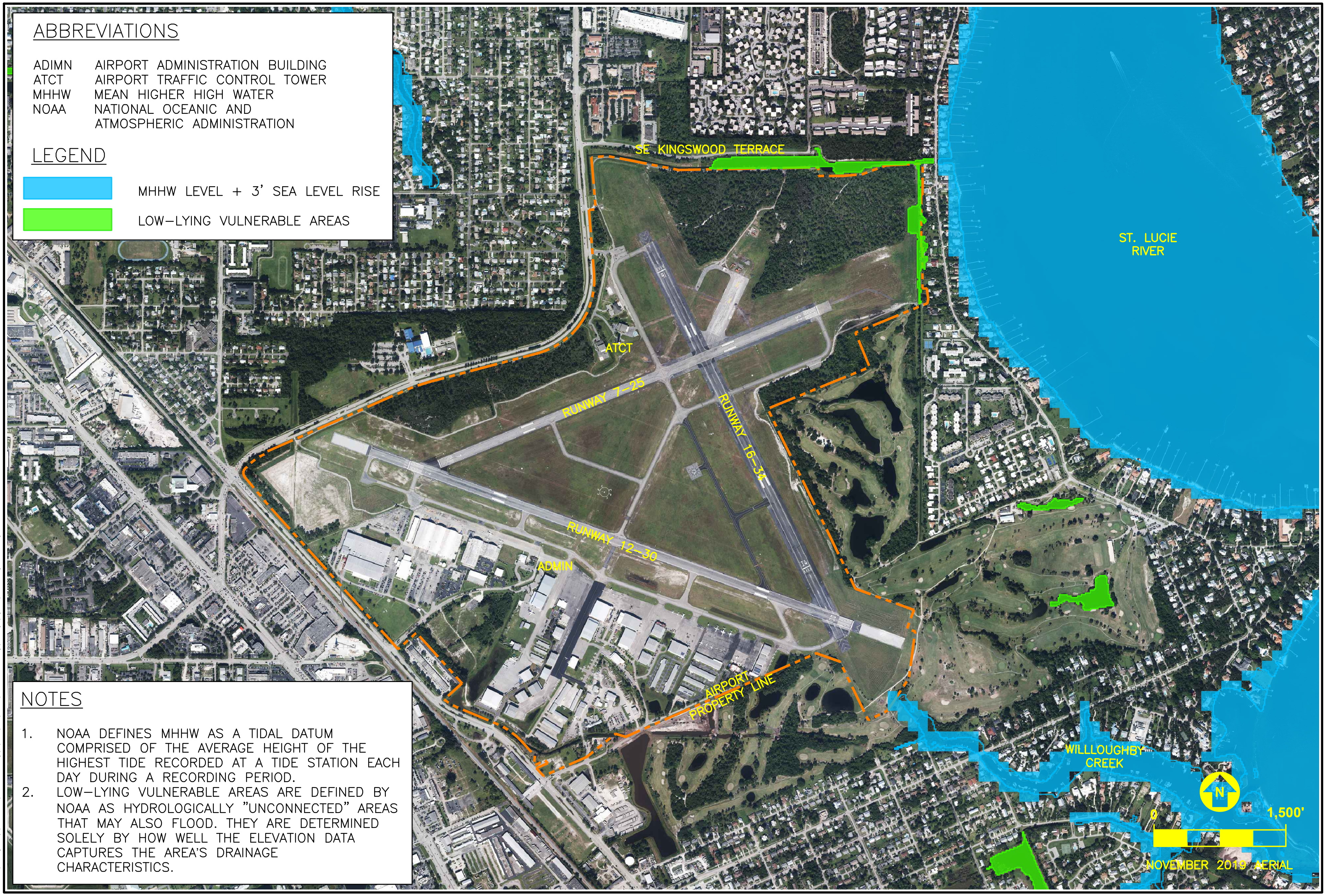

Jan 06, 2022 – 11:14am
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Source: National Oceanic and Atmospheric Administration (NOAA) Sea Level Rise Viewer and ESA, 2022.

FIGURE F-5
POTENTIAL EFFECTS OF 3 FOOT SEA LEVEL RISE

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NOTES

1. NOAA DEFINES MHHW AS A TIDAL DATUM COMPRISED OF THE AVERAGE HEIGHT OF THE HIGHEST TIDE RECORDED AT A TIDE STATION EACH DAY DURING A RECORDING PERIOD.
2. LOW–LYING VULNERABLE AREAS ARE DEFINED BY NOAA AS HYDROLOGICALLY "UNCONNECTED" AREAS THAT MAY ALSO FLOOD. THEY ARE DETERMINED SOLELY BY HOW WELL THE ELEVATION DATA CAPTURES THE AREA'S DRAINAGE CHARACTERISTICS.

Jan 06, 2022 – 1:42pm
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Source: National Oceanic and Atmospheric Administration (NOAA) Sea Level Rise Viewer and ESA, 2022.

FIGURE F-6
POTENTIAL EFFECTS OF 6 FOOT SEA LEVEL RISE

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Although SUA sits at a high enough elevation to withstand severe impacts of SLR during the Airport Master Planning horizon of 20 years, the airport does have a few low-lying areas that make it vulnerable to changes in sea levels. Furthermore, localized flooding events due to king tide and extreme precipitation, in combination with increased SLR, is likely to increase the magnitude and frequency of flooding experienced at the airport. In summary, threats specific to SUA from SLR may include:

Inundation. SLR could eventually require mitigation on the north and northeast side of the airport property where low-lying, vulnerable areas have been identified. These areas to the northeast of SUA have also been identified as priority areas by Martin County due to their potential for flooding. Future modifications to onsite stormwater systems to protect against or control inundation may also be required.

Stormwater Management. Increased water table and adjacent surface water levels may make the movement of stormwater off airport pavements increasingly complicated, which may require closures or delays until excessive standing water recedes.

Saltwater Intrusion. SLR may increase the salinity of nearshore water tables, which could increase the rate of corrosion and weathering of subsurface or surface infrastructure.

F.2.1.2 Increased Frequency of Extreme Temperatures

The definition of extreme heat varies based on many different factors, such as location, weather conditions (such as temperature, humidity, and cloud cover), and the time of year. The IPCC considers extreme heat to be days in which temperature is above 95°F.[20] According to local weather data, monthly mean temperatures in 2021 were slightly above average across much of the Southeast region.[21] Between 1942 and 2018, the Martin County area recorded 61 days a year (on overage) with a maximum temperature above 90ºF, typically concentrating in July and August.[22]

Each of the last four decades has been successively warmer than any decade that preceded it. There is high certainty that hot extremes (including heatwaves) have become more frequent and more intense across most land regions since the 1950s, with high confidence that human-induced climate change is the main driver of this change. It is anticipated with high confidence that an overall 2.7°F to 3.6°F temperature rise will be exceeded in the 21st century. Furthermore, the coldest and warmest daily temperatures of the year are expected to increase at least 5°F in most areas by mid-century, rising to 10°F or more by late-century. As climate change progresses, it is predicted that extreme temperatures may be experienced more frequently and for longer consecutive durations in

20 IPCC, 2021.

21 Southeast Regional Climate Center, University of North Carolina Chapel Hill, NC. 2021. *State Average Data*. Accessed in November 2021 at: https://sercc.com/state-climate-data/?wpv_view_count=2688&wpv-wpcf-climate-data-region=SER&wpv-wpcf-climate-data-type=TEMP&wpv_filter_submit=Submit.

22 Southeast Regional Climate Center, University of North Carolina Chapel Hill, NC. 2021. *Mean Days Maximum Temperature Data for Southeast Region*. Accessed in October 2021 at: https://sercc.com/comparative-climate-data/?wpv_view_count=4740&wpv-wpcf-climate-data-type=MEANDSMAXTEMP&wpv_filter_submit=Submit. Note that these data are specific for Vero Beach located 32 miles north of SUA.

comparison to known historic patterns.[23] The U.S. government's National Climate Assessment estimates 20-30 more days over 90°F in most areas of the U.S. by mid-century, with increases of 40–50 days in much of the Southeast.[24] Threats specific to SUA from higher temperatures may include:

Impacts to Airport Pavements. Florida airport pavements are constructed and maintained to withstand existing elevated Florida temperatures and other climate-related weathering and are typically refurbished or reconstructed on a 10- or 20-year cycle, respectively. Although rare, runway pavements exposed to extremely high temperatures could experience a loss of structural integrity and may be susceptible to warping, cracking, or rutting. Compromised runway and taxiway pavements affect aircraft safety and could require intervention and renovation under extreme circumstances. Particularly vulnerable pavements include areas of heavy use and/or high wheel pressure, such as turn areas. Furthermore, areas that have not been constructed properly (e.g., asphalt mixture is not designed properly) are prone to rutting under high temperatures.[25]

Cooling Requirements. Higher temperatures would require that SUA consume energy at an increased pace and would place increased demand on indoor cooling equipment supporting existing facilities. Repeated, higher intensity use of cooling equipment in high-temperature scenarios would strain equipment and could reduce its anticipated lifespan. Increased temperatures also decrease the efficiency with which energy is produced and delivered to consumers. Cumulatively across Martin County and the City of Stuart, increased temperatures for all residents and businesses would also place an increased strain on local energy providers, at a time when the system is not operating at optimal efficiency, as consumer demand increases to cool indoor structures.

Aircraft Performance. Aircraft experience reduced takeoff performance in increased temperature conditions, which may require operational restrictions for certain aircraft given the runway length available. Likewise, increased fuel consumption may require an increase in the provision and consumption of aviation fuel resources.

Facility Weathering. SUA buildings may be susceptible to the increased impacts of weathering brought on by prolonged hot and dry periods (warping and cracking), which would be further exacerbated by the increased incidence and intensity of precipitation events (rain, wind, erosion, scouring, etc.). Facility exposure and vulnerability is further discussed in Section F.3.

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23 IPCC, 2021.

24 USGCRP, 2017: *Climate Science Special Report: Fourth National Climate Assessment, Volume I* [Wuebbles, D.J., D.W. Fahey, K.A. Hibbard, D.J. Dokken, B.C. Stewart, and T.K. Maycock (eds.)]. U.S. Global Change Research Program, Washington, DC, USA.
The U.S. Global Change Research Program (USGCRP) is a federal program mandated by Congress to coordinate federal research and investments in understanding the forces shaping the global environment, both human and natural, and their impacts on society. USGCRP facilitates collaboration and cooperation across its 13 federal member agencies to advance understanding of the changing Earth system and maximize efficiencies in federal global change research.

25 Greg White, 2018. *State of the art: Asphalt for Airport Pavement Surfacing.* International Journal of Pavement Research and Technology, Volume 11, Issue 1, 2018.

F.2.1.3 Altered Rainfall Patterns

Over the last ten years, the City of Stuart recorded an average of 51 inches of precipitation per year (see Chapter 1). The rainy season generally occurs from June through October with an approximate average of 8 inches of rain per month. The dry season occurs from November through May with a range of 2 inches (January) to 5 inches (May) per month.

Across the globe, altered rainfall patterns are expected to increase the length of rainy seasons and duration/intensity of precipitation events in some areas, while causing extended precipitation deficits and protracted droughts in other locations or seasons.[26] The use of predictive modeling to foretell exactly where and how these precipitation pattern changes will occur is less robust than for other effects of climate change, but in general the southeastern U.S. is expected to experience a 5 to 10 percent increase in precipitation in conjunction with a 2.7ºF or 3.6ºF rise in average global temperature, respectively.[27] However, based on these models, it is postulated that this change may be experienced in southern Florida with altered seasonality, producing drier springs and summers and profoundly wetter falls and winters.[28] As detailed in Section F.2.1.2, a 2.7ºF and 3.6ºF temperature rise is expected to be exceeded in the 21st century with corresponding incremental impacts to rainfall patterns as temperature continues to shift.[29]

While drier seasons may not have marked impacts on airport facilities, threats specific to SUA from an increased volume and frequency of precipitation events may cause:

Weather Delays. On average, 70 percent of airport delays within the national airspace system are related to weather,[30] which may increase as storm patterns shift globally. Airport operations may experience increased weather-related operational delays due to decreased visibility, navigation limitations, and flooding of active airfield movement areas. Wet pavements require additional length for safe aircraft operations, so persistent flooding on paved surfaces may restrict their use until water is receded (i.e., episodic flooding may not always shut down runways, but aircraft cannot use them to full capacity).

Flooding. Coastal areas such as Martin County can be especially vulnerable to altered rainfall patterns that result in extreme precipitation events and flooding. As noted in the Martin County SLR Report, flooding has become a routine occurrence in the County. King tides that coincide with

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26 IPCC, 2021.

27 Hoegh-Guldberg, O., D. Jacob, M. Taylor, M. Bindi, S. Brown, I. Camilloni, A. Diedhiou, R. Djalante, K.L. Ebi, F. Engelbrecht, J. Guiot, Y. Hijioka, S. Mehrotra, A. Payne, S.I. Seneviratne, A. Thomas, R. Warren, and G. Zhou, 2018. *Impacts of 1.5ºC Global Warming on Natural and Human Systems. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty* [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M.Tignor, and T. Waterfeld (eds.)]. In Press

28 National Aeronautics and Space Administration, 2019. *Precipitation Measurement Missions: Climate Change, Trends and Patterns* accessed in November 2021 at: The Global Precipitation Measurement Mission (GPM) | NASA Global Precipitation Measurement Mission , and NASA 2013, *National Climate Assessment: 21st Century Precipitation Scenarios* accessed in November 2021 at: https://svs.gsfc.nasa.gov/4028.

29 IPCC 2021.

30 Sustainable Aviation Guidance Alliance, 2015. *Integrate Climate Resilience Considerations in Airport Development Projects, Case Studies: Port Authority of New York and New Jersey Airports*. 30 September.

high rainfall has also been noted to exacerbate flooding events.[31] SUA may experience an increased risk of flooding and standing water due to ineffective stormwater management systems in a changed environment and insufficient retention capacity or drainage success in low-lying areas. Perpetually saturated surfaces could reduce the efficiency of the system to move water through airport property and reduce the ability of low-lying areas to capture stormwater flow. Furthermore, areas of persistent flooding may be prone to attract wildlife and would require more frequent implementation of hazard reduction practices.

Facility Weathering. SUA assets and infrastructure (i.e., buildings and pavements) may be susceptible to the increased impacts of weathering brought on by both increased incidence and intensity of precipitation events (rain, wind, erosion, scouring) as well as from prolonged hot and dry periods (warping and cracking). Facility exposure and vulnerability is further discussed in Section F.3.

Diminished Water Quality. With increased volume of precipitation events, increased effort would be required to avoid water quality issues and permit violations associated with hazardous material contamination from runoff and insufficient containment.

F.2.1.4 Increased Incidence of Extreme Storm Events

Since 1870, the County has experienced 20 tropical storms, six Category 1, eight Category 2, three Category 3, and two Category 4 hurricanes. The most recent hurricane, Wilma, passed through the County in 2005 as a Category 2.[32]

Extreme storm events are defined as high-precipitation episodes that can produce flash flooding, gusty winds, hail, tornados, etc.[33] An increasing trend towards extreme storm events has been identified globally and is correlated to an increase in average global temperature.[34] Florida has always been susceptible to the impacts of hurricane and other extreme storm events, which may increase in intensity in susceptible locations as climate change progresses.[35, 36] In addition to damage from high winds, debris generation, and excessive rainfall, storm surges cause additional flooding on land adjacent to marine and freshwater features.

Although the airport cannot avoid impacts from hurricane or extreme storms, SUA is an essential transportation facility for evacuation and for supply import and staging after the storm passes and damages are assessed.

31 Martin County, 2021. *Sea Level Rise Report: 2021 Impact Analysis*.

32 Data compilation reproduced from: NOAA. *Historical Hurricane Tracks*. Accessed in October 2021 at: https://coast.noaa.gov/hurricanes/

33 National Academy of Sciences, Engineering, and Medicine, 2015. Transportation Research Board, Airport Cooperative Research Program Report 147- *Climate Change Adaptation Planning: Risk Assessment for Airports.*

34 IPCC, 2021.

35 IPCC, 2021.

36 U.S. Global Change Research Program, 2018: *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II* [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, 1515 pp. doi: 10.7930/NCA4.2018

F.2.2 Identifying Risks

The United Nations IPCC defines risk as:[37]

> *The potential for adverse consequences from a climate-related hazard for human and natural systems, resulting from the interactions between the hazard and the vulnerability and exposure of the affected system. Risk integrates the likelihood of exposure to a hazard and the magnitude of its impact. Risk also can describe the potential for adverse consequences of adaptation or mitigation responses to climate change.*

Risk can be defined in terms of the relative certainty that any of the four elements associated with climate change predictions (or a combination thereof) will impact a location, or it can be measured specific to the infrastructure or assets located in areas that would be particularly susceptible to the effects of climate change.

Modeling data sets from NOAA, the U.S. Army Corps of Engineers, and other entities dedicated to understanding potential climate-related threats are combined by various organizations to provide relative threat and risk indices. One such index is produced by the U.S. Global Change Research Program (USGCRP).[38] According to the USGCRP Coastal Vulnerability Index, the St. Lucie River area is ranked high risk that the coastal areas will be altered as sea level rises.[39] Additionally, the National Fish and Wildlife Foundation (NFWF) Coastal Resilience Evaluation and Siting Tool (CREST)[40] ranks the SUA area as high (9 out of 10) in an overall index of potential community exposure to SLR due to population density. [41] The NFWF CREST also ranks the SUA area as high (6 out of 10) in an overall threat index due to a combination of storm surge, flood prone areas, areas

[37] International Panel on Climate Change, 2018. *Summary for Policymakers. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty* [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, Maycock, M. Tignor, and T. Waterfield (eds.)]. World Meteorological Organization, Geneva, Switzerland, 32 pp. Accessed in September, 2021 at: https://www.ipcc.ch/sr15/chapter/spm/

[38] U.S. Global Change Research Program (USGCRP) is a Federal program mandated by Congress to coordinate Federal research and investments in understanding the forces shaping the global environment, both human and natural, and their impacts on society. USGCRP facilitates collaboration and cooperation across its 13 Federal member agencies to advance understanding of the changing Earth system and maximize efficiencies in Federal global change research. (Accessed in October 2021 at: https://www.globalchange.gov/about)

[39] U.S. Geologic Society, 2021. *Climate Change Hazards Portal.* Accessed in September 2021 at: https://marine.usgs.gov/coastalchangehazardsportal/

[40] Regional Coastal Resilience Assessments were developed by the National Fish and Wildlife Foundation (NFWF), in partnership with the National Oceanic and Atmospheric Administration, the U.S. Army Corps of Engineers, UNC Asheville's National Environmental Modeling and Analysis Center, and NatureServe (Accessed in October 2021 at: https://resilientcoasts.org/#About).

[41] National Fish and Wildlife Foundation, 2019. *Coastal Resilience Evaluation and Siting Tool.* Accessed in September 2021 at: https://resilientcoasts.org/#AnalyzeProjectSites

of low slope, impermeable soils, and SLR. The individual factors that contribute to the high coastal vulnerability indices for the SUA area are shown in **Figure F-7**.

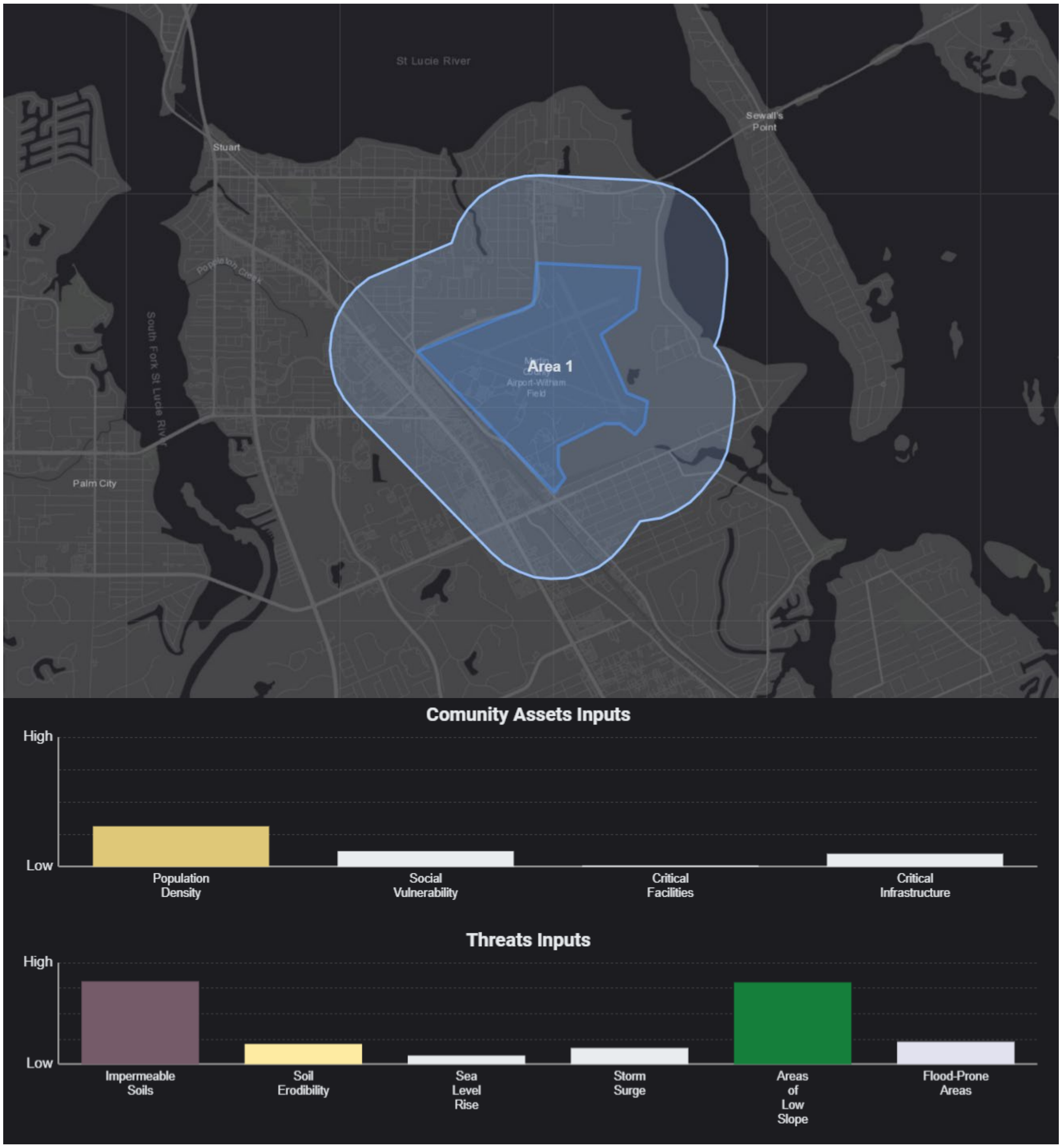


Figure F-7: Coastal Resilience and Threat Evaluation at SUA

NOTE: NFWF CREST resiliency evaluation was performed for “Area 1 (SUA and vicinity)”. Community asset and threat inputs are factored into the overall Threat Vulnerability Indices for the defined area.

SOURCE: Screen shot reproduced from National Fish and Wildlife Foundation (NFWF), 2021. *Coastal Resilience Evaluation and Siting Tool (CREST)*. Accessed in September 2021 at: https://resilientcoasts.org/#AnalyzeProjectSites

F.3 Review of SUA Vulnerable Assets

SUA is physically vulnerable to the threats associated with predicted climate trends under extreme conditions, especially on the northeast side of the airport (see Section F.2). In light of the ongoing criticality of SUA operations, airport assets are reviewed to determine the specificity of potential impacts and the appropriate level of planning and mitigation required to protect airport operations under multiple plausible future scenarios. This analysis proceeded in three steps: 1) identifying the critical assets at SUA, 2) scoring these critical assets for vulnerability to the threats of climate change, and 3) prioritizing response to perceived risk.

F.3.1 Step 1: SUA Critical Asset Inventory

Critical assets at the airport are listed in **Table F-3**. For consistency, this inventory includes and largely follows the format of the assets as discussed in the Airport Master Plan; however, the assets have been slightly reordered and re-categorized to capture the varying geography and relative proximity to adjacent aquatic systems and the disproportionate threat, or urgency to respond to that threat, that may be experienced at the different locations.

TABLE F-3
MARTIN COUNTY (WITHAM FIELD) CRITICAL ASSETS

Category	Specific Asset
Airfield Facilities	
Aircraft Operation Areas	Runway System
	Taxiway System
Airfield Electrical Systems	
Airfield Lighting	Rotating Beacon
	Runway Lighting
	Taxiway Lighting
	Airfield Signage
Takeoff and Landing Aids	Runway End Identifier Lights (REIL)
	Visual Glide Slope Indicators - PAPI systems
	Automated Surface Observing System (ASOS)
Northeast (NE) Area	
NE Area – Public Service Facilities	Martin County Sheriff's Office – Aviation Unit
	Martin County Fire Rescue
NE Area – Critical Support and Service Facilities	Airport Traffic Control Tower (ATCT)
NE Area – Sub-Critical Support and Service Facilities	Airport Maintenance Equipment and Facilities
NE Area – General Aviation Facilities	Automobile Parking Lots (inside fence)
NE Area – Landside Facilities	Interior Airport Perimeter Road
	Airport Access Roads
NE Area – Utilities	Stormwater Management Features
NE Area – Green Space	Public Safety Facility Improvements Stormwater Retention/Function

TABLE F-3
MARTIN COUNTY (WITHAM FIELD) CRITICAL ASSETS

Category	Specific Asset
Southwest (SW) Area	
SW Area – Public Service Facilities	Martin County Public Works (equipment storage/administration buildings)
SW Area – Critical Support and Service Facilities	Airfield Electrical Vault Fuel Farms (above-ground storage tanks)
SW Area – Sub-Critical Support and Service Facilities	Airport Administration / Operations Building U.S. Customs and Border Patrol
SW Area – General Aviation Facilities	Fixed Base Operator Terminals Aircraft Parking Aprons Hangars, T-Hangars, and Based Aircraft Tie-downs
SW Area – General Aviation Facilities	Automobile Parking Lots (inside fence)
SW Area – Landside Facilities	Interior Airport Perimeter Road Airport Access Roads Automobile Parking Lots (outside fence)
SW Area – Utilities	Stormwater Management Features
Other	
Utilities	Potable Water / Sewer Service Electrical Grid Connectivity Fiber / Communications Cables
Rail Spur	Access to Rail Transportation Network

SOURCE: ESA, 2022.

F.3.2 Step 2: Vulnerability Ranking

F.3.2.1 Methodology

In order to determine the risks to various airport assets, and thus their relative vulnerability, the sensitivity and adaptive capacity of a given category of assets is identified based on the following standard set of definitions:

Sensitivity. The evaluation of sensitivity captures the potential affects to an asset from an anticipated climate-related impact and the level of necessary repairs required to maintain the asset's designated function. The sensitivity of an asset is measured on a scale from 0 to 4, indicating the relative degree of damage expected from a given climate-related impact (**Table F-4**). Note that the sensitivity evaluation focuses on each individual asset in its location and its existing, designated function; i.e., the potential redundancy of a given asset across the airport or the ability for functions to be shifted to other assets in the event of climate-related damage are factored into SUA priority asset evaluation (Section F.3.4) and mitigation (Section F.4) discussions and not considered here.

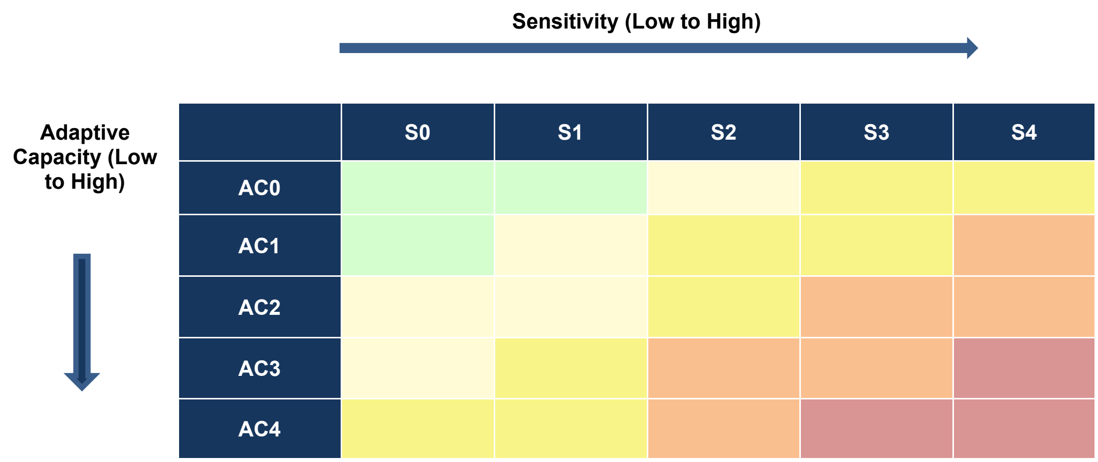
TABLE F-4 SENSITIVITY SCORING	
S0	*Not Affected* – asset is not impacted by threat and/or the avoidance of potential damage is already accounted for in existing design standards
S1	*Negligibly Affected* – asset likely to sustain damages that are cosmetic in nature and do not impact designated function of asset; asset is designed to be resilient to threat
S2	*Minimally Affected* – asset likely to sustain damage that causes non-critical inefficiencies but maintains short-term designated use of asset; or damage is immediately repairable without extended loss of function
S3	*Moderately Affected* – asset likely to sustain extensive damage; repairs are essential to ongoing designated function of asset but can be implemented without significant cost or time investment
S4	*Fully Affected* – asset is destroyed or otherwise fully inoperable; reconstruction or relocation is required to regain asset functionality and may require significant time or cost to reestablish

Adaptive Capacity. Adaptive capacity refers to the degree by which an asset can adjust to accommodate the projected changes, absorb damages while maintaining useful function, evolve to create new opportunities, or otherwise manage the potential impact without extensive disruption to the airport. Impacts are measured on a scale of 0 to 4, indicating the level of potential functional impairment of the identified asset (**Table F-5**). Note that adaptive capacity is scored for each asset based on "new circumstances" from each identified threat (i.e., SLR may only affect a specific area of the airport, but a super storm would likely affect the entire airport property).

TABLE F-5 ADAPTIVE CAPACITY SCORING	
AC0	*Fully Adaptable* – asset and existing designated use can persist in new circumstances without modification and may even confer benefits, efficiencies, or additional function not otherwise observed
AC1	*Moderately Adaptable* – asset and designated function can persist in new circumstances, but optimal efficiency regained with simple and/or low-cost adjustments to existing system; high potential for asset repurposing
AC2	*Minimally Adaptable* – asset can persist and maintain full function or be repurposed in new circumstances only if minor adjustments to existing system are implemented
AC3	*Negligibly Adaptable* – asset can re-gain full designated function or be repurposed in new circumstances only with extensive adjustments to existing system
AC4	*Not Adaptable* – asset is not useful or functional under new circumstances; asset cannot be repurposed and would be removed or demolished

Comparing these scores to the matrix given in **Table F-6** establishes an overall vulnerability ranking of each asset category.

TABLE F-6
VULNERABILITY RANKING MATRIX



Not Vulnerable / Potential Opportunity

Low Vulnerability

Medium-Low Vulnerability

Medium-High Vulnerability

High Vulnerability

F.3.2.2 SUA Asset Vulnerability Analysis Results

Table F-7 summarizes the results of the SUA asset vulnerability ranking for the categories of assets listed in **Table F-3**.

TABLE F-7
SUMMARY OF SUA ASSET CATEGORY VULNERABILITY ASSESSMENT

Airport Asset Categories	Climate Change Threat			
	Sea Level Rise	**Increase in Temperatures**	**Altered Rainfall Patterns**	**Extreme Storm Events**
Airfield Facilities				
Aircraft Operation Areas - Runway - Taxiway	Medium-Low Vulnerability	Medium-Low Vulnerability	Medium-High Vulnerability	Medium-High Vulnerability
Airfield Electrical Systems - Airfield Lighting - Takeoff and Landing Aids	Medium-Low Vulnerability	Not Vulnerable / Potential Opportunity	High Vulnerability	High Vulnerability
Northeast Area				
NE Area - Public Service Facilities - Martin County Sheriff's Office - Aviation Unit - Martin County Fire Rescue	Low Vulnerability	Medium-Low Vulnerability	Low Vulnerability	Low Vulnerability

TABLE F-7
SUMMARY OF SUA ASSET CATEGORY VULNERABILITY ASSESSMENT

Airport Asset Categories	Climate Change Threat			
	Sea Level Rise	**Increase in Temperatures**	**Altered Rainfall Patterns**	**Extreme Storm Events**
NE Area - Critical Support and Service Facilities - Airport Traffic Control Tower	Low Vulnerability	Medium-Low Vulnerability	Low Vulnerability	Medium-High Vulnerability
NE Area - Sub-Critical Support and Service Facilities - Airport Maintenance Equipment and Facilities	Low Vulnerability	Medium-Low Vulnerability	Medium-Low Vulnerability	Low Vulnerability
NE Area - General Aviation Facilities - Automobile Parking Lots (inside fence)	Not Vulnerable / Potential Opportunity	Low Vulnerability	Low Vulnerability	Medium-Low Vulnerability
NE Area - Landside Facilities - Interior Airport Perimeter Road - Airport Access Roads	Medium-Low Vulnerability	Low Vulnerability	Medium-High Vulnerability	Medium-High Vulnerability
NE Area - Utilities - Stormwater Management Features	Medium-High Vulnerability	Not Vulnerable / Potential Opportunity	Medium-High Vulnerability	Medium-High Vulnerability
NE Area Green Space - Public Safety Facility Improvements - Stormwater Retention/Function	Medium-Low Vulnerability	Not Vulnerable / Potential Opportunity	Medium-Low Vulnerability	Medium-Low Vulnerability
Southwest Area				
SW Area - Public Service Facilities - Martin County Public Works (equipment storage/ administration buildings)	Low Vulnerability	Low Vulnerability	Low Vulnerability	Low Vulnerability
SW Area - Critical Support and Service Facilities - Airfield Electrical Vault - Fuel Farms (above-ground storage tanks)	Medium-Low Vulnerability	Medium-Low Vulnerability	Medium-High Vulnerability	High Vulnerability
SW Area - Sub-Critical Support and Service Facilities - Airport Administration/ Operations Building - U.S. Customs and Border Patrol	Low Vulnerability	Medium-Low Vulnerability	Low Vulnerability	Low Vulnerability
SW Area - General Aviation Facilities - Fixed Base Operator Terminals - Aircraft Parking Aprons	Low Vulnerability	Medium-Low Vulnerability	Low Vulnerability	Low Vulnerability

TABLE F-7
SUMMARY OF SUA ASSET CATEGORY VULNERABILITY ASSESSMENT

Airport Asset Categories	Climate Change Threat			
	Sea Level Rise	Increase in Temperatures	Altered Rainfall Patterns	Extreme Storm Events
- Hangars, T-Hangars, and Based Aircraft Tie-downs				
SW Area - General Aviation Facilities - Automobile Parking Lots (inside fence)	Not Vulnerable / Potential Opportunity	Low Vulnerability	Low Vulnerability	Medium-Low Vulnerability
SW Area - Landside Facilities - Interior Airport Perimeter Road - Airport Access Roads - Automobile Parking Lots (outside fence)	Not Vulnerable / Potential Opportunity	Low Vulnerability	Medium-High Vulnerability	Medium-High Vulnerability
SW Area - Utilities - Stormwater Management Features	Medium-High Vulnerability	Not Vulnerable / Potential Opportunity	Medium-High Vulnerability	Medium-High Vulnerability
Other				
Utilities - Potable Water / Sewer Service - Electrical Grid Connectivity - Fiber / Communications Cables	Medium-Low Vulnerability	Not Vulnerable / Potential Opportunity	High Vulnerability	High Vulnerability
Rail Spur	Medium-Low Vulnerability	Not Vulnerable / Potential Opportunity	Medium-High Vulnerability	Medium-High Vulnerability

Table F-12 presents further detail regarding the rationale for each score, which is summarized below. Note that Step 3, asset priority ranking, puts the vulnerability score in context with its use and location at SUA and recommends which, if any, assets should be considered for mitigation activities and avoidance measures.

High Vulnerability assets include the airfield electrical systems, critical support and service facilities (e.g., airfield electrical vault and fuel farms), and primary utilities. These assets are identified at risk of damage from persistent inundation, increased precipitation, and extreme storm events due to their high sensitivity to standing water, water intrusion, and strong winds. Water damage has the potential to create extensive damage to electrical, fiber optic, and fuel storage systems, which would make them inoperable and require costly relocation and reconstruction effort to avoid future damage.

Medium-High Vulnerability assets include aircraft operation areas, some landside facilities (e.g., roadways), critical support and service facilities, stormwater features, and the rail spur. These assets are identified as potentially vulnerable to SLR, altered rainfall, and extreme storm events due to their sensitivity to flooding and erosion if an influx of water overwhelmed stormwater features. Stormwater management features are particularly vulnerable to SLR because a persistent high-water scenario would reduce the hydraulic gradient and hinder or prevent drainage from critical surfaces.

Medium-Low Vulnerability assets generally include building structures with heating, ventilation, and air conditioning (HVAC) equipment that could experience some strain and/or inefficiencies as its use is increased under a high temperature environment. However, these assets could be modified or upgraded to adapt to increased use.

Low Vulnerability. Most SUA assets are generally considered well-adapted to the four climate change threats and scored either a low or medium-low vulnerability rating. This rating suggests these assets may sustain damage that causes non-critical inefficiencies but can maintain their designated use in the short-term. If these assets were to be damaged, it is expected that they would be immediately repairable and be able to persist in full-functioning capacity.

F.3.3 Step 3: SUA Asset Priority Ranking

F.3.3.1 Methodology

While the first two tiers of resiliency planning considered the sensitivity and adaptive capacity of an asset related to a specific climate change related threat, this third step considers the use of the specific asset (i.e., criticality) and its physical or temporal relationship to the prospective threats (i.e., urgency). These criteria were assessed in order to identify the tolerance to the impending risks and to adjust the response as required. Note that this assessment is subjective in nature as it is intended to fine-tune the results in **Table F-7**, and it does not result in a quantified ranking table.

Tolerance to risk can vary based on the value of the asset being described.[42] For example, expensive or expansive projects with longer anticipated lifespans, or assets with increased community criticality (utilities, hospitals, etc.) may have a lower tolerance for risk, and it may be a good planning philosophy to err on the side of caution (i.e., plan in advance for extreme scenarios). Conversely, simple or less expensive projects, projects with a shorter lifespan, or projects that are not immediately critical community assets may be less of a consideration in long-term resiliency planning (i.e., plan for lower-risk scenarios). In order to determine the tolerance for risks to various SUA infrastructure, the criticality of the asset to the airport's mission and urgency of impending threats to airport assets are used to prioritize potential resiliency projects.

Criticality. Criticality refers to the relative importance of the asset in the ongoing safe and efficient function of the airport. Note that this analysis focuses on the asset only (independent of potential threats). Likewise, this analysis focuses primarily on the airport's mission and not the missions of tenant organizations.

[42] U.S. Global Change Research Program, 2019. *Climate Resilience Toolkit.* Accessed in September 2021 at: https://toolkit.climate.gov/topics/coastal/sea-level-rise

TABLE F-8 CRITICALITY SCORING	
C0	*Not Critical* – asset is not essential to SUA mission or operations
C1	*Negligibly Critical* – asset contributes negligible beneficial effects to SUA mission or operations, such as nonessential efficiencies or luxury services
C2	*Minimally Critical* – loss of asset would affect the efficiency by which the SUA mission or operations could be executed but would not require suspension of operations
C3	*Moderately Critical* – asset is required for SUA mission or operations, but use or function can be suspended in the short term (potentially due to redundancies elsewhere within airport property)
C4	*Fully Critical* – airport requires asset to be completely functional or SUA mission or operations will cease completely

Urgency. Urgency takes into account an asset's exposure to a potential threat, including the relative proximity of the asset to the threat in its existing condition. As well as physical exposure, urgency scoring included the potential timeframe in which SUA is likely to start experiencing the effects of specific climate-related threats. **Table F-9** identifies an urgency scoring methodology specific to SLR. As discussed in Section F.2.1.1, SLR of approximately 2-feet could occur within the 20-year planning horizon (by 2040), a 3-foot SLR is anticipated between 2070 and 2100, and 6 feet of SLR is not expected to occur before 2070. Six feet of SLR could occur before 2080 in the extreme scenario or by 2100 according to the intermediate scenario.[43] Temperature and precipitation are not specifically defined for the purposes of scoring SUA assets, but a global temperature increase of 2.7ºF is expected to be exceeded during the 21st century under the intermediate, high, and very high GHG scenarios, with a corresponding change in extreme hot days and rainfall patterns.[44] The Airport Master Plan effort is for a 20-year timeframe, which includes improvement projects programmed up to 2041, and many improvement projects could have an expected lifespan of 70 years or more.

TABLE F-9 SLR URGENCY SCORING	
U0	2100
U1	2080
U2	2060
U3	2040 – Master Planning horizon is thru 2041
U4	2020

43 Martin County, 2021. NOAA Intermediate-High SLR projections presented in the Martin County *Sea Level Rise Report: 2021 Impact Analysis.*

44 IPCC, 2021.

F.3.3.2 Asset Priority Ranking Results

This final evaluation fine-tunes the relative priority of each specific critical asset at SUA to produce a prioritized list of assets that may require mitigation or installation of best management practices to ensure the longevity or consistent functionality of the targeted asset. **Table F-10** lists the SUA assets that are most vulnerable (high and medium-high vulnerability), but tempers those scores in perspective by assessing the urgency of threats and the criticality of the asset's relationship to the airport's mission.

Future planning efforts must consider the long-term vulnerabilities of climate-related impacts to airport operations to ensure the longevity of critical systems and assets. Although the airport is at an elevation that makes it less susceptible to SLR, it does maintain fully critical assets that are susceptible to altered rainfall and increased incidence and intensity of storm events that could pose risk to the safe and efficient operation of the airport.

TABLE F-10
ASSET RISK EVALUATION AND PRIORITIZATION

Vulnerable Airfield Asset	Asset Criticality	Asset Vulnerability to Climate Change Threat*			
		Urgency (SLR only)	Sea Level Rise	Altered Rainfall Patterns	Extreme Storm Events
Airfield Facilities					
Aircraft Operation Areas - Runway - Taxiway					
Airfield Electrical Systems - Airfield Lighting - Takeoff and Landing Aids					
Northeast Area					
NE Area - Critical Support and Service Facilities - Airport Traffic Control Tower					
NE Area - Landside Facilities - Interior Airport Perimeter Road - Airport Access Roads					
NE Area - Utilities - Stormwater Management Features					
NE Area Green Space - Public Safety Facility Improvements - Stormwater Retention/Function					
Southwest Area					
SW Area - Critical Support and Service Facilities - Airfield Electrical Vault - Fuel Farms (above-ground storage tanks)					
SW Area - Landside Facilities - Interior Airport Perimeter Road					

TABLE F-10
ASSET RISK EVALUATION AND PRIORITIZATION

Vulnerable Airfield Asset	Asset Criticality	Asset Vulnerability to Climate Change Threat*			
		Urgency (SLR only)	Sea Level Rise	Altered Rainfall Patterns	Extreme Storm Events
- Airport Access Roads - Automobile Parking Lots (outside fence)					
SW Area - Utilities - Stormwater Management Features					
Other					
Utilities - Potable Water / Sewer Service - Electrical Grid Connectivity - Fiber / Communications Cables					
Rail Spur					

Not Vulnerable / Potential Opportunity
Low Vulnerability
Medium-Low Vulnerability
Medium-High Vulnerability
High Vulnerability

* NOTE: Increase in temperatures did not score any SUA assets as medium-high vulnerability or above; therefore, this threat is not included in this summary table.

F.3.4 Resiliency Impacts Analysis Conclusions

As shown in **Table F-10**, the following more urgent, critical, and vulnerable assets are classified as either medium-high and/or high vulnerability to the potential impacts of climate change, specifically, altered rainfall and/or extreme storm events, that may require consideration of funding to review and address alternatives (identified in red in **Table F-10**):

- **Aircraft Operation Areas** are fully critical to the operation of SUA and are identified as vulnerable to climate change threats because of the expansive impermeable surface area located in the airfield where standing water can accumulate and could disrupt aircraft operations. Pavements and areas adjacent to impervious surface could also experience increased scouring and erosion due to altered rainfall patterns and extreme weather events. Other impacts include creating an unsafe environment for aircraft operations, such as decreased visibility, slick surfaces, and system outages.

- **Airfield Electrical Systems** are fully critical to the continuity of safe and efficient airport operations and are identified as vulnerable to altered rainfall and/or extreme storm events because of possible water intrusion and inundation that could damage or destroy sensitive electrical components.

- **ATCT** is critical to the continuity of safe operations at SUA and is identified as medium-high vulnerability to extreme weather because its height and preponderance of glass, which could make it susceptible to high winds and projectiles during stormy conditions.

- **Airfield Electrical Vault** scores high due to its criticality to maintain consistent airport operations and medium-high to high vulnerability to altered rainfall and extreme storm events because of its sensitivity to water intrusion under compounded water retention. However, it is located in the southwest area of SUA at a high enough elevation that SLR is not anticipated to pose an immediate threat to sensitive electrical components.

- **Fuel Farms** are classified the same as the Airfield Electrical Vault because of the criticality of fuel to maintain aircraft operations. Without vigilant maintenance of onsite pollution controls and maintenance or retrofit of secondary containment systems to withstand climate change threats, altered rainfall and extreme storm events could create conditions for possible fuel migration to nearby surface water features or groundwater, leading to contamination of natural resources.

- **Utilities** (e.g., electrical systems, potable water, and communication systems) are located throughout SUA, are considered fully critical to operational continuity, and are highly vulnerable to increased precipitation and extreme weather events. Under these climate threats, increased water intrusion could damage or destroy sensitive electrical or communication components affecting the reliability of these systems, hinder potable water delivery, or overwhelm regional sewerage systems.

Minimally to moderately critical assets classified as either medium-high or high vulnerability to the potential impacts of climate change include:

- **Stormwater Management Features** in the northeast and southwest areas of SUA were considered medium-high vulnerability to SLR, altered rainfall patterns, and extreme storm events; however, the urgency of these feature varies according to their location. Stormwater management features immediately surrounding the airport in the northeast are located near low-lying areas identified in Section F.2.1.1 and thus classified with a higher SLR urgency. These areas are also considered vulnerable due to their proximity to Priority Area 9 as identified in the Martin County SLR Report (see **Figure F-1**).[45] If stormwater features have not been specifically designed to withstand the projected abnormal increase in precipitation or change in SLR, the system could become overwhelmed, fail to drain, and contribute to flooding of nearby areas. Consistently flooded stormwater features, such as retention ponds, could eventually become a wildlife attractant and hazard.

- **Landside Facilities (Interior Perimeter Road, Airport Access Roads, and Parking Lots)** are located primarily in the southwest areas of SUA. These assets were identified as medium-high vulnerability to altered rainfall patterns and extreme weather events due to the possibility of foreign object debris and erosion damaging roadways and parking areas. Given the close

[45] Martin County, 2021. *Sea Level Rise Report: 2021 Impact Analysis*.

proximity of the airport perimeter road to stormwater management features and low-lying areas in the northeast, this portion of the airport perimeter roadway was identified as at-risk to frequent flooding. Similar to other assets, the airport perimeter road abuts Priority Area 9 identified in the Martin County SLR Report as prone to flooding (see **Figure F-1**). Roadways in the southwest are still susceptible to climate change threats but are at a higher elevation where the effects are not anticipated to be as severe when compared to the northeast area.

- **Northeast Area Green Space** consists of primarily undeveloped, vegetated land. This space is considered an asset due to future plans to build airport facilities in a portion of this area. However, this area is also considered an asset because it provides a buffer to possible inundation of lower-lying areas that are vulnerable to SLR, simultaneously allowing the airport to absorb water from heavy rainfall events (see **Figure F-1**). New facilities planned in the northeast would result in the removal of some vegetated areas, and impacts to the current value of that area as it functions to retain and sequester precipitation in the landscape must be considered at a broader scale. It is important to note that any future structural improvements to this area should consider the corresponding loss of existing green infrastructure and employ best management practices to avoid additional vulnerability to climate risks.

- **Rail Spur** is identified as moderately critical due to its status as a component of the regional transportation infrastructure. Rail infrastructure provides the transportation of goods and services, which could be essential during and after recovery of extreme weather events. This asset is especially vulnerable to altered rainfall patterns and extreme weather, which could increase erosion, track debris, or otherwise make rail inoperable.

- **Energy Provision** is identified as moderately critical to continued airport operation. The disruption of electric service is common across the U.S. during periods of high temperatures as a result of demand that becomes near or above a utility's production capacity. Additionally, major storm events frequently cause power loss for unexpected and unknown durations. Although local utilities can generally access auxiliary power facilities to provide backup service when demand nears capacity limitations or main facilities are damaged, electricity quality and reliability is essential at SUA.

Other SUA assets were not found to be immediately vulnerable to climate change threats, were less sensitive or more adaptable, and were likewise less critical to continued aircraft operations at the airport. For example, increased temperatures have been known to impact a variety of airport assets, such as pavements and electrical systems. However, when pavements are engineered correctly and meet current standards they are not at high risk of rutting under increased temperatures. Additionally, the effects of high temperatures on the airport's electrical systems were also not considered to be a high priority because malfunctions to these systems are typically the result of aging equipment or poor maintenance activities, and the airport can help to mitigate malfunctioning electrical equipment by continuing the ongoing, comprehensive renewal and replacement program in place.

F.4 Suggested Mitigation and Avoidance Measures

This report is intended to advise of potential risks to airport improvement projects and continued management. It should be integrated into short- and long-term planning considerations as future infrastructure investments are determined and adapted as climate change threats progress. Every facility improvement project at SUA should include an analysis of potential climate-related threats through engineering design considerations; in particular, those that would be sited in the northeast area or in proximity to stormwater management features would be subject to additional structural design and access considerations as the new project is oriented and connected within the overall airport infrastructure.

The National Academy of Sciences, Engineering, and Medicine, Transportation Research Board, Airport Cooperative Research Program recommends that climate change adaptation planning review six major elements, including: prevention; structural prevention; natural resource protection; infrastructure projects; emergency services; and education, awareness, and collaboration.[46] Likewise, the IPCC recommends the consideration of the following approaches to adapting to climate-related threats: reduce exposure; increase resilience to changing risks; transformation of existing cultures; reduce vulnerability; prepare, respond, and recover; and transfer and share risks.[47]

In respect to recommended planning elements and adaptation considerations, the following adaptation and resiliency strategies are tailored to the assets and threats at SUA. This list reflects a summary of strategies available in various airport-related studies and include recommended policies, procedures, and best management practices that will promote the avoidance or mitigation of climate-related impacts.[48] For further discussion of potential strategies, several notable example airports in the U.S. have prepared extensive resilience analyses, including Barnstable, Boston Logan, JFK, LaGuardia, Newark Liberty, Oakland, Philadelphia, San Diego, San Francisco, Seattle-Tacoma, and Stewart. Some of these strategies have already been implemented by SUA, some are in-progress, and some may be considered as they are triggered by specific thresholds or become relevant in longer-term planning exercises:

- **Disaster Preparedness**
  - *Continuous Energy Provision.* SUA may consider the establishment of an onsite renewable energy microgrid (e.g., solar infrastructure) to generally reduce its environmental impact as well as to protect operational continuity in the event of local/regional brownouts and outages.

46 National Academy of Sciences, Engineering, and Medicine, 2015. *Transportation Research Board, Airport Cooperative Research Program Report 147- Climate Change Adaptation Planning: Risk Assessment for Airports*.

47 IPCC 2012.

48 Airports Council International (ACI), 2018. ACI Policy Brief: *Airports' Resilience and Adaptation to a Changing Climate;* and *ACI Resolution* March, 2018.
National Academy of Sciences, Engineering, and Medicine, 2015. *Transportation Research Board, Airport Cooperative Research Program Report 147- Climate Change Adaptation Planning: Risk Assessment for Airports*.
National Academy of Sciences, Engineering, and Medicine, 2012. *Transportation Research Board, Airport Cooperative Research Program Report 33- Airport Climate Adaptation and Resilience.*

- *Mission Relocation* includes establishing essential functions at less vulnerable locations. For example, all mission-critical infrastructure should be elevated well above the 100-year floodplain (such as the electrical vault to be housed in the new Administrative Building sited in Flood Zone X outside of the 100-year floodplain).

- *System Redundancies* should be included as a goal to ensure quick recovery and increased operational effectiveness, especially during and immediately following extreme storm events. System redundancies can be identified where an asset is capable of a secondary mission or reorientation, such as repurposing a building or hangar, and may likewise include acquiring redundant equipment, assigning duplicate or overlapping essential personnel, or installing backup utility options.

- *Communication Contingencies* are also important to plan for in the event that satellite or navigational signals and fiber optics are disrupted or deemed inoperable for an extended period of time.

✈ **Insurance Coverage and Contingency Funding.** Identify gaps in insurance coverage. Identify funding requirements and required reserves or available grants to cover short-term, long-term, and disaster-related resilience-focused projects.

✈ **Cultural Paradigm.** Integrate the potential risks of climate change threats into airport planning and operational procedures. This step includes considering potential vulnerabilities, adaptations, and necessary changes in each level of airport planning, such as but not limited to, business continuity; operations; sustainability; safety management systems; communications; disaster preparedness; and emergency response and utility and transportation plans.

✈ **Construction Standards and Site Design**

- *Land Use Practices* includes modifying land uses in concert with natural infrastructure, such as protecting, enhancing, or creating shorelines, mangroves, marshes, or riparian areas that will naturally mitigate and attenuate floodwaters or minimizing the installation of impervious materials in low lying, flood-prone areas. Particular caution is suggested in utilizing the vegetated area in the northeast boundary of SUA as reducing it while adding additional impervious surfaces may affect its continued ability to buffer SLR or precipitation events.

- *Hazard Avoidance* includes locating assets in areas that are not anticipated to be vulnerable to climate-related threats.

- *Structure Elevation* includes locating structures (or placing adequate fill) in construction areas to maintain structures above a designated flood elevation.

- *Floodproofing.* **Table F-11** lists critical equipment and systems that are subject to floodproofing standards.[49] These standards may include ensuring that systems remain

[49] Reproduced from 2014 *Massport Floodproofing Design Guide.*

completely dry and that all potential floodwater intrusion be prevented, or that systems be fortified against floodwater that may inevitably contact them.

TABLE F-11
CRITICAL INFRASTRUCTURE SUBJECT TO FLOODPROOFING STANDARDS

System	Critical Equipment/Systems
Electrical	Substations, Transformers, Switchgear, Service and Distribution Panels, Emergency Panels, Cable Terminations and Splices, Emergency Generators, Stock and Parts Storage, Meter Centers
Water and Plumbing	Domestic/Fire Water Pumps and Controls, Sump Pump Non-Submersible Motors and Controls, Plumbing Systems (lavatories, showers, toilets), Ejector and Grinder Pumps, Water Heaters, Pipe Insulation
Mechanical	Air Intake and Exhaust Vents/Louvers, Air Conditioning Units and Condensers, Chilled Water Systems, Pumps, Ventilation Units, Boilers, Unit Heaters, Distribution Duct Work Telecommunications Telephone Switches, Network Interface Devices, IDF Closets, Data/Computer Centers/Rooms, Dispatch Rooms, Emergency Communications Centers, Public Announcement System Control Rooms, Radio Systems (including personal radio storage areas), Surveillance Systems, Access Control Systems
Emergency and Fire	Fire Alarm Master Boxes, Emergency Operations Centers, Emergency Supplies (medical, food/water, cots/blankets), Emergency Vehicles and Specialized Equipment (medical, fire, rescue, law enforcement)
Hazardous Materials	Waste Oil, Fuel Storage Tanks, Chemical Supplies
Other	Records Storage, Office Space, Parking Garages

NOTE: Floodproofing recommended but not required for tenants and third-party leases/developments.
SOURCE: Reproduced from 2014 *Massport Floodproofing Design Guide*.

- **Existing Infrastructure**
  - *Evaluation of Useful Life*. Some assets may be nearing the end of their useful life and thus it would not be cost-effective to retrofit them; rather, it may be most efficient to leave them in place until they are not functional or destroyed by an impending climate threat. SUA should be aware of which non-critical or redundant assets fall into this category and plan accordingly, such as through an ongoing, comprehensive renewal and replacement plan.

  - *Retrofit or Relocate.* This response is generally reserved for assets of high criticality or limited adaptive capacity. Crucial assets that cannot be retrofitted should be relocated; conversely, those that cannot be relocated should be fortified against climate-related vulnerabilities.

  - *Remove.* This response is reserved for assets that are defunct, redundant, or cannot be adapted in place.

  - *Energy Provision.* Elevate and upgrade lift stations and other power generators or transmission infrastructure well above flood prone area. Such infrastructure may require floodproofing standards that maintain all components as fully dry. Again, consider the establishment of onsite renewable energy systems that are controllable by the airport and more dependable, resilient, and nimble than the regional grid system.

- **Hazard Assimilation / Segregate or Modify the Hazard.** This recommendation deals with the threat specifically rather than in defense of existing assets against the threat. For example:
  - *Construction of Flood Barriers.* This is a longer-term consideration that may include installation of natural infrastructure to mitigate flood waters (i.e., marshes, living shorelines) or the construction of impervious barriers, such as flood walls, to prevent encroachment of floodwaters.
  - *Construction of Additional Stormwater Management Features, Pumps, or Channels* to rapidly move water off airport properties.
- **Altered Maintenance Review Schedule**. Some systems, such as roadway pavements and areas subject to scour or erosion, will require regular observation for potential signs of weathering or other impacts. Receptive systems will require increased level and rate of maintenance (e.g., runways and taxiways), which should be planned for in budgetary operations.

Table F-12
Vulnerability Assessment Matrix

<u>**Airport Asset Categories**</u>	Asset Criticality	**1. Sea Level Rise** - Inundation - Problematic Stormwater Collection / Movement - Saltwater Intrusion	Sensitivity	Adaptive Capacity	Urgency	Vulnerability Ranking
Airfield Facilities						
Aircraft Operation Areas - Runway - Taxiway	*4*	- Not susceptible due to higher elevation and distance from aquatic resources.	*0*	*4*	*0*	Medium-Low Vulnerability
Airfield Electrical Systems - Airfield Lighting - Takeoff and Landing Aids	*4*	- Not susceptible due to higher elevation and distance from aquatic resources. - Saltwater intrusion causes increased rate of corrosion, especially of underground metal components that may be exposed to a rising water table.	*1*	*4*	*0*	Medium-Low Vulnerability
Northeast Area						
NE Area - Public Service Facilities - Martin County Sheriff's Office - Aviation Unit - Martin County Fire Rescue	*4*	- Not susceptible due to higher elevation and distance from aquatic resources.	*0*	*2*	*0*	Low Vulnerability
NE Area - Critical Support and Service Facilities - Airport Traffic Control Tower	*4*	- Not susceptible due to higher elevation and distance from aquatic resources.	*0*	*3*	*0*	Low Vulnerability
NE Area - Sub-Critical Support and Service Facilities - Airport Maintenance Equipment and Facilities	*2*	- Not susceptible due to higher elevation and distance from aquatic resources.	*0*	*2*	*0*	Low Vulnerability
NE Area - General Aviation Facilities - Automobile Parking Lots (inside fence)	*1*	- Not susceptible due to higher elevation and distance from aquatic resources.	*0*	*1*	*0*	Not vulnerable / Potential Opportunity
NE Area - Landside Facilities - Interior Airport Perimeter Road - Airport Access Roads	*2*	- Access roads at the north and northeast of airport property possibly impacted/inundated making other areas inaccessible.	*3*	*1*	*2*	Medium-Low Vulnerability
NE Area - Utilities - Stormwater Management Features	*2*	- System becomes sensitive after threshold of capacity is exceeded. Stormwater movement becomes issue as SLR restricts drainage.	*3*	*3*	*3*	Medium-High Vulnerability
NE Area Green Space - Public Safety Facility Improvements - Stormwater Retention/Function	*2*	- Development is susceptible due to lower elevation and proximity to stormwater features that could lose function.	*3*	*1*	*3*	Medium-Low Vulnerability

Southwest Area						
SW Area - Public Service Facilities - Martin County Public Works (equipment storage/administration buildings)	*1*	- Not susceptible due to higher elevation and distance from aquatic resources.	*0*	*2*	*0*	Low Vulnerability
SW Area - Critical Support and Service Facilities - Airfield Electrical Vault - Fuel Farms (above-ground storage tanks)	*4*	- Not susceptible due to higher elevation and distance from aquatic resources.	*0*	*4*	*0*	Medium-Low Vulnerability
SW Area - Sub-Critical Support and Service Facilities - Airport Administration/Operations Building - U.S. Customs and Border Patrol	*2*	- Not susceptible due to higher elevation and distance from aquatic resources.	*0*	*2*	*0*	Low Vulnerability
SW Area - General Aviation Facilities - Fixed-Base Operator Terminals - Aircraft Parking Aprons - Hangars, T-Hangars, and Based-Aircraft Tie-downs	*1*	- Not susceptible due to higher elevation and distance from aquatic resources.	*0*	*2*	*0*	Low Vulnerability
SW Area - General Aviation Facilities - Automobile Parking Lots (inside fence)	*1*	- Not susceptible due to higher elevation and distance from aquatic resources.	*0*	*1*	*0*	Not vulnerable / Potential Opportunity
SW Area - Landside Facilities - Interior Airport Perimeter Road - Airport Access Roads - Automobile Parking Lots (outside fence)	*2*	- Not susceptible due to higher elevation and distance from aquatic resources.	*0*	*1*	*0*	Not vulnerable / Potential Opportunity
SW Area - Utilities - Stormwater Management Features	*2*	- System becomes sensitive after threshold of capacity is exceeded. Stormwater movement becomes issue as SLR restricts drainage.	*2*	*3*	*2*	Medium-High Vulnerability
Other						
Utilities - Potable Water / Sewer Service - Electrical Grid Connectivity - Fiber / Communications Cables	*4*	- Not susceptible due to higher elevation and distance from aquatic resources. - Saltwater intrusion causes increased rate of corrosion, especially of underground metal components that may be exposed to a rising water table.	*1*	*4*	*0*	Medium-Low Vulnerability
Rail Spur	*3*	- Not susceptible due to higher elevation and distance from aquatic resources.	*0*	*4*	*0*	Medium-Low Vulnerability

Airport Asset Categories	Asset Criticality	**2. Increase in Temperatures** - Increased Rate of Weathering / Warping - Increased Energy Demand - Decreased Aircraft Performance	Sensitivity	Adaptive Capacity	Urgency	Vulnerability Ranking
Airfield Facilities						
Aircraft Operation Areas - Runway - Taxiway	*4*	- Runway pavements exposed to extreme heat can experience a loss of structural integrity and may be susceptible to warping or cracking. Although the system is engineered for direct sunlight placement and to withstand increased temperature, the number of increased temperature days may accelerate refurbish/restoration schedule. Areas of heavy use and/or high wheel pressure, such as turn areas, may be especially susceptible and require increased maintenance.	*2*	*2*	*0*	Medium-Low Vulnerability
Airfield Electrical Systems - Airfield Lighting - Takeoff and Landing Aids	*4*	- Majority of electrical system is buried and unaffected by increased temperature scenario. Although emerged lights are metal and could experience warping or melting, system is engineered for direct sunlight placement and to withstand increased temperature. May become increased safety hazard as metals can become excessively hot, but potential for exposure is very low in active airfield surfaces.	*1*	*0*	*0*	Not vulnerable / Potential Opportunity
Northeast Area						
NE Area - Public Service Facilities - Martin County Sheriff's Office - Aviation Unit - Martin County Fire Rescue	*4*	- Some building interior with occupied climate-controlled spaces (HVAC strain/inefficiencies).	*2*	*1*	*2*	Medium-Low Vulnerability
NE Area - Critical Support and Service Facilities - Airport Traffic Control Tower	*4*	- Some building interior with occupied climate-controlled spaces (HVAC strain/inefficiencies).	*2*	*1*	*2*	Medium-Low Vulnerability
NE Area - Sub-Critical Support and Service Facilities - Airport Maintenance Equipment and Facilities	*2*	- Some building interior with occupied climate-controlled spaces (HVAC strain/inefficiencies).	*2*	*1*	*2*	Medium-Low Vulnerability
NE Area - General Aviation Facilities - Automobile Parking Lots (inside fence)	*1*	- Like runway and taxiway pavements, parking pavements may be susceptible to increased warping; however, parking pavements are less structurally complex than runway and taxiway pavements and do not require the same level of investment to construct and maintain.	*1*	*1*	*0*	Low Vulnerability
NE Area - Landside Facilities - Interior Airport Perimeter Road - Airport Access Roads	*2*	- Roadway pavements exposed to extreme heat can experience a loss of structural integrity and may be susceptible to warping or cracking. Although road system is engineered for direct sunlight placement and to withstand increased temperature, the number of increased temperature days may minimally accelerate refurbish/restoration schedule.	*1*	*1*	*0*	Low Vulnerability
NE Area - Utilities - Stormwater Management Features	*2*	- No impact anticipated.	*0*	*0*	*0*	Not vulnerable / Potential Opportunity
NE Area Green Space - Public Safety Facility Improvements - Stormwater Retention/Function	*2*	- No impact anticipated.	*0*	*0*	*0*	Not vulnerable / Potential Opportunity

Southwest Area						
SW Area - Public Service Facilities - Martin County Public Works (equipment storage/administration buildings)	*1*	- Some building interior contains climate controlled spaces that will experience HVAC strain/inefficiencies. Generally, interior climate modifications are straightforward (assets are highly adaptive to this threat).	*1*	*1*	*2*	Low Vulnerability
SW Area - Critical Support and Service Facilities - Airfield Electrical Vault - Fuel Farms (above-ground storage tanks)	*4*	- Increased provision of fuel at fuel farm due to aircraft inefficiencies.	*2*	*1*	*3*	Medium-Low Vulnerability
SW Area - Sub-Critical Support and Service Facilities - Airport Administration/Operations Building - U.S. Customs and Border Patrol	*2*	- Some building interior with occupied climate-controlled spaces (HVAC strain/inefficiencies).	*2*	*1*	*2*	Medium-Low Vulnerability
SW Area - General Aviation Facilities - Fixed-Base Operator Terminals - Aircraft Parking Aprons - Hangars, T-Hangars, and Based-Aircraft Tie-downs	*1*	- Open-air hangar facilities that are not climate controlled, but may require installation of industrial fans or other air circulation methods in extended periods of extreme heat. Some building interior contains climate controlled spaces that will experience HVAC strain/inefficiencies. Generally, interior climate modifications are straightforward (assets are adaptive to this threat). - Like runway and taxiway pavements, parking pavements may be susceptible to increased warping; however, parking pavements are less structurally complex than runway and taxiway pavements and do not require the same level of investment to construct and maintain. - Terminal building interiors with occupied climate-controlled spaces may experience HVAC strain/inefficiencies.	*2*	*1*	*3*	Medium-Low Vulnerability
SW Area - General Aviation Facilities - Automobile Parking Lots (inside fence)	*1*	- Like runway and taxiway pavements, parking pavements may be susceptible to increased warping; however, parking pavements are less structurally complex than runway and taxiway pavements and do not require the same level of investment to construct and maintain.	*1*	*1*	*0*	Low Vulnerability
SW Area - Landside Facilities - Interior Airport Perimeter Road - Airport Access Roads - Automobile Parking Lots (outside fence)	*2*	- Roadway pavements exposed to extreme heat can experience a loss of structural integrity and may be susceptible to warping or cracking. Although road system is engineered for direct sunlight placement and to withstand increased temperature, the number of increased temperature days may minimally accelerate refurbish/restoration schedule.	*1*	*1*	*0*	Low Vulnerability
SW Area - Utilities - Stormwater Management Features	*2*	- No impact anticipated.	*0*	*0*	*0*	Not vulnerable / Potential Opportunity
Other						
Utilities - Potable Water / Sewer Service - Electrical Grid Connectivity - Fiber / Communications Cables	*4*	- Majority of electrical system is buried and unaffected by increased temperature scenario.	*1*	*0*	*0*	Not vulnerable / Potential Opportunity
Rail Spur	*3*	- No impact anticipated.	*0*	*0*	*0*	Not vulnerable / Potential Opportunity

Airport Asset Categories	Asset Criticality	**3. Altered Rainfall Patterns** - Long-term Storm Trend - Storm-related Weather Delays - Problematic Stormwater Collection / Movement - Increased Rate of Weathering - Increased Contact Between Water and Materials (water quality impacts) - Increased Scouring / Erosion	Sensitivity	Adaptive Capacity	Vulnerability Ranking
Airfield Facilities					
Aircraft Operation Areas - Runway - Taxiway	*4*	- Consistent inundation of paved surfaces, including the difficulty of draining standing water after storm events, prohibits constant use of runways and taxiways. - Increased incidence of scouring and erosion adjacent to impervious areas. - Runway pavements exposed to constant rainfall may experience increased rate of erosion, and constant heavy precipitation over time may accelerate pavement refurbish / restoration schedule.	*3*	*3*	Medium-High Vulnerability
Airfield Electrical Systems - Airfield Lighting - Takeoff and Landing Aids	*4*	- Compounded water retention may cause water intrusion to short or destroy sensitive electrical system.	*4*	*3*	High Vulnerability
Northeast Area					
NE Area - Public Service Facilities - Martin County Sheriff's Office - Aviation Unit - Martin County Fire Rescue	*4*	- May cause localized erosion and scouring issues adjacent to impervious surfaces. - Increased weathering of constructed surfaces.	*1*	*2*	Low Vulnerability
NE Area - Critical Support and Service Facilities - Airport Traffic Control Tower	*4*	- May cause localized erosion and scouring issues adjacent to impervious surfaces. - Increased weathering of constructed surfaces.	*1*	*2*	Low Vulnerability
NE Area - Sub-Critical Support and Service Facilities - Airport Maintenance Equipment and Facilities	*2*	- May cause localized erosion and scouring issues adjacent to impervious surfaces. - Increased weathering of constructed surfaces.	*2*	*2*	Medium-Low Vulnerability
NE Area - General Aviation Facilities - Automobile Parking Lots (inside fence)	*1*	- Consistent inundation of paved surfaces prohibits constant use, including the difficulty of draining standing water after storm events. - May cause localized erosion and scouring issues adjacent to impervious surfaces. - Increased weathering of constructed surfaces.	*1*	*2*	Low Vulnerability
NE Area - Landside Facilities - Interior Airport Perimeter Road - Airport Access Roads	*2*	- Roads consistently flooded in part of their extent restricts or prohibits use of on-airport roadway system.	*2*	*4*	Medium-High Vulnerability
NE Area - Utilities - Stormwater Management Features	*2*	- System becomes sensitive after threshold of capacity is exceeded. - Additional standing water and saturated surfaces increases potential for stormwater management features to become wildlife attractant / hazards. - May cause localized erosion and scouring issues.	*3*	*3*	Medium-High Vulnerability
NE Area Green Space - Public Safety Facility Improvements - Stormwater Retention/Function	*2*	- May cause localized erosion and scouring issues. - Partial and recurrent inundation under heavy rainfall could create wetland habitat and become wildlife attractant.	*2*	*2*	Medium-Low Vulnerability

Southwest Area					
SW Area - Public Service Facilities - Martin County Public Works (equipment storage/administration buildings)	*1*	- May cause localized erosion and scouring issues adjacent to impervious surfaces. - Increased weathering of constructed surfaces.	*1*	*1*	Low Vulnerability
SW Area - Critical Support and Service Facilities - Airfield Electrical Vault - Fuel Farms (above-ground storage tanks)	*4*	- Compounded water retention may cause water intrusion to short or destroy sensitive electrical system. - May cause localized erosion and scouring issues adjacent to impervious surfaces. - Increased weathering of constructed surfaces. - Increased vulnerability for hazardous material migration (fuel).	*2*	*4*	Medium-High Vulnerability
SW Area - Sub-Critical Support and Service Facilities - Airport Administration/Operations Building - U.S. Customs and Border Patrol	*2*	- May cause localized erosion and scouring issues adjacent to impervious surfaces. - Increased weathering of constructed surfaces.	*1*	*1*	Low Vulnerability
SW Area - General Aviation Facilities - Fixed-Base Operator Terminals - Aircraft Parking Aprons - Hangars, T-Hangars, and Based-Aircraft Tie-downs	*1*	- Consistent inundation of paved surfaces prohibits constant use, including the difficulty of draining standing water after storm events. - May cause localized erosion and scouring issues adjacent to impervious surfaces. - Increased weathering of constructed surfaces.	*1*	*1*	Low Vulnerability
SW Area - General Aviation Facilities - Automobile Parking Lots (inside fence)	*1*	- Consistent inundation of paved surfaces prohibits constant use, including the difficulty of draining standing water after storm events. - May cause localized erosion and scouring issues adjacent to impervious surfaces. - Increased weathering of constructed surfaces.	*1*	*2*	Low Vulnerability
SW Area - Landside Facilities - Interior Airport Perimeter Road - Airport Access Roads - Automobile Parking Lots (outside fence)	*2*	- Roads consistently flooded in part of their extent restricts or prohibits use of on-airport roadway system.	*2*	*4*	Medium-High Vulnerability
SW Area - Utilities - Stormwater Management Features	*2*	- System becomes sensitive after threshold of capacity is exceeded. - Additional standing water and saturated surfaces increases potential for stormwater management features to become wildlife attractant / hazards. - May cause localized erosion and scouring issues.	*3*	*3*	Medium-High Vulnerability
Other					
Utilities - Potable Water / Sewer Service - Electrical Grid Connectivity - Fiber / Communications Cables	*4*	- Compounded water retention may cause water intrusion to short or destroy sensitive electrical system, disrupt communications, or cause sewer overflow.	*4*	*3*	High Vulnerability
Rail Spur	*3*	- Railroad consistently flooded in part of their extent restricts or prohibits use.	*2*	*3*	Medium-High Vulnerability

Airport Asset Categories	Asset Criticality	**4. Extreme Storm Events** - Episodic Storm Event (vs long-term rainfall trend; airport closes for storm / resumes within minimal timeframe) - High wind - Intense rain, storm surge, and flooding	Sensitivity	Adaptive Capacity	Vulnerability Ranking
Airfield Facilities					
Aircraft Operation Areas - Runway - Taxiway	*4*	- Foreign objects and debris can damage runways and taxiways or restrict use until cleared. Airport lighting and signage are on frangible mounts, i.e., are designed to break away in aircraft impact, which makes them more susceptible to impact from other foreign objects and debris during high-winds. - Storm surge and flooding of paved surfaces restrict use until receded.	*2*	*4*	Medium-High Vulnerability
Airfield Electrical Systems - Airfield Lighting - Takeoff and Landing Aids	*4*	- Temporary, but high volume water inundation may cause water intrusion to short or destroy sensitive electrical system.	*4*	*3*	High Vulnerability
Northeast Area					
NE Area - Public Service Facilities - Martin County Sheriff's Office - Aviation Unit - Martin County Fire Rescue	*4*	- Temporarily disrupted facility operations - High winds directly cause damage to structures or cause projectile-related structure damage.	*1*	*2*	Low Vulnerability
NE Area - Critical Support and Service Facilities - Airport Traffic Control Tower	*4*	- Temporarily disrupted facility operations - High winds directly cause damage to structures or cause projectile-related structure damage.	*2*	*3*	Medium-High Vulnerability
NE Area - Sub-Critical Support and Service Facilities - Airport Maintenance Equipment and Facilities	*2*	- Temporarily disrupted facility operations - High winds directly cause damage to structures or cause projectile-related structure damage.	*1*	*2*	Low Vulnerability
NE Area - General Aviation Facilities - Automobile Parking Lots (inside fence)	*1*	- Storm surge and flooding of paved surfaces restrict use until receded.	*2*	*2*	Medium-Low Vulnerability
NE Area - Landside Facilities - Interior Airport Perimeter Road - Airport Access Roads	*2*	- Foreign objects and debris can damage roadways or restrict use until cleared. - Storm surge and flooding of paved surfaces restrict use until receded.	*2*	*4*	Medium-High Vulnerability
NE Area - Utilities - Stormwater Management Features	*2*	- Extreme volume of standing water likely to temporarily overwhelm system. - May cause localized erosion and scouring issues.	*3*	*3*	Medium-High Vulnerability
NE Area Green Space - Public Safety Facility Improvements - Stormwater Retention/Function	*2*	- May cause localized erosion and scouring issues. - Partial and recurrent inundation under heavy rainfall could create wetland habitat and become wildlife attractant. - Heavy winds could cause downed trees.	*2*	*2*	Medium-Low Vulnerability

Southwest Area					
SW Area - Public Service Facilities - Martin County Public Works (equipment storage/administration buildings)	*1*	- Temporarily disrupted facility operations - High winds directly cause damage to structures or cause projectile-related structure damage.	*1*	*1*	Low Vulnerability
SW Area - Critical Support and Service Facilities - Airfield Electrical Vault - Fuel Farms (above-ground storage tanks)	*4*	- Temporarily disrupted facility operations. - High winds directly cause damage to structures or cause projectile-related structure damage. - Storm surge and flooding of paved surfaces restrict use until receded. - Increased vulnerability for hazardous material migration (fuel).	*3*	*4*	High Vulnerability
SW Area - Sub-Critical Support and Service Facilities - Airport Administration/Operations Building - U.S. Customs and Border Patrol	*2*	- Temporarily disrupted facility operations. - High winds directly cause damage to structures or cause projectile-related structure damage. - Storm surge and flooding of paved surfaces restrict use until receded.	*1*	*2*	Low Vulnerability
SW Area - General Aviation Facilities - Fixed-Base Operator Terminals - Aircraft Parking Aprons - Hangars, T-Hangars, and Based-Aircraft Tie-downs	*1*	- Temporarily disrupted facility operations. - High winds directly cause damage to structures or cause projectile-related structure damage. - Storm surge and flooding of paved surfaces restrict use until receded.	*1*	*2*	Low Vulnerability
SW Area - General Aviation Facilities - Automobile Parking Lots (inside fence)	*1*	- Storm surge and flooding of paved surfaces restrict use until receded.	*2*	*2*	Medium-Low Vulnerability
SW Area - Landside Facilities - Interior Airport Perimeter Road - Airport Access Roads - Automobile Parking Lots (outside fence)	*2*	- Foreign objects and debris can damage roadways or restrict use until cleared. - Storm surge and flooding of paved surfaces restrict use until receded.	*2*	*4*	Medium-High Vulnerability
SW Area - Utilities - Stormwater Management Features	*2*	- Extreme volume of standing water likely to temporarily overwhelm system. - May cause localized erosion and scouring issues.	*3*	*3*	Medium-High Vulnerability
Other					
Utilities - Potable Water / Sewer Service - Electrical Grid Connectivity - Fiber / Communications Cables	*4*	- Temporary, but high volume water inundation may cause water intrusion to short or destroy sensitive electrical system, disrupt communications, or cause sewer overflow.	*4*	*3*	High Vulnerability
Rail Spur	*3*	- Rail spur potentially useful in Emergency Management scenario for movement of relief goods and services - Extreme volume of standing water likely to make system inoperable. - May cause localized erosion and scouring issues.	*2*	*3*	Medium-High Vulnerability

APPENDIX G

Public Outreach

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ESA

Witham Field – Potential Improvements off Dixie Highway
Public Open House
August 10, 2022 (4:00 p.m. – 6:00 p.m.)

Name	Representing	Phone Number	E-Mail Address
Douglas DiCarlo	ESA	727-200-7326	ddicarlo@esassoc.com
[illegible signature]	Myself	772-287-0128	JKBentel2@Comcast.net
[illegible signature]	My-SELF	772-485-1522	JKBENTEL2@COMCAST.NET
Rebecca S. Bruner	City of Stuart	772-285-4491	Beckybruner24@yahoo.com
Leonora Wildfeir	myself		lwildfeir@gmail.com
Devin Lawrence	APP	772-781-4720	DLawrence@AppJetCenter.com
[illegible]	[illegible]	561 603 1413	[illegible]@proctorcc.com
Michael ONeill	Proctor	407 416 9703	moneill@proctorcc.com
FRANK Tidikis	META/Self	561-310-7597	Tidikis@Bellsouth.net
Chris Henderson	Fair Wind Air Charter	772-288-4130	chris@FWJets.com
JON GOTTSCHALK	PRIVATE PILOT	772 349-8550	jongott45@gmail.com
GENE SWENSON	PALM COVE	609 384 2001	MERCURY1213@AOL.COM
DOUG DAVIS	HOMEOWNER NEAR AIRPORT / AIR SHOW	772-323-4865	DouglasRD23@HOTMAIL.COM
WILL LAUGHLIN	self	772-287-4676	SNDDK@YAHOO.com

Witham Field – Potential Improvements off Dixie Highway
Public Open House
August 10, 2022 (4:00 p.m. – 6:00 p.m.)

Name	Representing	Phone Number	E-Mail Address
Howard Ham	Aircraft Owner	772 2859344	howardham@yahoo.com
Sharon Liddell		443/350-2914	sharonliddell430@gmail.com
Craig & Patricia Boorman	Homeowner	772-284-0307	silentfaith@comcast.net
Eric Ingraham	EAA	772-284-4227	Eric@IngrahamGroup.com
Colleen D Sample	Woodlands	772 285 0081	samplethegoodlife@gmail.c
Kirby Koolurris			Kirby1221@comcast.net
Nick Gulotta	Resident	772 307 9896	Boxcar72@protonmail.com
Dayna J Regis	Resident	772-631-9175	djr13@bellsouth.net
Mike Neal	Resident	772-486-1120	mikeneal988@gmail.com
Barry McLaughlin	Southern Breeze Ent.	561-701-5445	bminsouthfl@outlook.com
Renee Allen	EAA & Aircraft owner	772-204-2732	renee@reneeallenInsurance.com
DANNY DUKE	Self	561-329-8904	mduke731@gmail.com ~~dann~~dduke731@gmail.com
Ted Astolfi	ECMC	772-288-1225	TAstolfi@mceconomy.org
ALISON RAMPERSAD	——	(954) 610-2896	ALRAMPERSAD@IM91.COM

gai consultants ESA

Witham Field – Potential Improvements off Dixie Highway
Public Open House
August 10, 2022 (4:00 p.m. – 6:00 p.m.)

Name	Representing	Phone Number	E-Mail Address
Kenneth Nelson		772-283-1156	—
RONALD E SCHONER		7722605272	
Catherine Heretick		571.643.1520	
Dennis Heretick		703-300-5686	
Donna Campbell			mooncoin@me.com
Inez van Ravenzwaaij		772-301-6465	inez@stuartairshow.com
Sharon & ~~Bob~~ Ardito		856-404-1579	ShaMom2@gmail.com
BOB ARDITO		856-889-1724	musemaven@gmail.com
CINDY GROOVER		305998-0333	cindygroover@gmail.com
Bob + Lynda Boden		612-309-0870	bodingroup@yahoo.com
Cody Parham		6786176958	cody.parham@hdrinc.com
Helen McBride	CITY OF STUART Homeowner	305-331-8299	helenbmcb@icloud.com
Sam Carver	SVA	772-221-2374	scarver@martin.fl.us
Jack Thompson	GAI	407-423-8398	J.Thompson@gaiconsultants.com

Comment Form

Witham Field Potential Improvements off Dixie Highway
Public Open House - August 10, 2022

Name: Missy Harris

Address: 525 SE Alamanda Way

Phone or Email: missyh333@hotmail.com

Please provide comments in the area below (use back or attach additional sheets if necessary):

Please - Do not increase the size

Comments may be submitted at the Public Open House, by email, or to the address below.

ESA

EMAIL: ddicarlo@esassoc.com
MAIL: Douglas DiCarlo
ESA
5404 Cypress Center Drive, Suite 125
Tampa, FL 33609

Comment Form

Witham Field Potential Improvements off Dixie Highway
Public Open House - August 10, 2022

Name: Renee Allen

Address: 1327 NE SAGO Dr.
Jensen Bch. FL 34957

Phone or Email: Renee@reneeallenInsurance.com

Please provide comments in the area below (use back or attach additional sheets if necessary):

As an Aircraft owner of a 172 I am 100% in favor of more Shade hangar's & Hangars. It's time to give back to GA. It has been taken away for too many years - 20+ years.

And it's nice to be able to accomodate all aviation - The BIG airlines are taken Care of - now its time to take care of the LITTLE GA.

Thank you!

Renee Allen

Comments may be submitted at the Public Open House, by email, or to the address below.

EMAIL: ddicarlo@esassoc.com

MAIL: Douglas DiCarlo
ESA
5404 Cypress Center Drive, Suite 125
Tampa, FL 33609

ESA

Comment Form

Witham Field Potential Improvements off Dixie Highway
Public Open House - August 10, 2022

Name: Debra Duvall

Address: 1000 NE Juniper Place, Jensen Beach, FL 34957

Phone or Email: 772-288-9020

Please provide comments in the area below (use back or attach additional sheets if necessary):

I support the Witham Field improvements off Dixie Highway and also creating a talent pipeline for the aviation and aerospace sector by developing interests in our young people through creation of an Outdoor Aviation Education Center and Aviation Themed Playground on Monterey Road across from the YMCA.

Debra Duvall

Comments may be submitted at the Public Open House, by email, or to the address below.

ESA

EMAIL: ddicarlo@esassoc.com
MAIL: Douglas DiCarlo
ESA
5404 Cypress Center Drive, Suite 125
Tampa, FL 33609

From:	Jon Gottschalk
To:	Douglas DiCarlo
Subject:	Martin County Airport information meeting 8/10/2022
Date:	Monday, August 15, 2022 11:34:32 AM

Doug, It was nice meeting you at the airport information meeting on the 10th of this month. I would strongly encourage the development of the Dixie highway property as a first priority as the site is already cleared and ready for hanger development. The airport manager has indicated that the maintenance property is first priority and is budgeted. It would seem logical to divert the budgeted funds to the Dixie Highway property so that the hangers could be constructed soon. My recommendation and request would be that only tee hangers and box hangers be considered on that site.
Further I suggest allowing pilots to form a “Witham Aero Club II. This provides hangar space with little cost to the County. The revenue stream to the county would be the lot lease as it is with with Witham Aero Club I.
Mr. Carver wants the maintenance facility to be built first. Conservatively that means 3 to 5 years before hangars are built. The strong demand for small aircraft hangar space is now! Also, he seems to be a proponent of “shade” hangars. Obviously they are much cheaper to build, but offer little protection from salt air, dust, vandalism and hurricanes.
Thank you for your consideration.
Jon R. Gottschalk
(772) 349-8550
Jongott45@gmail.com

Comment Form

Witham Field Potential Improvements off Dixie Highway
Public Open House - August 10, 2022

Name: Edward Weinberg

Address: 1000 SE Monterey Commons Blvd., Su. 208
Stuart, FL 34996

Phone or Email: eweinberg@ewconsultants.com

Please provide comments in the area below (use back or attach additional sheets if necessary):

With ever growing demand for professionals and technical support in the aviation industry, it is critical that we develop a pipeline if talent and interest in this field. Based on my experience elsewhere in the U.S. (specifically Greenville, SC), provision of an Outdoor Aviation Education Center is an excellent way to facilitate interest and excitement about the aviation industry for children and young adults in the K-12 education system.

I fully support and advocate inclusion of an Outdoor Aviation Education Center at Witham Field

Comments may be submitted at the Public Open House, by email, or to the address below.

ESA

EMAIL: ddicarlo@esassoc.com
MAIL: Douglas DiCarlo
ESA
5404 Cypress Center Drive, Suite 125
Tampa, FL 33609

Comment Form

Witham Field Potential Improvements off Dixie Highway
Public Open House - August 10, 2022

Name: Ted Astolfi

Address: 1002 SE Monterey Commons Blvd, Suite 201
Stuart, FL 34996

Phone or Email: tastolfi@mceconomy.org

Please provide comments in the area below (use back or attach additional sheets if necessary):

Martin County needs and supports a pipeline of talent for Aviation to support Witham Field, its aircraft owners and its aviation businesses.

Young people need to become informed and excited about aviation. An Outdoor Aviation Education Center would enable all ages to see aircraft operations, learn about aviation and aerpspace; its importance and its careers.

I strongly support the inclusion of an Outdoor Aviation Education Center on Witham Field that will provide education of our school age children from pubic schools, charter schools, private schools and home schools about aviation it's important contributions to our economy and out future.

Comments may be submitted at the Public Open House, by email, or to the address below.

ESA

EMAIL: ddicarlo@esassoc.com
MAIL: **Douglas DiCarlo**
ESA
5404 Cypress Center Drive, Suite 125
Tampa, FL 33609

From:	Howard Ham
To:	Douglas DiCarlo
Subject:	SUA 8/10/2022 meeting
Date:	Wednesday, August 17, 2022 12:25:27 PM

Doug, I enjoyed meeting and talking with you at the airport meeting on the 10th of this month.
As discussed that evening, it seems to me that the Dixie Hwy property could be developed much sooner with it already cleared and ready. I suggest that the strongest demand is for tee and box hangars. I would hope that no shade structures would be considered. Shade structures offer no security to aircraft, do nothing to protect from our salty ocean air, and only complicate matters when preparing for hurricanes.

Thank you,

Howard Ham

Comment Form

Witham Field Potential Improvements off Dixie Highway
Public Open House - August 10, 2022

Name: WILLIAM LIPPISCH

Address: 18 RIVERVIEW DRIVE
STUART, FL 34996

Phone or Email: WELIPPISCH@GMAIL.COM

Please provide comments in the area below (use back or attach additional sheets if necessary):

I SUPPORT THE CONCEPT & IMPLEMENTATION OF HAVING AN OUTDOOR AVIATION CENTER (EDUCATIONAL) AT WITHAM FIELD. THIS COULD BE THE SPARK FOR A YOUNG PERSON TO PERSUE A CAREER IN AN AVIATION RELATED FIELD. THERE IS A HUGE PROJECTED NEED IN THE NEXT 20 YEARS, OVER 750K PILOTS & 730K TECH'S.
YOUNG PEOPLE NEED TO BE EXPOSED AT AN EARLY AGE TO ENTER THIS TRAINING.

Comments may be submitted at the Public Open House, by email, or to the address below.

ESA

EMAIL: ddicarlo@esassoc.com
MAIL: Douglas DiCarlo
ESA
5404 Cypress Center Drive, Suite 125
Tampa, FL 33609

gai consultants

ESA