# Immokalee Regional Airport, Airport Layout Plan Update

Airport Layout Plan Narrative

Collier County Airport Authority

**April 17 2017**

Working Paper # 1

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# Executive summary

Immokalee Regional Airport (IMM) is undertaking Airport Master Plan (AMP) and Airport Layout Plan (ALP) updates. The purpose of this study is to provide a 20-year development program that will create the safe, efficient, economical, and environmentally responsible airport facility capable of facilitating the demand for aviation services which can be reasonably expected, meet the development goals of the CCAA), and create additional public value for residents in the Immokalee area and the entire aeronautical community. These updates will provide CCAA and IMM with a method and proposed schedule for correcting identified airport design deficiencies as well as accommodate future growth in aviation demand.

CCAA's specific goals for this analysis are to:

1. Understand the existing and future fleet mix demands
2. Understand the future operational demand and capacity gaps
3. Create a viable, and sustainable path for airport development and future capital investment.

**30% Narrative**

This document represents the first deliverable of the initial phase of the analysis process. This first phase of the project summarizes efforts undertaken in Tasks 1, 2, 3 and 4. This 30% narrative aims to introduce the Immokalee Regional Airport and provide an in-depth analysis of the future needs of the Airport.

# 1. Introduction

## 1.1. Purpose, Goals & Objectives

The purpose of this study is to provide a 20-year development program that will create the safe, efficient, economical, and environmentally responsible airport facility capable of facilitating the demand for aviation services which can be reasonably expected, meet the development goals of the CCAA, and create additional public value for residents in the Immokalee area and the entire aeronautical community.

Consistent with this purpose, the following goals and objectives were established to guide the development of a 20-year visioning for the Airport. These goals will guide the project development alternatives and serve as the ultimate criteria for the selection of a preferred development plan. The objectives coupled with each goal aim to create measurable milestones to be addressed within this planning effort.

### 1.1.1. Goal No. 1

**Continue to meet and enhance the level of service provided to all airport users and develop an airport facility that will provide adequate capacity to fill its role as a general aviation airport in southeastern Florida.**

**Objectives:**

- Provide adequate runway capacity for estimated demand in terms of annual and hourly operations.
- Provide adequate runway length to meet forecasted regional market and operational needs.
- Provide opportunities for development of services associated with corporate aviation, industrial aviation, and other general aviation uses.
- Provide necessary ancillary facilities and equipment to support anticipated operations at IMM.

### 1.1.2. Goal No. 2

**Provide guidelines for future development, while satisfying anticipated aviation demand.**

**Objectives:**

- Provide adequate airside and landside facilities to meet anticipated demand while adhering to FAA safety and design standards.
- Effectively market commercial and non-commercial GA operators and facilities.
- Develop synergies between IMM and its community sponsors and beneficiaries that will benefit the Airport and the entire region.

### 1.1.3. Goal No. 3

**Provide an airport that is safe and reliable.**

**Objectives:**

- Provide navigational aids, flight support services, and meteorological facilities which enhance the safety and reliability of operations under all weather conditions.
- Protect FAA-mandated safety areas, runway protection zones, and other clear zones.
- Minimize obstructions to air navigation.
- Develop facilities to meet the demands of the proposed critical aircraft.

### 1.1.4. Goal No. 4

**Develop IMM in a manner which minimizes negative environmental impacts.**

**Objectives:**

- Identify the major environmental issues of concern, including noise impacts.

- Minimize potential environmental impacts in developing future facilities.
- Create an efficient development layout to provide ease of air and ground access.

### 1.1.5. Goal No. 5

**Promote the development of compatible land uses in the Airport's vicinity.**

**Objectives:**

- Promote land use planning and development objectives for on- and off-airport land uses which are compatible with the anticipated long-range needs of the Airport and community as a whole.
- Designate areas for future development (i.e. on-Airport land uses).
- Encourage the adoption of airport protective zoning.

### 1.1.6. Goal No. 6

**Develop an airport that supports local and regional economic goals while accommodating new opportunities or shifts in development patterns.**

**Objectives:**

- Achieve a level of service and user convenience such that the Airport is a positive factor in regional economic development decisions.
- Achieve capacities of the airfield so that the Airport may be an attractive location for corporate operations, aircraft maintenance and/or manufacturing operations, or other aviation-related businesses.
- Provide appropriate and achievable commercial opportunities on and around the Airport.
- Assure economic feasibility through equitable distribution of user charges, capital investment, maintenance, and operating costs, while keeping overall costs within an acceptable level.
- Identify financial alternatives and funding sources available for the implementation of aviation related and non-aviation related development projects.
- Develop an airport layout plan which easily integrates with existing and proposed transportation infrastructure and encourages economic growth.

### 1.1.7. Goal No. 7

**Develop an airport that is consistent with federal, state, regional, and local plans.**

**Objectives:**

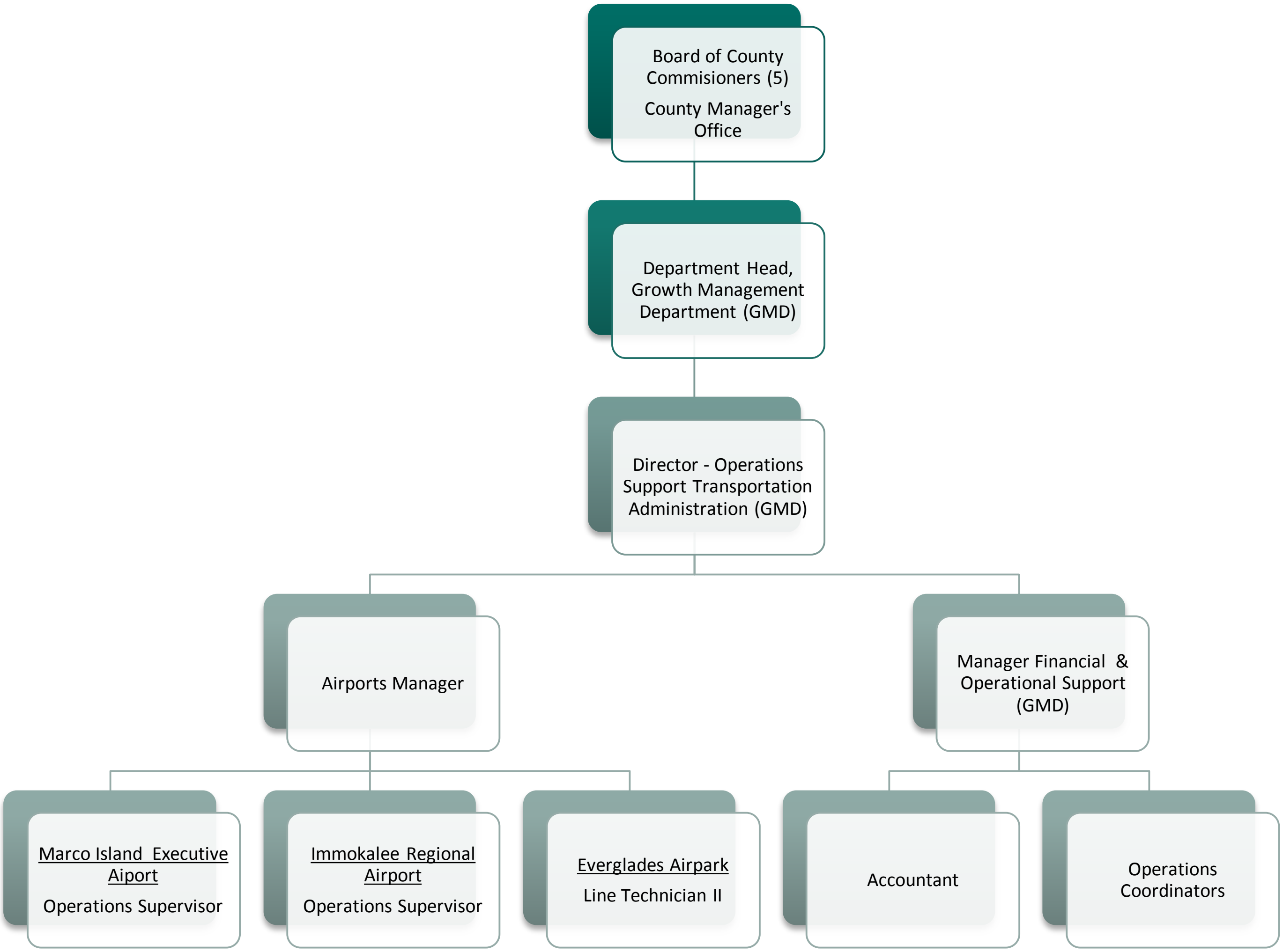
- Develop IMM in accordance with local comprehensive plans, land use plans, and transportation plans.
- Ensure applicable FAA standards for airport development are met.
- Comply with FAA established safety area and design criteria.

These goals and objectives reflect policy goals to be reached throughout the planning process. These goals include the ultimate development of facilities to serve the existing and future aviation needs of the region, and provisions for the type of development that will yield the most public benefit from the required investment. Finally, these goals must be manageable within existing limitations of funds and design principles

## 1.2. Airport Organization

IMM is a publicly owned airport and operated by the Collier County Airport Authority (CCAA). Created in 1993, CCAA was given the purpose of overseeing the management and development of three general aviation (GA) airports that serve the county. Those airports include Marco Island Executive Airport (MKY), Everglades Airpark (X01), and Immokalee Regional Airport (IMM). Their overall mission is to operate and develop those airports for the benefit of the surrounding communities. The overall CCAA organizational chart and how it relates to the Collier County Board of Commissioners is depicted in **Figure 1-1.**

**Figure 1-1 CCAA Organizational Chart**




Source: Collier County Airport Authority, 2017

## 1.3. Review of Existing Studies

There have been multiple studies that have been completed or are in progress for IMM. The following subsections provide a summary of prior and current studies that will be valuable when determining the Airport's future needs. It is important to become familiar with these studies when analyzing future airport needs to ensure compatibility, efficiency, and effectiveness with local, state, and federal plans or to address issues regarding potential future land use incompatibilities.

### 1.3.1. National Plan of Integrated Airport Systems (NPIAS) – FAA

The National Plan of Integrated Airport Systems (NPIAS) was submitted to Congress under 49 U.S. Code § 47103 on September 30, 2016. This plan identified 3,340 existing airports that are significant to national air transportation and contain estimates that $32.5 billion in infrastructure development will be needed over the next five years to meet the needs of all segments of civil aviation. The airports selected are comprised of all commercial service airports, all reliever airports, and qualified GA airports. The NPIAS's primary purpose is to determine the identified airport's specific eligibility to receive a portion of the grant fund under the Airport Improvement Program (AIP).

IMM is classified as an eligible Public Use, Regional General Aviation Airport under the NPIAS. This is due to the requirement for GA airports to have a minimum of 10 based aircraft and within the 20-mile vicinity of a NPIAS qualified airport. IMM has 58 based aircraft, which places them under a qualified NPIAS category.

### 1.3.2. Florida Aviation System Plan- FDOT

In 2005, The Florida Department of Transportation (FDOT) along with the Federal Aviation Administration (FAA) and Florida's Public Airports developed the Florida Aviation System Plan (FASP). In accordance with the Continuing Florida Aviation System Planning Process (CFASPP), the FASP identifies seven strategic goals and the appropriate approaches, analysis, and overall recommendations to achieve these goals. Those goals include having a well-planned system of airports for the projected capacity growth in the coming years. That includes identifying major development projects for all of Florida's airports and accurate long range plans to ensure the capable planning for the future. The FASP is also attempting to provide a diversified system of airports that is capable of meeting user demands by providing convenient air travel.

In the most recently updated (2010) FASP, the plan predicted there would be substantial growth within IMM in the coming years, due primarily to the rapid growth in the surrounding regions, particularly looking towards Naples Municipal Airport as capacity for GA services reduces. Another notable growth comes from the town of Ave Maria, as a larger market will be present in the immediate vicinity of IMM. FASP will assist CCAA with both funding and planning of major development projects needed at IMM.

### 1.3.3. Florida State-wide Aviation Economic Impact Study- FDOT

In August of 2014, the FDOT completed the Florida State-wide Aviation Economic Impact Study. That study analyzed the total economic impact coming from airports within the state, which included both direct and indirect impacts. Certain factors considered included airport tenants, businesses located at the airport, and airport construction projects to name a few. It was calculated that as of August 2014, IMM contributes over $27 million per year to the local economy. This comes from $16 million direct impact and $123,000, with multiplier impacts of over $11 million dollars.

### 1.3.4. Long Range Transportation Plan 2040- Collier Metropolitan Planning Organization

The Collier 2040 Long Range Transportation Plan (LRTP), completed by the Collier Metropolitan Planning Organization, intends to identify necessary transportation improvements to ensure efficient operations while considering factors such as environmental impact, economic development, etc. In relation to IMM, this study identified two major projects which could have a significant impact on the Airport.

- High levels of congestion are foreseen on the SR29 north of Immokalee Road, and significant levels of congestion on Immokalee Road west of Randall Boulevard to I-75 and the I-75 north of Immokalee Road.

An important SR-29 bypass is planned for the Immokalee area which if completed will bring transient vehicular traffic around the northeast corridor of the Airport.

### 1.3.5. Environmental Protection Agency Brownfield Grant Assessment

Provided through the Environmental Protection Agency (EPA), the Brownfield Grant Fund allows for the allocation of funds to provide for the financial support to perform planning and action towards cleaning up these declared brownfield sites. As of 2008, IMM has been given the designation of having a Brownfield status, which makes them qualified for funds that are under the Brownfields Redevelopment Act. CCAA placed a grant application to begin testing and planning in December 2016. Those efforts will be done by the

Regional Planning Council administering the program and procuring environmental consultants to carry out the task of the environmental testing and planning. If after the analyses are complete and the sites are determined contaminated, an additional grant request will be placed to perform clean-up and remediation for any identified sites.

## 1.4. Key Planning Issues

CCAA identified the following key issues to be considered during the development of the ALP and its associated drawings:

- Increasing industrial & non-aviation areas within the airport boundary to allow for the expansion of non-aeronautical land uses, and increase lease revenue.
- Increase economic development within the immediate region of the Airport.

# 2. Inventory of Existing Conditions

The development of an Airport Layout Plan (ALP) for the Immokalee Regional Airport (IMM) requires the collection and evaluation of baseline information relating to the Airport's property, facilities, services, location, and tenants, as well as access, utilities, and environmental considerations. The developed information will be used in determining any necessary airport improvements or expansions that are indicated by aviation activity forecast and the demand/capacity analyses. The information covered in this chapter was obtained through a variety of sources, including: Airport site visits, interviews with Airport staff and tenants, and through examination of airport records and other public documents. This chapter includes the following sections:

- Airport Background
- Airport Facility Inventory
- Airspace Structure
- Regional Setting and Land Use
- Environmental Considerations

## 2.1. Airport Background

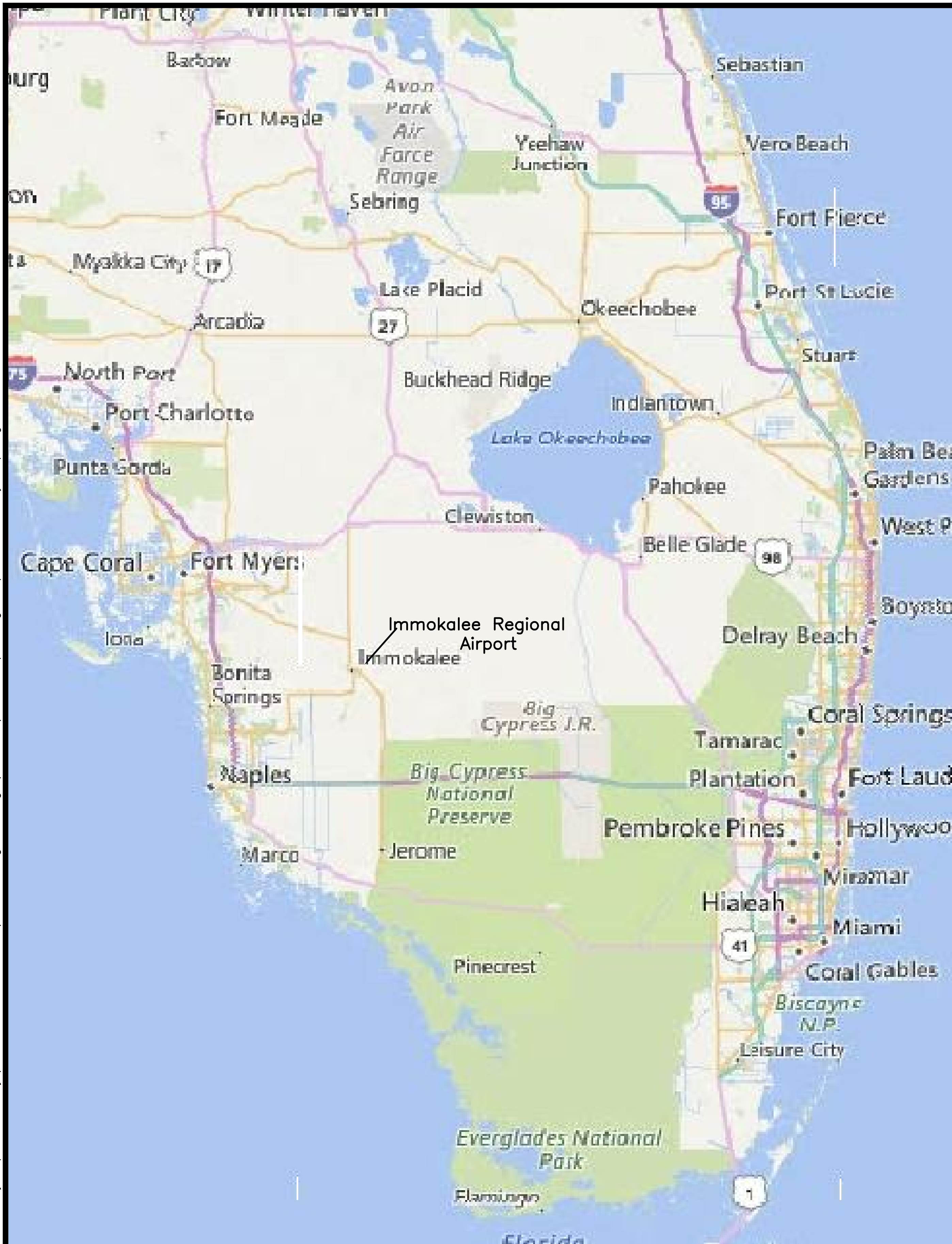
IMM is located on an approximate 1,381-acre property in the City of Immokalee, Florida. The airport is located approximately one-mile northeast of downtown Immokalee, and 30 miles northeast of Naples Municipal Airport (APF). The town of Ave Maria is located just over six miles to the southwest, and was founded in 2005. Ave Maria is currently a developing college town which has anticipated high population growth within the next decade. **Figure 2-1**, Location Map, illustrates the location of IMM within the State of Florida. **Figure 2-2**, Vicinity Map, illuminates the Airport in relation to its surround communities.

As the Airport is less than one-mile northeast of the Town of Immokalee, there are several major roadways that are serving traffic through the community. State Road 29, which runs north and south through Immokalee serves as a transition point on County Road 846. County Road 846 joins into the town of Immokalee from the east, where it runs approximately 20 miles east and joins with County Road 833.

As part of the ALP update, the existing airport reference point (ARP) for IMM has been calculated to be 26° 26' 01.7599" North Latitude, 81° 24' 7.4600" West longitude. The Airport's elevation is approximately 36.5 feet above mean sea level (AMSL).

### 2.1.1. Airport History

IMM was originally established as Immokalee Army Airfield, which was assigned to the United States Army Air Forces East Coast Training Center. Activated on July 5th, 1942, the Airport was primarily used for Air Force Pilot Training (4-engine B-17 & B-24 aircraft). In 1945, after the war ended, the Army Corps affirmed IMM as surplus and it then became a civil airport. In January 1960, the U.S. Government deeded the Immokalee Army Airfield property to Collier County for use as a civilian airport. From the declaration of surplus in 1945, there were limited crop dusting operations being served out of IMM. It was not until 1993, when the Collier County Airport Authority was created, that plans for updating the runway and building infrastructure was put into motion, growing the into the local resource that it is today.

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Immokalee Regional Airport
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COLLIER COUNTY AIRPORT AUTHORITY

Location Map

Figure 2-1

Plotted By: hask8597 Mar17,2017 – 11:14am
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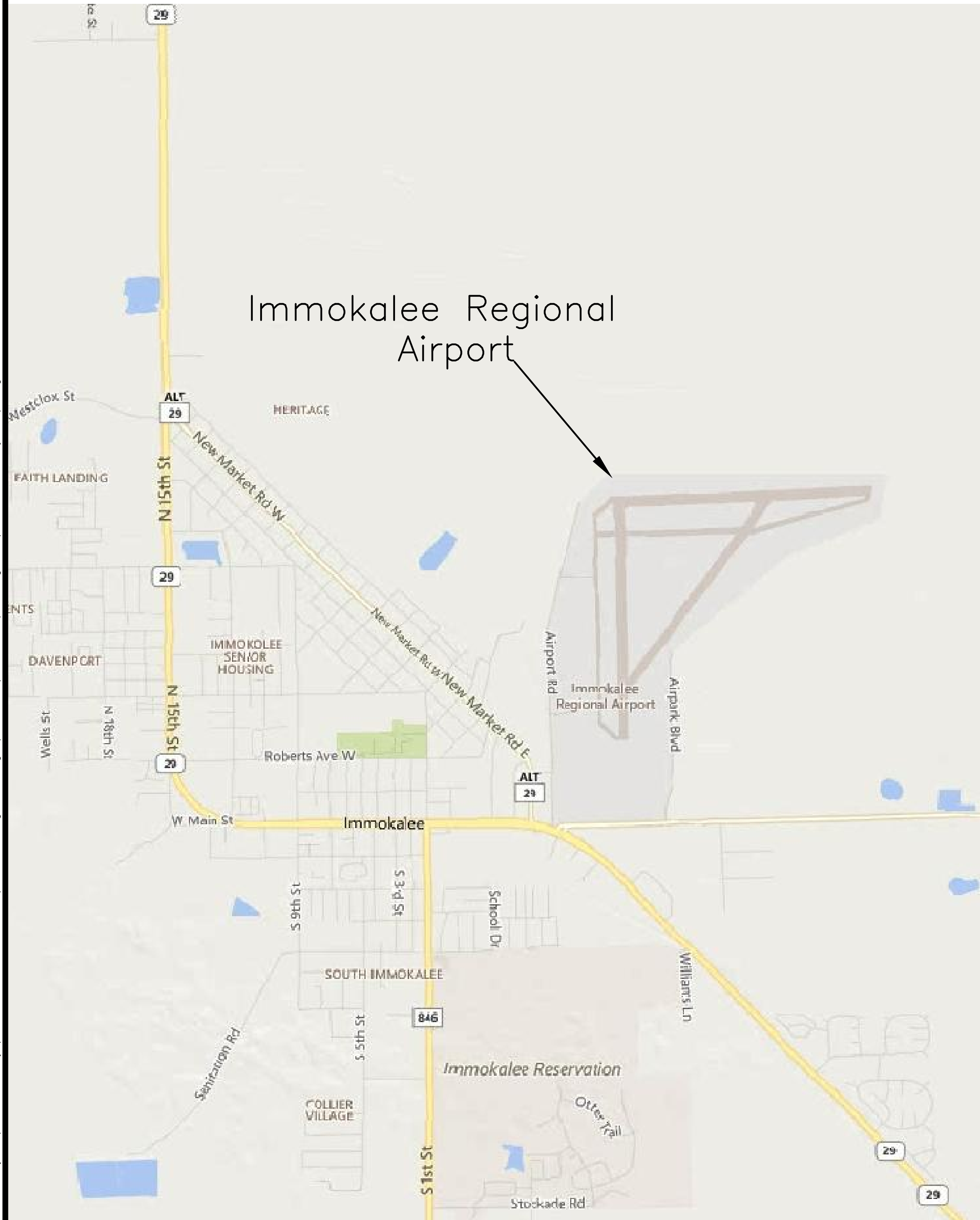


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Immokalee Regional Airport
Airport Layout Plan Update

COLLIER COUNTY AIRPORT AUTHORITY

Vicinity Map

Figure 2-2

## 2.2. Airport Facility Inventory

The identification of existing aviation facilities, their locations, and their abilities to meet the daily needs to airport users are vital elements to updating the ALP. The existing airside and landside facilities at IMM are defined in the following sections.

### 2.2.1. Airside Facilities

The existing airside facilities at IMM will be described in the following pages. The facilities that will be designated will include: Runways, taxiways, airfield pavement conditions, lighting, markings, signage, apron areas, and then specialized airfield facilities.

#### 2.2.1.1. Runways

The existing airfield runway configuration consists of two bi-directional runways. Runway 9-27 is considered the Airport's primary runway, and is approximately 5,000 feet long and 100 feet wide. The surface is asphalt in composition which is currently listed in fair condition. Markings for Runway 18-36 include non-precision for both runway ends. Runway 18-36 is approximately 4,550 feet long and 150 feet wide. The surface is asphalt and is currently described as being in poor condition, with non-precision surface markings for each runway end. Up until 1998 Runway 4-22 was operational as an effective crosswind runway, but was closed and repurposed as one of only three of Florida's IHRA sanctioned race tracks; the Immokalee Regional Raceway. **Table 2-1** summarizes the Airport's runway characteristics.

**Table 2-1 Runway Characteristics**

| Dimensions | Runway 9-27 | | Runway 18-36 | |
|---|---|---|---|---|
| Length (ft.) | 5,000 | | 4,550 | |
| Width (ft.) | 100 | | 150 | |
| Surface Material | Asphalt | | Asphalt | |
| Markings | Non-Precision | | Non-Precision | |
| **Load Bearing Capacity by Gear Type** | | | | |
| SWL (pounds) | 35 | | 35 | |
| DWL (pounds) | 60 | | 60 | |
| 2DWL (pounds) | 110 | | 110 | |
| Approach Slope | 3.00 | | 3.00 | |
| Effective Gradient | 0.1% | | 0.1% | |
| **Runway End Coordinates** | **Runway 09** | **Runway 27** | **Runway 18** | **Runway 36** |
| Latitude | N 26° 26' 13.478" | N 26° 26' 15.175" | N 26° 26' 09.638" | N 26° 25' 24.602" |
| Longitude | W 081° 24' 14.628" | W 081° 23' 19.654" | W 081° 24' 18.608" | W 81° 24' 16.880" |

Sources: FAA 5010, Atkins, 2017. SWL = Single Wheel Load, DWL = Double Wheel Load, and 2DWL = Double Tandem Wheel Load

**Declared Distances**

The FAA requires GA airports having certain operational limitations to publish declared distances for each runway. This information informs pilots what the available runway lengths are for different types of operations to maintain standard safety areas and protection zones. Declared distances include the following:

- Take Off Run Available (TORA) – The runway length declared available for the ground run of an aircraft.

- Take Off Distance Available (TODA) – The runway length declared available for the ground run of an aircraft plus any remaining clearway.
- Accelerated Stop Distance Available (ASDA) – The length of runway plus any stop way declared available and suitable for the safe deceleration of an aircraft after aborting a takeoff.
- Landing Distance Available (LDA) – The length of runway declared available for landings.

The declared distances for IMM are not published and/or not calculated. The below table shows a general assumption of distances for each category for each individual runway:

**Table 2-2 Declared Distances**

| Runway | TORA | TODA | ASDA | LDA |
|---|---|---|---|---|
| 9 | 5,000 | 5,000 | 5,000 | 5,000 |
| 27 | 5,000 | 5,000 | 5,000 | 5,000 |
| 18 | 4,550 | 4,550 | 4,550 | 4,550 |
| 36 | 4,550 | 4,550 | 4,550 | 4,550 |

Source: Atkins Analysis 2017

### 2.2.1.2. Taxiways

IMM has three primary taxiways that currently provide access from the aircraft apron areas and hangar facilities to each runway end. These taxiways are designed to satisfy the conditions of the runways and associated critical aircraft that they function for. A summary of IMM's taxiways is as follows:

- Taxiway Alpha (A) is a 50 foot' wide full length parallel taxiway on the west side of Runway 18-36. Taxiway A lies approximately 525' from the Runway 18-36 centerline. There is a connection at both Runway 18-36 thresholds and a connector located 1,052 feet from the Runway 36 threshold (Taxiway A1).
- Taxiway Bravo (B) is situated on the northern portion of the airfield, and serves as a 50- foot- wide full length parallel taxiway south of Runway 9-27. Taxiway B supports a run up pad designed for ADG III aircraft at each runway end.  There is a midfield taxiway connector located approximately 2,010 feet from the Runway 9 threshold. The western portion of Taxiway B is located approximately 750 feet south of the centerline of Runway 9-27. East of taxiway connector B-2, Taxiway B angles north and aligns again near the Runaway 27 approach end, 400 feet south of the Runway 9-27 centerline.  Bravo also connects with Runway 18 approach end, which provides direct access to Taxiway Alpha.
- Taxiway Charlie (C) is a 35-foot-wide connector between the Runway 36 end and into the main apron area on IMM. Charlie has a connector (Taxiway C-1) that is 1,052 feet from the Runway 36 threshold. Taxiway C terminates just south of the abandoned Runway 4/22. Taxiway Charlie's and Runway 18-36's centerline separation is approximately 417 feet.

### 2.2.1.3. Airfield Pavement Condition

Due to pavement rehabilitation and geometry modifications, IMM is currently awaiting the next FDOT Airfield PCI rating cycle. IMM's most recent pavement condition index (PCI) analysis and report, completed in June 2015, indicates that overall IMM's airfield pavements are in very poor condition. Most pavement areas analyzed at the time of that study were rated very poor, or serious. If that document is released within the ALP update project this section will be updated to reflect the most current pavement condition study.

Since the 2015 FDOT PCI study was completed significant pavement work has been completed at IMM to include a full rehabilitation of Runway 9-27 during which the thresholds of Runways 9 and 18 were de-coupled. Due to its recent rehabilitation, Runway 9-27 is likely rated good at this time which was not reflected at the time of the FDOT pavement survey. However, it is important to note that minimal work occurred on

Runway 18-36 during the decoupling project. Therefore, Runway 18-36 is still considered to be in very poor condition with PCI's ranging from 29 to 35. **Table 2-3** lists the various pavements analyzed as part of the PCI study, their PCI values, and their PCI ratings. Additionally, **Figure 2-3** graphically depicts IMM's pavement conditions as of 2015.

**Table 2-3 Pavement Condition Report Overview**

| Pavement Section Name | Section | PCI | Rating | Notes |
|---|---|---|---|---|
| Runway 18-36 | 6105 | 30 | Very Poor | |
| Runway 18-36 | 6110 | 32 | Very Poor | |
| Runway 18-36 | 6115 | 29 | Very Poor | |
| Runway 18-36 | 6120 | 35 | Very Poor | |
| Runway 18-36 | 6130 | 25 | Serious | Pavement Removed in Rehab Effort |
| Runway 18-36 | 6125 | 16 | Serious | Pavement Removed in Rehab Effort |
| Runway 9-27 | 6205 | 18 | Serious | Pavement Removed in Rehab Effort |
| Runway 9-27 | 6210 | 20 | Serious | Pavement Removed in Rehab Effort |
| Runway 9-27 | 6215 | 24 | Serious | Pavement Reconstructed in Rehab |
| Runway 9-27 | 6220 | 24 | Serious | Pavement Reconstructed in Rehab |
| Runway 9-27 | 6225 | 27 | Very Poor | Pavement Reconstructed in Rehab |
| Runway 9-27 | 6230 | 29 | Very Poor | Pavement Reconstructed in Rehab |
| Taxiway A | 205 | 99 | Very Poor | Portions removed in rehab effort |
| Taxiway A-1 | 210 | 97 | Serious | |
| Taxiway A-2 | 220 | 18 | Serious | Pavement Removed in Reconfiguration |
| Taxiway C | 315 | 86 | Good | |
| Taxiway C | 310 | 85 | Satisfactory | |
| FBO Apron | 4205 | 83 | Satisfactory | |
| Apron | 4210 | 80 | Satisfactory | |
| Apron Expansion | 4215 | 93 | Good | |
| Apron Expansion | 4220 | 94 | Good | |
| T-Hangar Taxilanes | 4405 | 85 | Satisfactory | |
| Crop Dusting Apron | 4310 | 76 | Satisfactory | |
| Apron | 4315 | 94 | Good | |

*Source: 2015 Statewide Airfield Pavement Management Program, District 1 Report, FDOT, 2015.*

### 2.2.1.4. Lighting

A variety of lighting aids are available at IMM to facilitate identification, approach, landing, and taxiing. These aids are essential during night operations and operations during adverse weather conditions. The systems, categorized by function, are further described in the following paragraphs.


AIRFIELD PAVEMENT CONDITION INDEX RATING EXHIBIT
IMMOKALEE REGIONAL AIRPORT
COLLIER COUNTY, FLORIDA
FLORIDA DEPARTMENT OF TRANSPORTATION - AVIATION AND SPACEPORT OFFICE

OFFICE OF FREIGHT, LOGISTICS & PASSENGER OPERATIONS

IMM 1

ATKINS
482 South Keller Road | Tel. (407) 647-7275
Orlando, FL 32810 | Fax (407) 806-4500
www.atkinsglobal.com/northamerica

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Airfield Pavement Condition Index

Figure 2-3

#### Obstruction Lighting

Existing obstructions that cannot be removed are lighted. Obstructions near the Airport are marked or lighted during both daylight and night time hours, to warn pilots of their presence. These obstructions may be identified for pilots on approach charts and on the official Airport Obstruction Chart, published by the National Oceanic and Atmospheric Administration (NOAA).

A more detailed analysis of airspace obstructions will be conducted as part of the ALP presented in later phases of this report.

#### Visual Approach Aids

Visual approach aids consist of a series of visual cues which help pilots with aircraft alignment and position relative to a runway. The primary visual approach aids located at IMM include a precision approach path indicator (PAPI) for each runway. The PAPI light systems are located near each runway's approach end positioned to the left of each end. This provides pilots with a visual descent guidance during a visual approach to the appropriate touchdown point on the runway. Each of the Airport's PAPI systems has a four light configuration which indicates a 3.00-degree angled glide path.

#### Runway End Identification Lighting (REIL)

Runway End Identification Lights (REIL) systems are put in place to help pilots rapidly identify runway thresholds in areas of light pollution, or large open spaces. These systems consist of two synchronized flashing unidirectional white lights situated near the runway threshold. Runway 9-27 and Runway 18-36 are both equipped with REIL systems.

#### Runway and Taxiway Edge Lighting

Runway edge lighting is used to shape the edges of a runway during night operations and/or periods of low visibility. This system of lights is often identified by the intensity of the lights installed. Both Runways at IMM are equipped with pilot controlled Medium Intensity Runway Lighting (MIRL) systems. Taxiway A, B, and C are equipped with Medium Intensity Taxiway Lights (MITL). The lighting systems for the newly reconstructed areas, such as Runway 9/27 and Taxiway B, were upgraded to light-emitting diode (LED) systems.

#### Apron Lighting

The FBO apron is lit by an overhead seven-mast lighting system. No other apron lighting is known to exist on the airfield.

### 2.2.1.5. Markings

All IMM's runway ends are striped with non-precision instrument markings. The runway markings were identified to be in good condition at the time of the last field inspection, and no issues have been identified since that last airfield inspection.

### 2.2.1.6. Signage

IMM's airfield signage consists of all required signage for a public use GA airport. These airfield identification signs assist pilots in recognizing their locations on the airfield and direct them to their desired end point. The Airport currently has all required directional signage, location signage, and mandatory signs including holding position signage.

### 2.2.1.7. Airport Apron Areas

IMM has one primary apron area which is operated by the CCAA, and located on the southeast portion of the airfield. The apron allows for aircraft parking, re-fueling, and other aircraft ground support services. The support services provided by CCAA include fueling, and courtesy car. The primary apron space is approximately 20,000 square yards, not including the apron area reserved for the three T-hangars which sit on the north side of the CCAA apron area, and the additional buildings in the vicinity.

A secondary apron area is located on the western portion of the Airport, connected to Taxiway A. That apron area is accompanied by a conventional hangar operated by *Three Mayhoods, LLC.* It is approximately 5,330 square yards.

## 2.2.2. Landside Facilities

IMM's existing landside facilities include a GA fixed base operator (FBO) and associated small building, aircraft storage hangars, fuel farms, automobile parking located to the south of the FBO building, and an airport maintenance building. Turbo Service Inc. is currently leasing out a testing facility for jet engine testing. There are non-aviation use cargo facilities located on the southeast portion of the abandoned Runway 4-22.

### 2.2.2.1. Fixed-Base Operator and General Aviation Terminal

As previously stated, the FBO is operated by the CCAA, along with the lease agreements for the hangar facilities and the other facilities on airport property. Fueling is available 24 hours a day (100LL & Jet A). On-call service for fueling is available during out of FBO service hours. The FBO terminal is located on the southernmost part of the apron area and includes pilot supplies, rental cars, a pilot lounge, etc. Access to this facility is provided by the Airpark Boulevard located east of the building, via SR 846.

### 2.2.2.2. Hangar Areas

Multiple hangars currently exist at IMM, which include a conventional hangar, T-hangars, and box hangars. The Airport's FBO manages all leased hangars which reside on the IMM property with exception of one private hangar located southwest of the Runway 36 threshold).

#### Conventional Hangars

A conventional hangar is typically rectangular or square in shape of facility and can hold multiple aircraft while allowing for additional equipment to be present within the facility (based on size). There are currently four conventional hangars at IMM, which are being leased by individuals of companies performing business on airport property. Two of those hangars are located directly east of Taxiway C, one is located on the secondary apron, west of Taxiway A, and the last is located southwest of Runway 36's threshold.

#### Shade Ports

Shade port aircraft storage consists of a shed roof structure with open walls. The structure offers some protection from the elements, but does not completely enclose an aircraft. There are two overhang structures on the airfield. The first, located just south of the existing FBO is owned by CCAA and is currently scheduled for demolition. The second, located southwest of Runway 36's threshold is privately owned and operated.

#### T-Hangars

T-Hangars are designed to maximize aircraft storage utilization. They typically allow for the complete protection of aircraft stored inside and are often scaled for small recreational aircraft. The facilities are usually rectangular and store aircraft in a line by alternating direction of aircraft by nose and tail. Currently, there are three T-hangar units at the Airport, with the capacity to house ten aircraft each. Those hangars are located directly north of the main apron area, where the FBO and majority of tie-down spaces preside.

### 2.2.2.3. Fuel Storage

The Airport's fuel storage is maintained by the CCAA, IMM's FBO operator, which provides fuel service during operating hours and on-call service outside of set hours. The fuel storage is located directly on the east side of the FBO Ramp. Each tank at the self-serve facility holds approximately 10,000 gallons of fuel. One tank is used for the storage of 100LL (low lead) Avgas and the other is used for Jet-A. The area of the tanks and containment area is approximately 5,000 square feet.

### 2.2.2.4. Automobile Parking

IMM has multiple parking areas on airport property. A parking area on the south side of the facility services the GA terminal and FBO building. That parking area has a fifteen-vehicle capacity. The conventional hangar located to the east of the southernmost part of Taxiway C has a large parking area to accompany the sheriff department which leases that area. On the east side of Airport Boulevard there are multiple parking areas for the facilities and leasehold which operate within those landside facilities.

#### 2.2.2.5. Security Fence

Developed and non-developed areas within the airfield and landside regions need to be protected to ensure the safe and secure operations at IMM. As such, perimeter fencing has been installed around the appropriate areas to ensure this safe environment. This includes airfield access from different points on the property using access gates where only authorized personnel can gain entrance. The airfield operations area (AOA) is completely enclosed by fencing of varying height and structure, however fencing does not completely envelope the entire airport property. The AOA fencing has deficiencies which will be addressed in subsequent chapters of this report.

## 2.3. Navigational Aids

Navigational aids, commonly referred to as NAVAIDs, assist pilots with enroute navigation and approaches and departures into and out of airports. These aids consist of both ground-based electronic systems and space-based satellite radio systems.

NAVAIDs for an airport vary in complexity, which is primarily based on the type of operations that will be occurring at that certain airport. The more sophisticated the NAVAID, the lower the minimums are at an airport. The basis that categorizes these aids consider the type of guidance pilots are receiving while on approach. If there is both vertical and horizontal guidance, then this can be classified as a precision-approach. Yet if there is only horizontal guidance, it is classified as a non-precision approach. The systems available at an airport play an important role in determining weather minimums and overall day to day operations.

### 2.3.1. Terminal Area NAVAIDs and Landing Aids

Included in this group are NAVAIDs located at or near the airfield for providing aircraft guidance information while arriving, departing, or overflying the area under all weather conditions. Landing aids provide either precision or non-precision approaches to an airport or runway.

Currently the Airport has five non-precision instrument approach procedures (IAPs), all of which provide straight-in approaches to each of the Airport’s runways. The non-precision IAPs utilize global positioning satellite (GPS) data and a ground based VOR system. The Airport’s GPS approaches all offer wide area augmentation system (WAAS) which augments GPS signals for improved accuracy. The WAAS augmentation of GPS signals permits approach minima lower than approaches supported by ground based equipment. **Figures 2-4** through **2-8** depict the Airport’s published approach procedures.

As shown on **Figure 2-4**, the VOR IAP to Runway 18 uses a 3.04-degree glide slope with a runway threshold crossing height (TCH) of 50 feet above ground level (AGL), and provides a descent to 560 feet above mean-sea-level (AMSL); or 524 feet above the Runway’s 36-foot touchdown zone elevation (TDZE) during visibility conditions as low as 1 statute mile visibility. This information is often referred to by pilots and the aviation community as an airport’s “approach minimums”, “minimums” or “approach minima”.

As shown on **Figure 2-5** the non-precision area navigation (RNAV) LPV, GPS IAP to Runway 36 uses a 3.00-degree glide slope with a runway TCH of 43 feet AGL, and provides a descent to 284 feet AMSL; 250 feet above the Runway’s TDZE during visibility conditions as low as 3/4 of a mile.

As shown on **Figure 2-6**, the non-precision RNAV, GPS IAP to Runway 27 provides a standard 3.00-degree glide slope and a runway crossing height of 50 feet. This approach allows for descents as low at 285 feet; 250 feet above the Runway’s TDZE during visibility conditions as low as 1 statute miles.

IMMOKALEE, FLORIDA — AL-6603 (FAA) — 16091

# VOR RWY 18
IMMOKALEE RGNL (IMM)

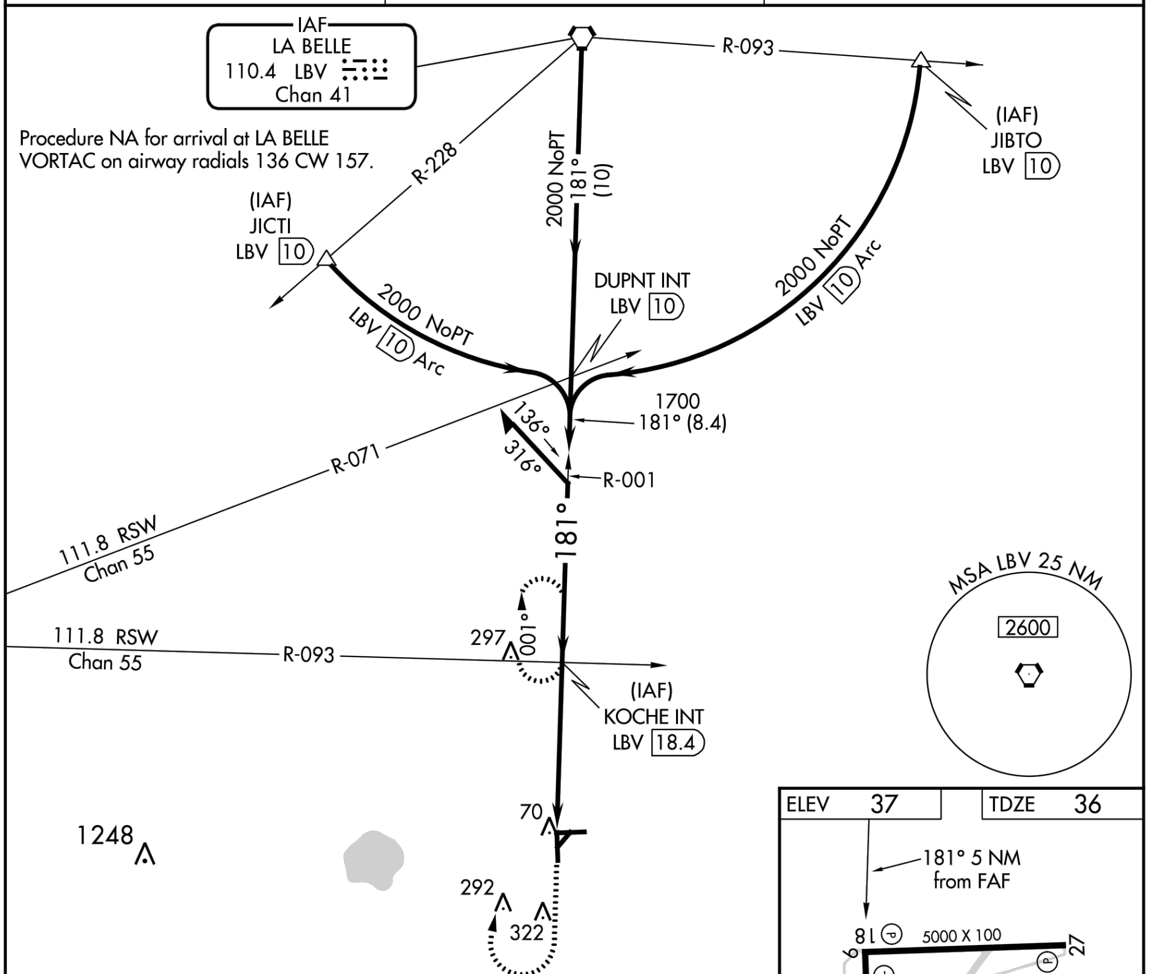
| VORTAC LBV | APP CRS | Rwy Idg | 5000 |
|---|---|---|---|
| 110.4 | 181° | TDZE | 36 |
| Chan 41 | | Apt Elev | 37 |

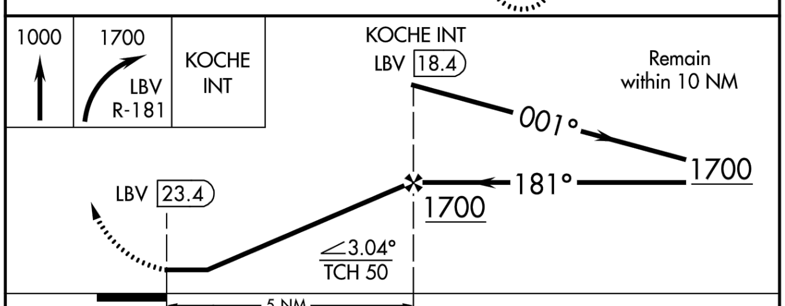
T, A NA

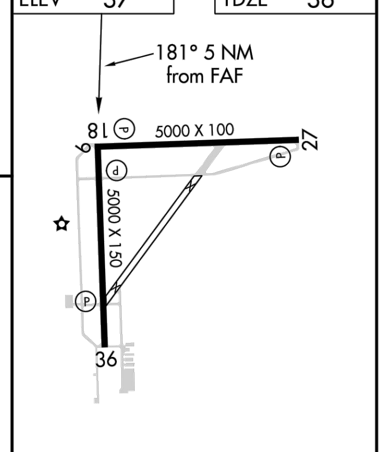
Helicopter visibility reduction below ¾ SM NA. When local altimeter setting not received, use Southwest Florida Intl altimeter setting and increase all MDA 60 feet; increase Circling Cat C/D visibility ¼ mile.

MISSED APPROACH: Climb to 1000 then climbing right turn to 1700 via LBV VORTAC R-181 to KOCHE INT/ LBV 18.4 DME and hold.

| AWOS-3 | FORT MYERS APP CON ★ | CTAF |
|---|---|---|
| 118.525 | 119.75 327.8 | 122.9 L |




REIL Rwys 18 and 36
REIL Rwys 9 and 27 L
MIRL Rwys 9-27 and 18-36 L

| CATEGORY | A | B | C | D |
|---|---|---|---|---|
| S-18 | 560-1<br>524 (600-1) | 560-1¼<br>524 (600-1¼) | 560-1½<br>524 (600-1½) | 560-1¾<br>524 (600-1¾) |
| CIRCLING | 560-1<br>523 (600-1) | 560-1¼<br>523 (600-1¼) | 660-1¾<br>623 (700-1¾) | 660-2<br>623 (700-2) |

FAF to MAP 5 NM

| Knots | 60 | 90 | 120 | 150 | 180 |
|---|---|---|---|---|---|
| Min:Sec | 5:00 | 3:20 | 2:30 | 2:00 | 1:40 |

IMMOKALEE, FLORIDA
Amdt 6B 24JUL14

26°26′N-81°24′W

IMMOKALEE RGNL (IMM)

# VOR RWY 18

SE-3, 02 FEB 2017 to 02 MAR 2017

SE-3, 02 FEB 2017 to 02 MAR 2017

ATKINS

Immokalee Regional Airport
Airport Layout Plan Update

Runway 18 VOR
IAP

Figure
2-4

IMMOKALEE, FLORIDA

AL-6603 (FAA)

16091

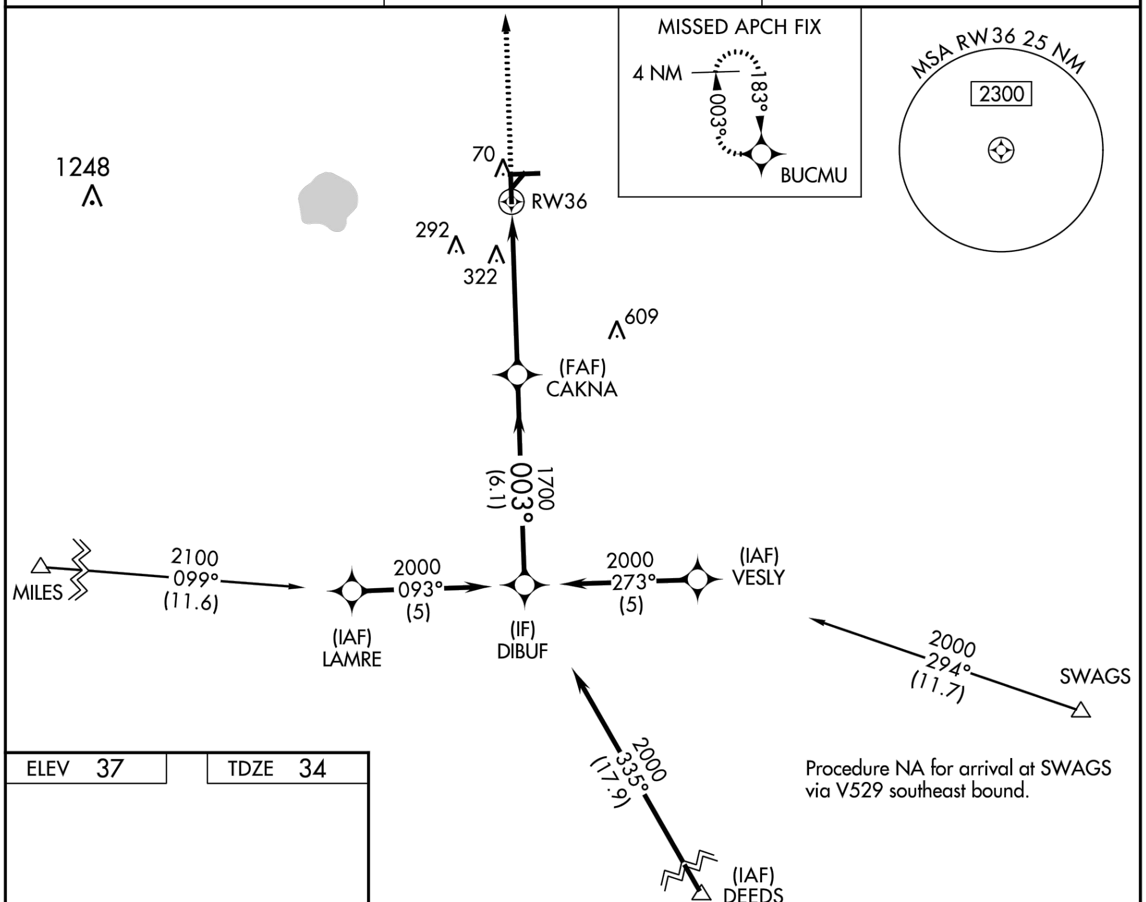
# RNAV (GPS) RWY 36

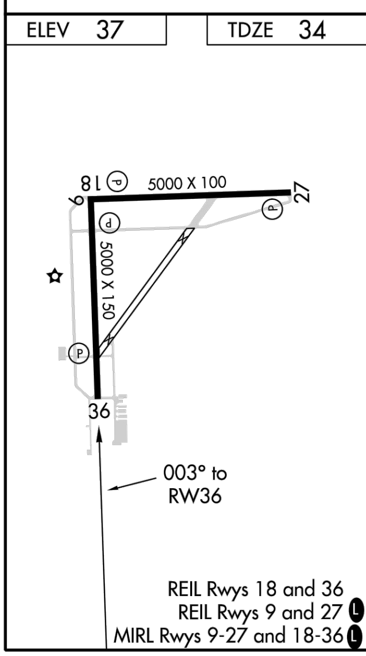
IMMOKALEE RGNL (IMM)

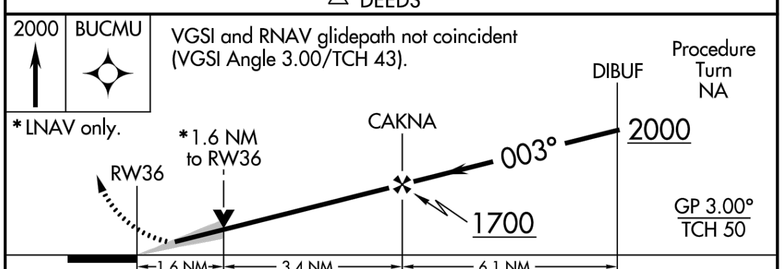
| WAAS CH 73013 W36A | APP CRS 003° | Rwy ldg 5000 TDZE 34 Apt Elev 37 |
|---|---|---|

| | |
|---|---|
| T ▲NA For uncompensated Baro-VNAV systems, LNAV/VNAV NA below -15°C (5°F) or above 48°C (118°F). DME/DME RNP-0.3 NA. When local altimeter setting not recieved, use Southwest Florida Intl altimeter setting and increase all DA 48 feet and all MDA 60 feet; increase LPV all Cats, LNAV/VNAV all Cats, and Circling Cats C/D visbility ¼ mile, increase LNAV Cats C/D visibility ⅛ mile. Baro-VNAV and VDP NA when using Southwest Florida Intl altimeter setting. | MISSED APPROACH: Climb to 2000 direct BUCMU and hold. |

| AWOS-3 | FORT MYERS APP CON * | CTAF |
|---|---|---|
| 118.525 | 119.75 327.8 | 122.9 L |




| CATEGORY | A | B | C | D |
|---|---|---|---|---|
| LPV DA | 284-¾ 250 (300-¾) | | | |
| LNAV/VNAV DA | 664-2¼ 630 (700-2¼) | | | |
| LNAV MDA | 580-1 546 (600-1) | | 580-1⅝ 546 (600-1⅝) | |
| CIRCLING | 580-1 543 (600-1) | | 660-1¾ 623 (700-1¾) | 660-2 623 (700-2) |

IMMOKALEE, FLORIDA

Orig-C 16OCT14

26°26′N-81°24′W

IMMOKALEE RGNL (IMM)

RNAV (GPS) RWY 36

SE-3, 02 FEB 2017 to 02 MAR 2017

| ATKINS | Immokalee Regional Airport Airport Layout Plan Update | COLLIER COUNTY AIRPORT AUTHORITY | Runway 36 RNAV (GPS) IAP | Figure 2-5 |
|---|---|---|---|---|

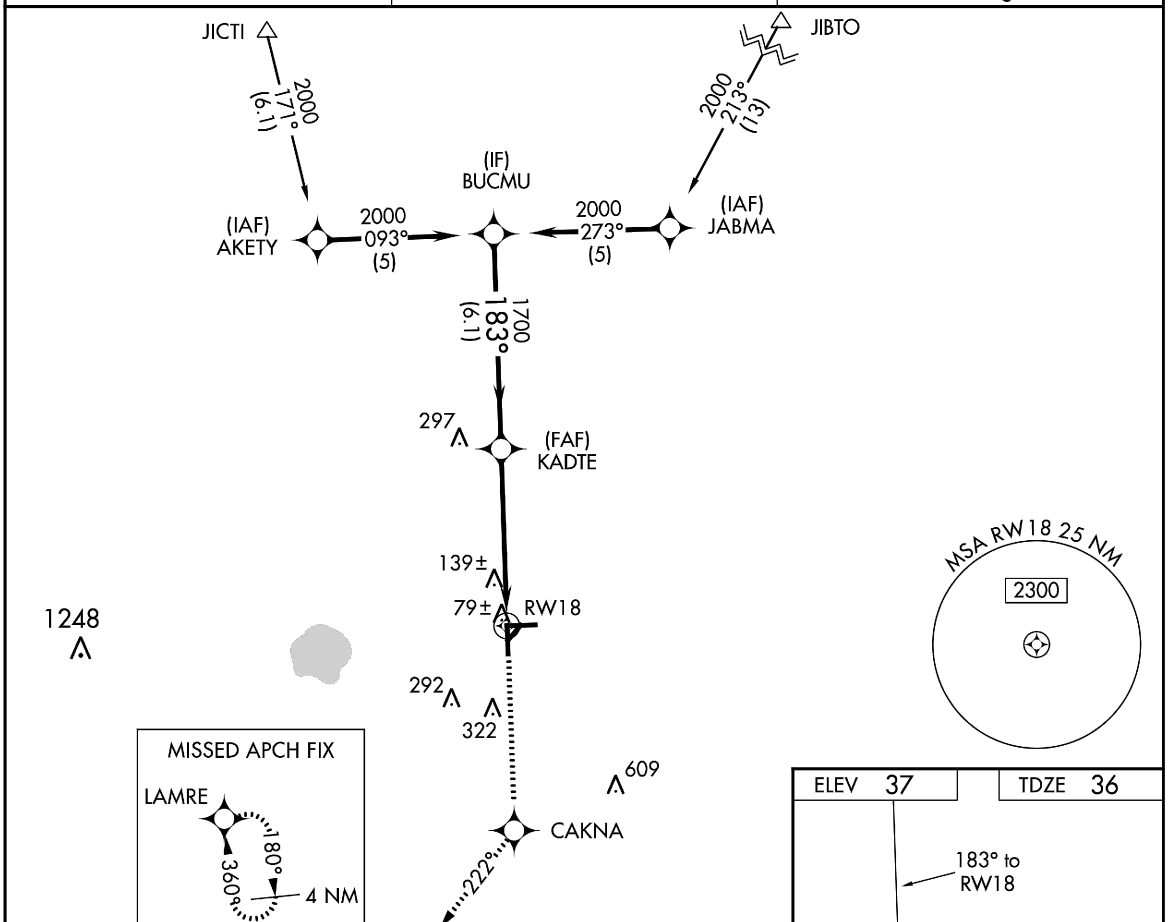
| WAAS CH 63213 W18A | APP CRS 183° | Rwy ldg 5000 TDZE 36 Apt Elev 37 |
|---|---|---|

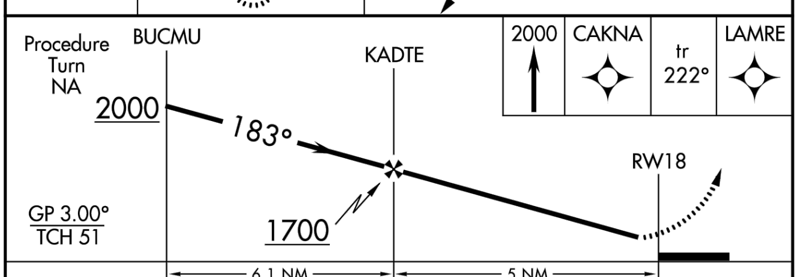
# RNAV (GPS) RWY 18
## IMMOKALEE RGNL (IMM)

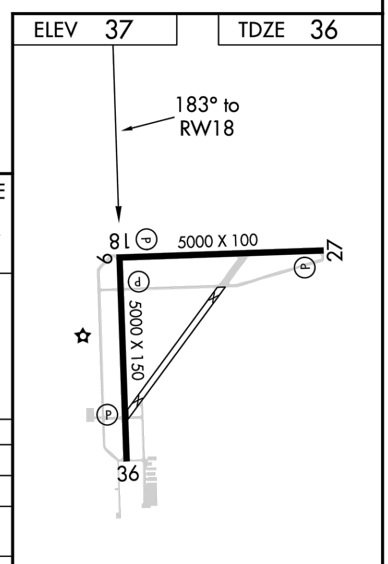
T ▲NA For uncompensated Baro-VNAV systems, LNAV/VNAV NA below -15°C (5°F) or above 48°C (118°F). DME/DME RNP-0.3 NA. Helicopter visibility reduction below ¾ SM NA. When local altimeter setting not received, use Southwest Florida Intl altimeter setting and increase all DA 48 feet and all MDA 60 feet; increase LNAV Cat C and Circling Cat C/D visibility ¼ mile. Baro-VNAV NA when using Southwest Florida Intl altimeter setting.

MISSED APPROACH: Climb to 2000 direct CAKNA and via track 222° to LAMRE and hold.

| AWOS-3 | FORT MYERS APP CON ★ | CTAF |
|---|---|---|
| 118.525 | 119.75 327.8 | 122.9 Ⓛ |




| CATEGORY | A | B | C | D |
|---|---|---|---|---|
| LPV DA | 286-1 250 (300-1) | | | |
| LNAV/VNAV DA | 380-1¼ 344 (400-1¼) | | | |
| LNAV MDA | 400-1 364 (400-1) | | | 400-1¼ 364 (400-1¼) |
| CIRCLING | 520-1 483 (500-1) | | 660-1¾ 623 (700-1¾) | 660-2 623 (700-2) |

REIL Rwys 18 and 36
REIL Rwys 9 and 27 Ⓛ
MIRL Rwys 9-27 and 18-36 Ⓛ

IMMOKALEE, FLORIDA
Orig-B 24JUL14

26°26'N-81°24'W

IMMOKALEE RGNL (IMM)
RNAV (GPS) RWY 18

SE-3, 02 FEB 2017 to 02 MAR 2017

IMMOKALEE, FLORIDA

AL-6603 (FAA)

16091

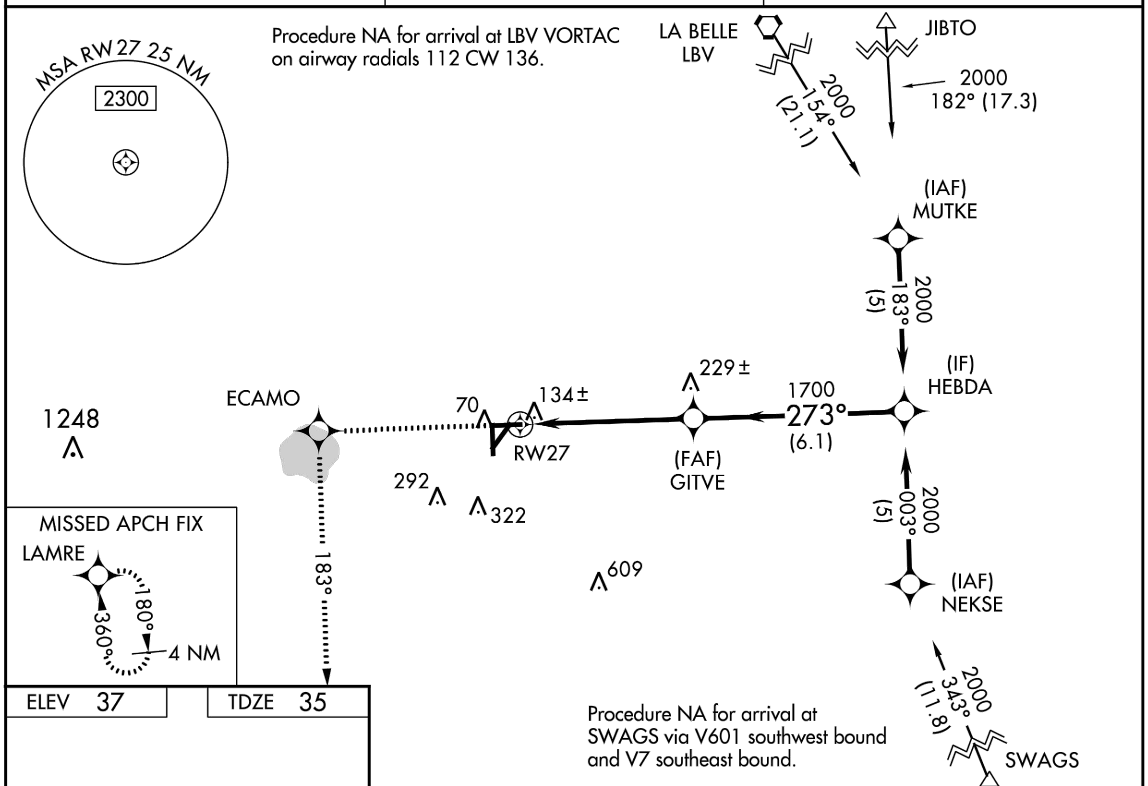
# RNAV (GPS) RWY 27

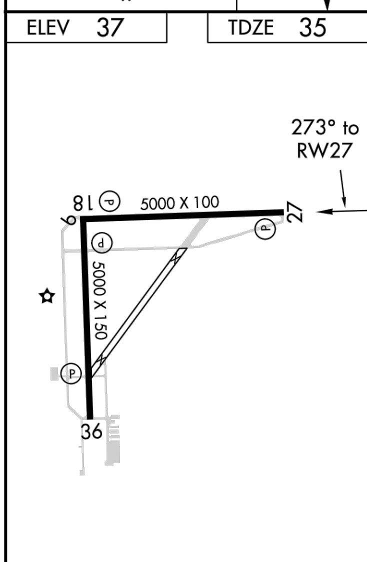
IMMOKALEE RGNL (IMM)

| WAAS CH 69613 W27A | APP CRS 273° | Rwy Idg 5000 TDZE 35 Apt Elev 37 |
|---|---|---|

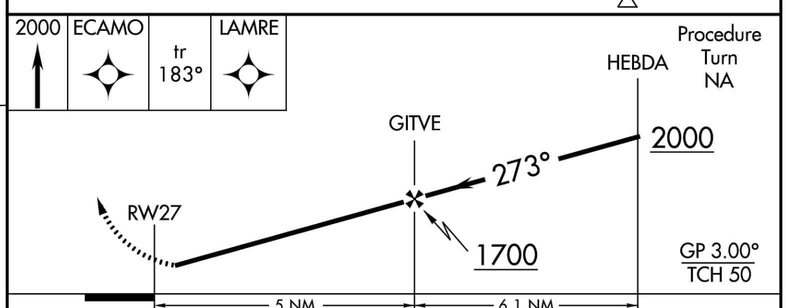
| Notes | Missed approach |
|---|---|
| T, A NA. For uncompensated Baro-VNAV systems, LNAV/VNAV NA below -15°C (5°F) or above 48°C (118°F). DME/DME RNP-0.3 NA. Visibility reduction by helicopters NA. When local altimeter setting not received, use Southwest Florida Intl altimeter setting and increase all DA 48 feet and all MDA 60 feet; increase LNAV/VNAV all Cats, LNAV Cat C and Circling Cat C/D visibility ¼ mile. Baro-VNAV NA when using Southwest Florida Intl altimeter setting. Straight-in/Circling to Rwy 27 NA at night. | MISSED APPROACH: Climb to 2000 direct ECAMO and via track 183° to LAMRE and hold. |

| AWOS-3 | FORT MYERS APP CON ★ | CTAF |
|---|---|---|
| 118.525 | 119.75 327.8 | 122.9 L |




REIL Rwys 18 and 36
REIL Rwys 9 and 27 L
MIRL Rwys 9-27 and 18-36 L




| CATEGORY | A | B | C | D |
|---|---|---|---|---|
| LPV DA | 285-1 250 (300-1) | | | |
| LNAV/VNAV DA | 404-1¼ 369 (400-1¼) | | | |
| LNAV MDA | 400-1 365 (400-1) | | | 400-1¼ 365 (400-1¼) |
| CIRCLING | 520-1 483 (500-1) | | 660-1¾ 623 (700-1¾) | 660-2 623 (700-2) |

IMMOKALEE, FLORIDA

Orig-B 21AUG14

26°26'N-81°24'W

IMMOKALEE RGNL (IMM)

RNAV (GPS) RWY 27

SE-3, 02 FEB 2017 to 02 MAR 2017

SE-3, 02 FEB 2017 to 02 MAR 2017

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Immokalee Regional Airport
Airport Layout Plan Update

COLLIER COUNTY AIRPORT AUTHORITY

Runway 27
RNAV (GPS) IAP

Figure 2-7

IMMOKALEE, FLORIDA AL-6603 (FAA) 16091

# RNAV (GPS) RWY 9

IMMOKALEE RGNL (IMM)

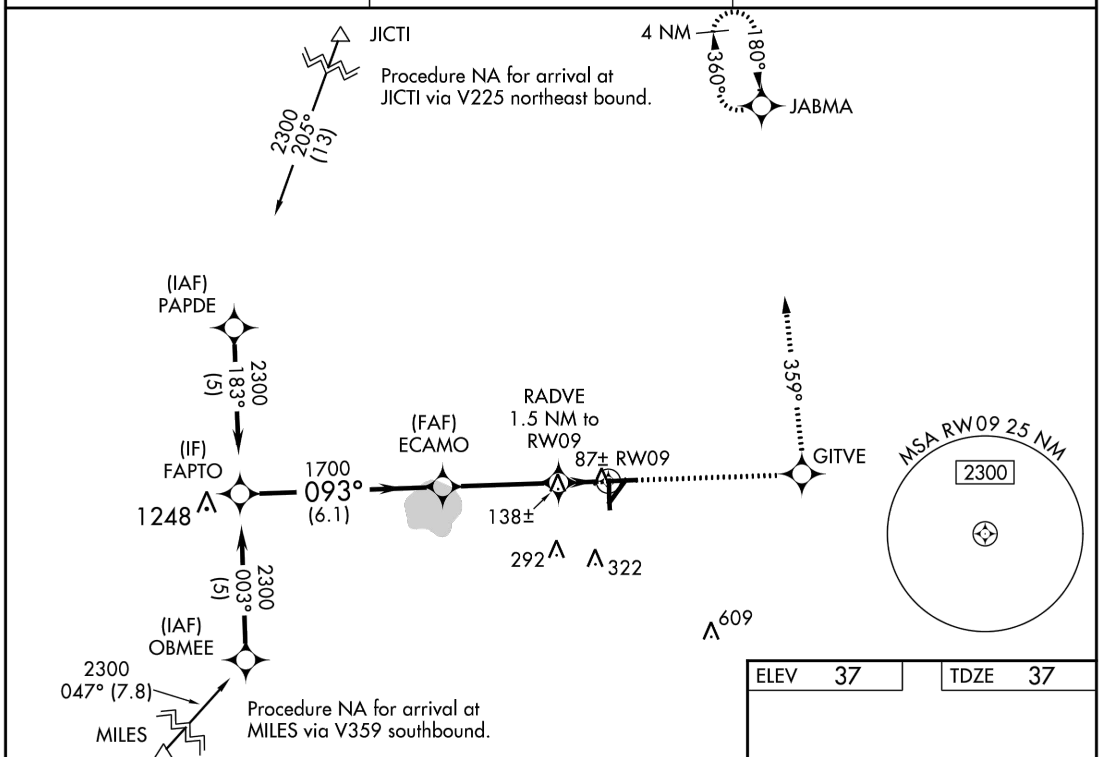
| WAAS CH 99713 W09A | APP CRS 093° | Rwy ldg 5000 TDZE 37 Apt Elev 37 |
|---|---|---|

T A NA For uncompensated Baro-VNAV systems, LNAV/VNAV NA below -15°C (5°F) or above 48°C (118°F). DME/DME RNP-0.3 NA. Visibility reduction by helicopters NA. When local altimeter setting not received, use Southwest Florida Intl altimeter setting and increase LPV DA 48 feet, LNAV/VNAV DA 125 feet and all MDA 60 feet; increase LPV all Cats, LNAV Cat C and Circling Cat C/D visibility ¼ mile, and LNAV/VNAV all Cats visibility ½ mile. Baro-VNAV NA when using Southwest Florida Intl altimeter setting.

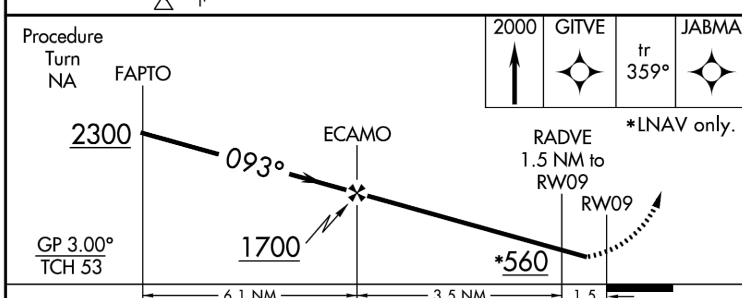
MISSED APPROACH: Climb to 2000 direct GITVE and via track 359° to JABMA and hold.

| AWOS-3 | FORT MYERS APP CON ★ | CTAF |
|---|---|---|
| 118.525 | 119.75 327.8 | 122.9 L |

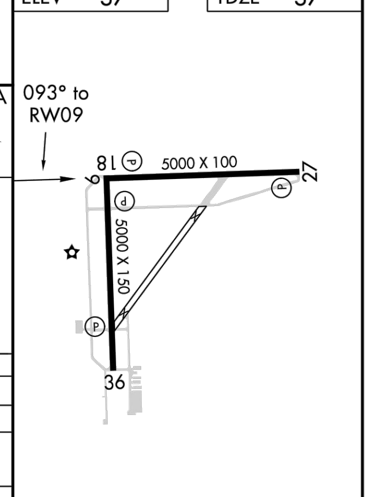
SE-3, 02 FEB 2017 to 02 MAR 2017




SE-3, 02 FEB 2017 to 02 MAR 2017




| ELEV 37 | TDZE 37 |
|---|---|




| CATEGORY | A | B | C | D |
|---|---|---|---|---|
| LPV DA | 325-1 288 (300-1) | | | |
| LNAV/VNAV DA | 401-1¼ 364 (400-1¼) | | | |
| LNAV MDA | 400-1 363 (400-1) | | | 400-1¼ 363 (400-1¼) |
| CIRCLING | 520-1 483 (500-1) | | 660-1¾ 623 (700-1¾) | 660-2 623 (700-2) |

REIL Rwys 18 and 36
REIL Rwys 9 and 27 L
MIRL Rwys 9-27 and 18-36 L

IMMOKALEE, FLORIDA
Orig-B 21AUG14

26°26′N-81°24′W

IMMOKALEE RGNL (IMM)

RNAV (GPS) RWY 9

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Immokalee Regional Airport
Airport Layout Plan Update

COLLIER COUNTY AIRPORT AUTHORITY

Runway 9
RNAV (GPS) IAP

Figure 2-8

Plotted By: hask8597 Apr14,2017 - 10:27am
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As shown on **Figure 2-7**, the non-precision RNAV, GPS IAP to Runway 18 provides a standard 3.0-degree glide slope with a runway TCH of 51 feet AGL, and provides a descent to 286 feet AMSL; 235 feet above the Runway's TDZE during visibility conditions as low as 1 mile.

As shown on **Figure 2-8**, the non-precision RNAV, GPS IAP to Runway 9 provides a standard 3.00-degree glide slope and a threshold crossing height of 53 feet. This approach allows for descents as low at 325 feet; 272 feet above the Runway's TDZE during visibility conditions as low as 1 statute miles.

Other NAVAIDs at IMM, such as the Automated Weather Observation System (AWOS), segmented circle and lighted wind cone (located southeast of the Runway 9 threshold), and supplemental lighted wind cone, provide weather condition information to pilots operating at the Airport. Those NAVAIDS provide electronic and visual indication of wind direction and velocity, which assists pilots in determining the proper runway end to conduct their operations. The AWOS also reports current conditions such as ceiling, visibility, temperature, dew point, altimeter setting, as well as any recorded remarks.

## 2.4. Airspace Structure

Congress granted the FAA the authority to control all airspace over the United States, via the Federal Aviation Act of 1958. The FAA then established the National Airspace System (NAS) to protect persons and property on the ground, and to establish a safe and efficient airspace environment for civil, commercial, and military aviation. The NAS is defined as the common network of U.S. Airspace, including air navigation facilities, airports, and landing areas, aeronautical charts and information, associated rules, regulations and procedures, technical information, personnel, and material. System components shared jointly with military are also included.

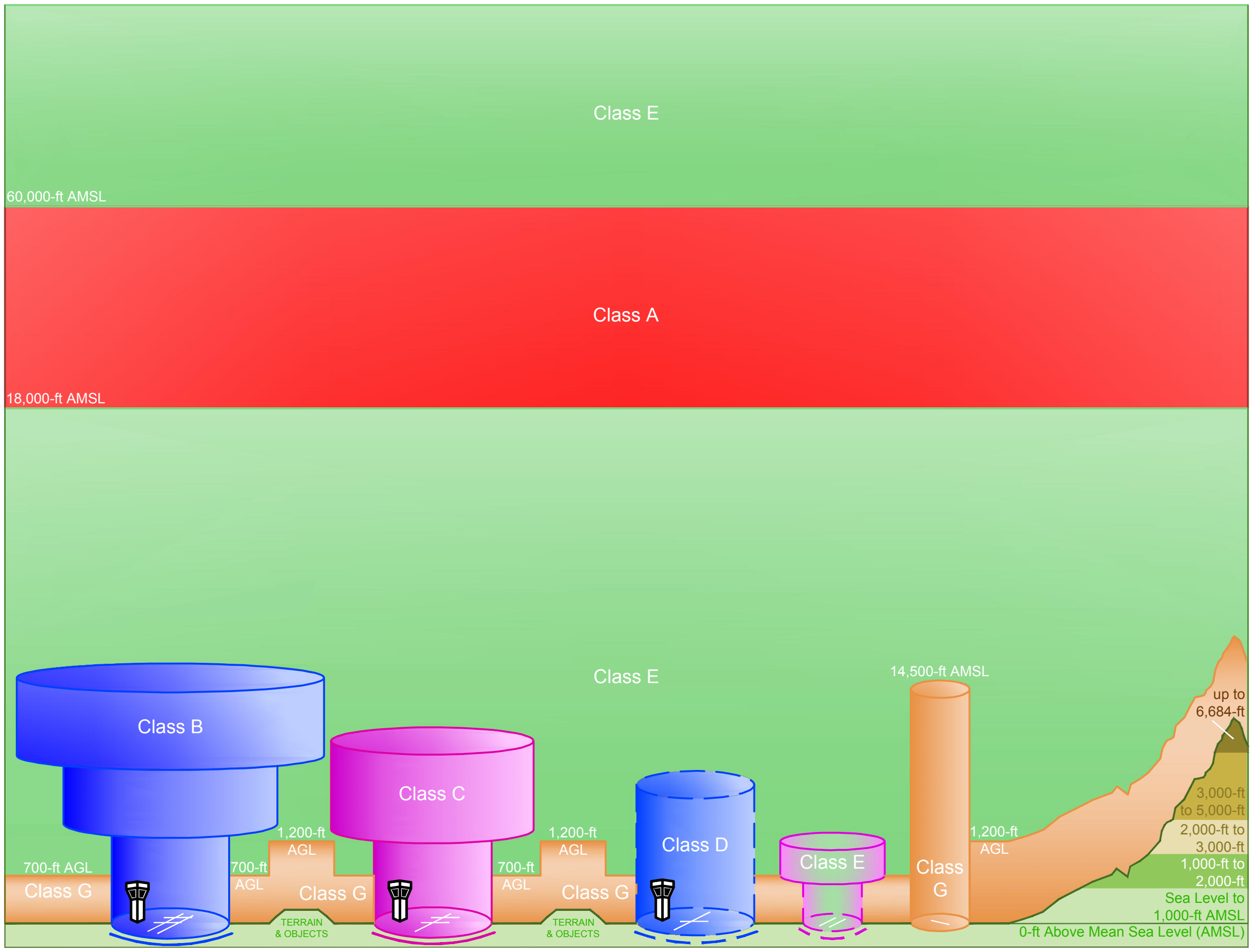
### 2.4.1. Airspace Environs

Airspace is classified as controlled or uncontrolled. Controlled airspace is supported by ground-to-air communications, NAVAIDs, and air traffic services. In September 1993, the FAA reclassified major airspace. The new classifications are graphically depicted in **Figure 2-9,**

The types of controlled airspace around Immokalee Regional include:

- Class A airspace, which includes all airspace between 18,000 feet AMSL and 60,000 feet AMSL (as well as waters 12 NM off the cost of the 48 contiguous states).
- Class C airspace (formerly referred to as the Airport Radar Service Area), includes around Southwest Florida International Airport (RSW) from either the surface or 1,200 feet AMSL to 4,000 feet AMSL. This variation can be determined based on the location within the five-nautical mile coverage from the airport property.
- Class E airspace, which includes all controlled airspace other than Class A, B, C, or D. Class E airspace extends upward from either the surface of the designated altitude to overlying or adjacent controlled airspace. Class E airspace includes transition areas and control zones for airports without air traffic control towers (ATCTs).
- Class G airspace, which is uncontrolled airspace.

The only airspace classification that pertains specifically to IMM (Class E) will be explained in further detail. The Fort Myers Approach Control is responsible for enroute control of all aircraft operating in an instrument flight rules (IFR) flight into IMM. See Figure 2-10 for a depiction of the visual flight rules (VFR) Sectional chart for the Immokalee Region




Communication Requirements and Weather Minimums

| | Class A | Class B | Class C | Class D | Class E | Class G |
|---|---|---|---|---|---|---|
| Minimum Pilot Qualification | Instrument Rating | Student * | Student * | Student * | Student * | Student * |
| Entry Requirements | IFR: ATC Clearance<br>VFR: Operations Prohibited | ATC Clearance | IFR: ATC Clearance<br>VFR: Two-Way Communication w/ ATC | IFR: ATC Clearance<br>VFR: Two-Way Communication w/ ATC | IFR: ATC Clearance<br>VFR: None | None |
| VFR Visibility Below 10,000 AMSL ** | N/A | 3 Statute Miles | 3 Statute Miles | 3 Statute Miles | 3 Statute Miles | Day: 1 Statute Mile<br>Night: 3 Statute Miles |
| VFR Cloud Clearance Below 10,000 AMSL | N/A | Clear of Clouds | 500 Below<br>1,000 Above<br>2,000 Horizontal | 500 Below<br>1,000 Above<br>2,000 Horizontal | 500 Below<br>1,000 Above<br>2,000 Horizontal | 500 Below<br>1,000 Above<br>2,000 Horizontal *** |
| VFR Visibility 10,000 AMSL and Above ** | N/A | 3 Statute Miles | 3 Statute Miles | 3 Statute Miles | 5 Statute Miles | 5 Statute Miles |
| VFR Cloud Clearance 10,000 AMSL and Above | N/A | Clear of Clouds | 500 Below<br>1,000 Above<br>2,000 Horizontal | 500 Below<br>1,000 Above<br>2,000 Horizontal | 500 Below<br>1,000 Above<br>1 Statute Mile Horizontal | 1,000 Below<br>1,000 Above<br>1 Statute Mile Horizontal |
| Airport Application | N/A | • Radar<br>• Instrument Approaches<br>• Weather<br>• Control Tower<br>• High Density | • Radar<br>• Instrument Approaches<br>• Weather<br>• Control Tower | • Instrument Approaches<br>• Weather<br>• Control Tower | • Instrument Approaches<br>• Weather | |
| Special VFR Permitted? | No | Yes | Yes | Yes | Yes | N/A |

* Prior to operating within Class B, C, or D airspace (or Class E airspace with an operating control tower), student, sport, and recreational pilots must meet the applicable FAR Part 61 training and endorsement requirements. Solo student, sport, and recreational pilot operations are prohibited at those airports listed in FAR Part 91, Appendix D, Section 4.

** Student pilot operations require at least 3 statute miles visibility during the day and 5 statute miles visibility at night.

*** Class G VFR cloud clearance at 1,200 AGL and below (day): clear of clouds.

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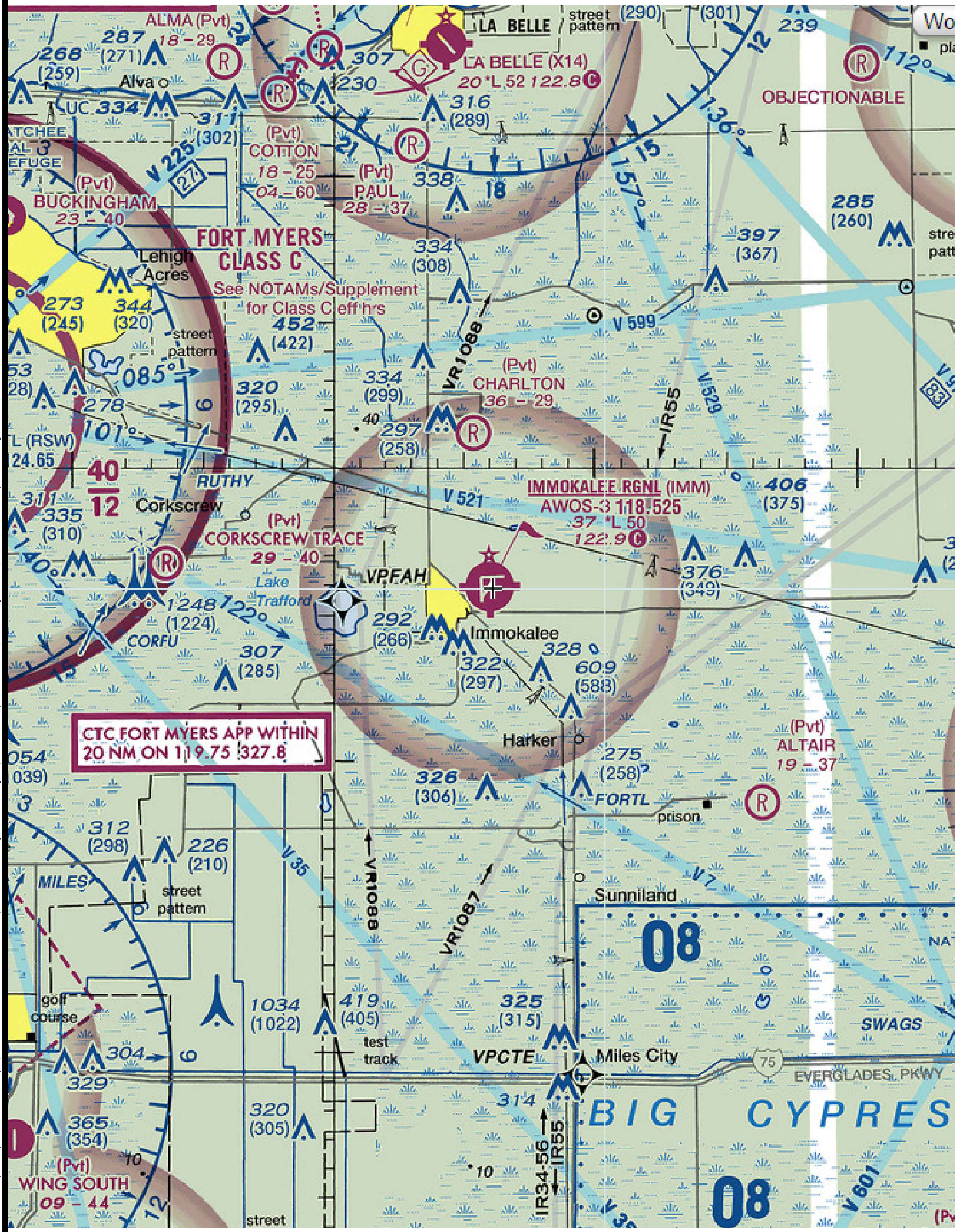
Immokalee Regional Airport
Airport Layout Plan Update

COLLIER COUNTY AIRPORT AUTHORITY

General Airspace Classification

Figure 2-9




ATKINS

Immokalee Regional Airport
Airport Layout Plan Update

COLLIER COUNTY AIRPORT AUTHORITY

Regional Airspace

Figure 2-10

Plotted By: hask8597
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#### 2.4.1.1. Class E

Most of the remaining controlled airspace is designated as Class E airspace, which includes several different segments. When an airport is designated as Class E, it has usually been established to allow IFR traffic to remain in controlled airspace while transitioning between the enroute and airport environments. Generally, Class E airspace extends either from the surface or 700 feet, up to 1,200 feet above an airport's elevation (charted in AMSL) surrounding those airports that are non-towered yet are equipped with an instrument approach. The configuration of each Class-E airspace area is individually tailored. Each pilot operating at a Class-E airport should provide situation and directional information via radio communications with other pilots operating within the airspace.

#### 2.4.1.2. Uncontrolled Airspace and Air Traffic Procedures

The FAA has developed various airspace classifications to address the need for controlling the airspace based upon the type and level of operations occurring at a specific airfield. IMM is a non-towered airport and designated as Class E airspace. This airspace consists of a circle centered on the Airport that encompasses a radius of approximately six-nautical miles, and up to an altitude of 1,200 AGL. No ATC clearance is required for aircraft entering or operating in the Airport's Class E airspace.

### 2.4.2. FAR Part 77 Surfaces and Existing Obstructions

Federal Aviation Regulations (FAR) Part 77, *Objects Affecting Navigable Airspace*, defines standards for determining obstructions to navigable airspace. These imaginary surfaces are used to protect operations around airports from high structures that can pose a threat to aircraft landing at or departing an airport or operating within an airport's terminal airspace.  Obstructions are primarily determined by superimposing the Part 77 "imaginary surfaces" over an airport and its surrounding areas. An analysis is performed to determine the elevations of various objects (structures, terrain, trees, towers, etc.). The objects' elevations are then compared to the elevations of the associated Part 77 surfaces. Objects that are found to be higher than the Part 77 surfaces are considered obstructions. Within the ALP set developed in conjunction with this report, an airport airspace sheet will illustrate the various obstructions and objects located within the Part 77 areas.

Dimensions of the "imaginary surfaces" are derived from the type of approaches and aircraft operating at the Airport. Federal regulations require that the primary and horizontal surfaces, identified within the Part 77 imaginary surfaces guidance, of the most demanding approach be applied to the entire runway. The typical Part 77 configuration and dimensions of the Part 77 surfaces for IMM are illustrated in **Figure 2-11**.

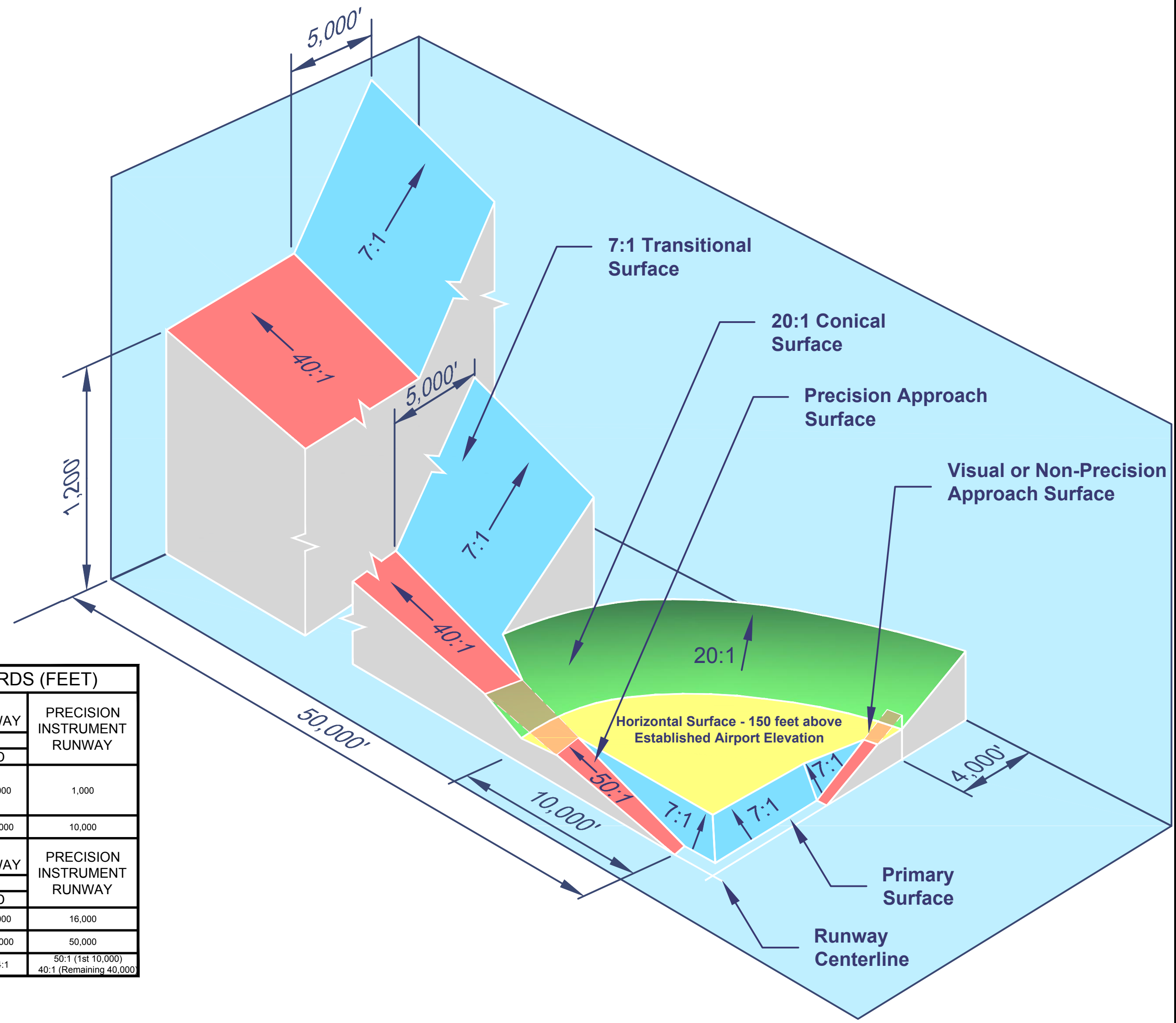
### 2.4.3. Airports in the Region

There are currently six public-use airports and about six private airstrips within an approximate 35 NM radius around IMM. **Table 2-4** lists the surrounding airports and provides information on distance and direction from the Airport. Among those six public-use airports, two are considered as commercial service.

**Table 2-4 Airports Surrounding Immokalee Regional Airport (IMM)**

| Airport Name (I.D.) | Location from IMM | Use |
|---|---|---|
| Everglades (X01) | 35 NM S | GA-Public |
| Marco Island (MKY) | 30 NM SW | GA-Public |
| Naples (APF) | 26 NM SW | Commercial Service |
| Southwest Florida International (RSW) | 20 NM NW | Commercial Service |
| La Belle (X14) | 18 NM N | GA-Public |
| Air Glades (2IS) | 26 NM NE | GA-Public |
| Big Cypress | 23 NM E | Private |

*Source: Airnav.com, 2017.*




A - UTILITY RUNWAYS
B - RUNWAYS LARGER THAN UTILITY
C - VISIBILITY MINIMUMS GREATER THAN 3/4 MILES
D - VISIBILITY MINIMUMS AS LOW AS 3/4 MILE
E - PRECISION INSTRUMENT APPROACH SLOPE IS 50:1 FOR INNER 10,000 FEET AND 40:1 FOR AN ADDITIONAL 40,000 FEET

| DIM | ITEM | DIMENSIONAL STANDARDS (FEET) | | | | | |
|---|---|---|---|---|---|---|---|
| | | VISUAL RUNWAY | | NON-PRECISION INSTRUMENT RUNWAY | | | PRECISION INSTRUMENT RUNWAY |
| | | A | B | A | B | | |
| | | | | | C | D | |
| A | WIDTH OF PRIMARY SURFACE AND APPROACH SURFACE WIDTH AT INNER END | 250 | 500 | 500 | 500 | 1,000 | 1,000 |
| B | RADIUS OF HORIZONTAL SURFACE | 5,000 | 5,000 | 5,000 | 10,000 | 10,000 | 10,000 |
| | | VISUAL RUNWAY | | NON-PRECISION INSTRUMENT RUNWAY | | | PRECISION INSTRUMENT RUNWAY |
| | | A | B | A | B | | |
| | | | | | C | D | |
| C | APPROACH SURFACE WIDTH AT END | 1,250 | 1,500 | 2,000 | 3,500 | 4,000 | 16,000 |
| D | APPROACH SURFACE LENGTH | 5,000 | 5,000 | 5,000 | 10,000 | 10,000 | 50,000 |
| E | APPROACH SLOPE | 20:1 | 20:1 | 20:1 | 34:1 | 34:1 | 50:1 (1st 10,000) 40:1 (Remaining 40,000) |

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Immokalee Regional Airport
Airport Layout Plan Update

Typical Part 77 Surfaces
Cross Section

Figure
2-11

## 2.5. Land Use and Zoning

Land use and zoning around an airport is critically important to the future utility and sustainability of airport operations. Without the security and support provided by compatible land uses around an airport property, airports and their sponsors can face a variety of safety difficulties, health and human safety concerns, and social/political dissent, which in the long run detracts from the airports ability to reach its full public value potential. **Figure 2-12** identifies the existing land use and zoning condition around the Airport.

There is currently only a small area (24 acres) of existing aviation related development, which is located to the east/southeast of Runway 36's approach end. Other areas under this category are located southwest of the Runway 36 approach end, and to the west of Runway 18-36 which runs into the upland management area. This upland management area spans a majority of land holdings on the western portion of the property, and was established to ultimately preserve the land in terms of biodiversity associated with this area along with overall environmental protection. That area is approximately 154 acres.

Most of the Airport's property is zoned under the category of industrial development tract, and most of the land outside of the airport property line is also categorized as such. The intent of those lands are slated for agricultural use, along with generic industrial use.

### 2.5.1. Currently Vacant or Underutilized Land

Multiple areas on the Airport's property have been identified as future development areas which are still currently vacant. They could reasonably serve as sites for some form of future development and are not unreasonably restricted. **Figure 2-13** identifies those lands.

## 2.6. Environmental Consideration

Gaining perspective on existing environmental considerations at the Airport during the inventory portion of the planning process enables the preparation of future development options which have the highest possibility for implementation by seeking to minimize negative environmental affects up front, and reviewing environmental considerations as part of the analysis of development alternatives. The following sections will identify different environmental issues present at IMM which have the potential to affect future development. These issues include wind and meteorological data, aircraft noise, surface water management, soils and geology, and floodplain and wetlands areas.

### 2.6.1. Wind and Meteorological Data

The climatic conditions commonly experienced at an airport can play a large role in the layout and usage of the facility. Weather patterns characterized by periods of low visibility and cloud ceilings often lower the capacity of an airfield, and wind direction and velocity dictate runway usage.

#### 2.6.1.1. Ceiling and Visibility

FAA Advisory Circular (AC) 150/5060-5, *Airport Capacity and Delay*, identifies three categories of ceiling and visibility minimums. These categories include VFR, IFR, and Poor Visibility and Ceiling (PVC).

Meteorological data obtained through the National Climatic Data Center (NCDC) consisting of 10 years of hourly wind observations for Page Field Airport (FMY) was used to analyze the ceiling, visibility, and wind conditions at IMM. Although IMM is equipped with an Automated Weather Observation System (AWOS), a 10-year climatic history was unavailable from this piece of equipment as it was installed in 2017. According to a detailed review of the wind information obtained from the RSW AWOS the following conditions can be reasonably expected at IMM:

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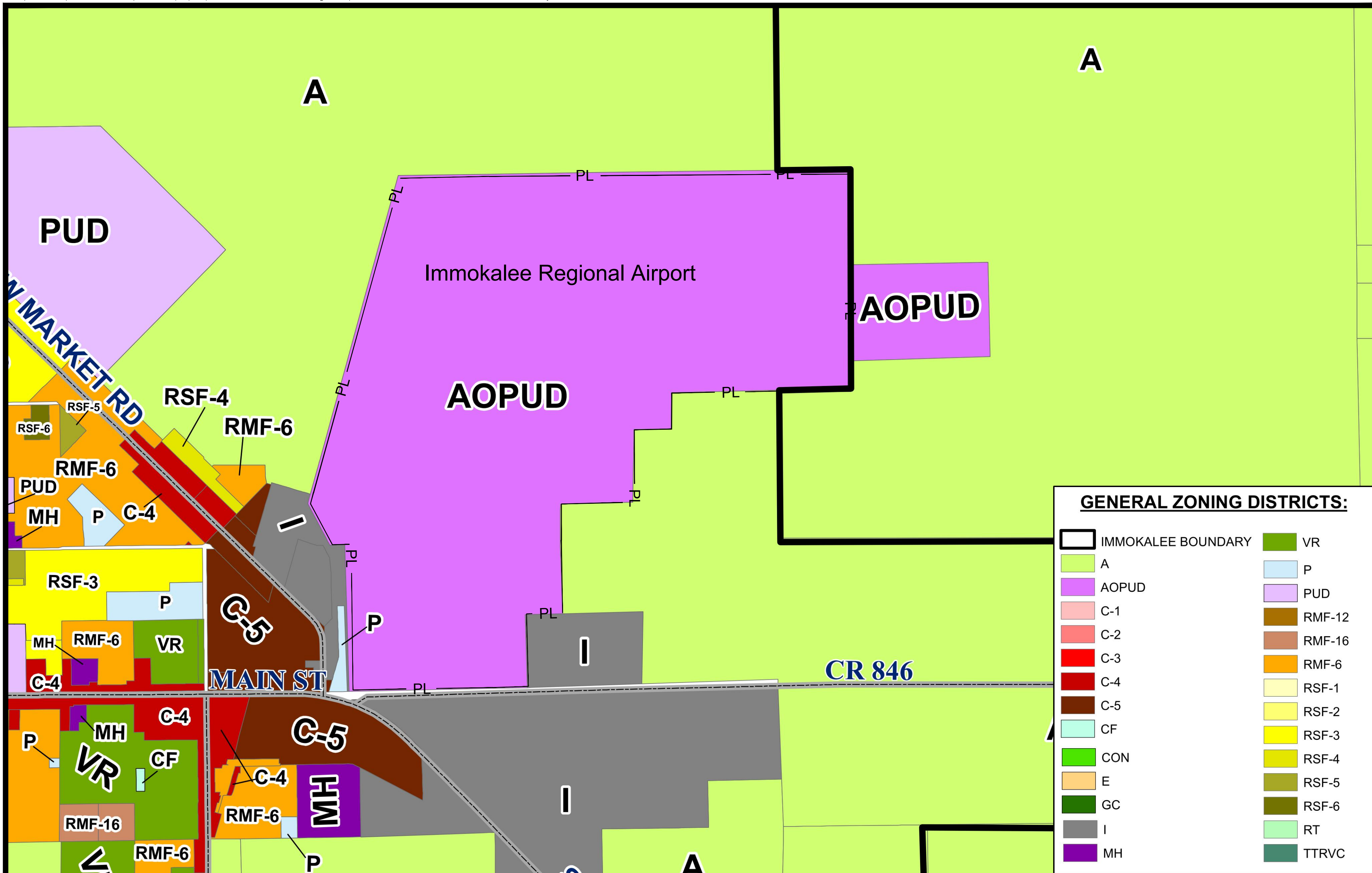
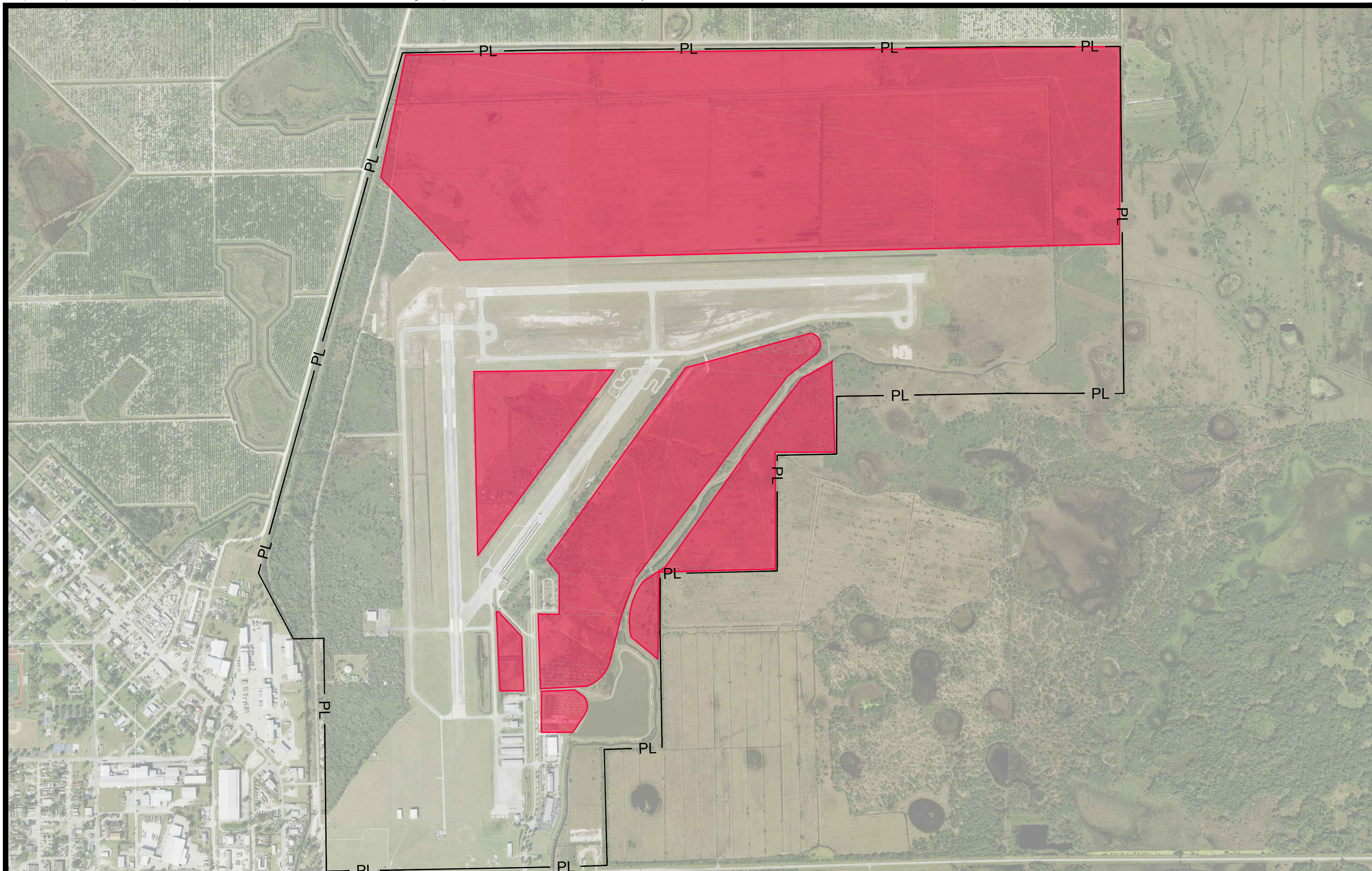



| | | | | |
|---|---|---|---|---|
| ATKINS | Immokalee Regional Airport<br>Airport Layout Plan Update | Airport Zoning | COLLIER COUNTY AIRPORT AUTHORITY | Figure<br>2-12 |

C:\Users\marr4680\Desktop\2-13_Vacant&Underutilized-land.dwg Apr18,2017 - 3:51am Plotted By: marr4680

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Immokalee Regional Airport
Airport Layout Plan Update

Vacant Underutilized Property

COLLIER COUNTY AIRPORT AUTHORITY

Figure 2-13

- VFR conditions, when the ceiling is equal to or greater than 1,000 feet AGL and when visibility is equal to or greater than three (3) statute miles, occur at the Airport approximately 92.03 percent of the time.
- IFR conditions, when the ceiling is less than 1,000 feet AGL and/or when visibility is less than three (3) statute miles, but when ceiling is greater than 200 feet AGL and visibility is greater than 0.5 miles, occur at the Airport approximately 8.05 percent of the time.

#### 2.6.1.2. Wind Coverage

Local wind conditions at an airport play a large role in the runway usage at the field as aircraft operate most efficiently when taking-off and landing into the wind. Runways not oriented to take full advantage of prevailing winds are often not utilized as frequently. Aircraft can operate on a runway when the crosswind component, or wind component perpendicular to the direction of travel, is not excessive. Crosswind components differ slightly depending on the size of aircraft. The appropriate crosswind components for IMM's runways were determined by the type of aircraft typically operating on those runways. **Figure 2-14** depicts the all-weather wind rose when considering 10.5, 13 or 16 knot crosswind components for Runway 9-27 and 18-36.

The FAA indicates that the desired wind coverage for an airport is at least 95 percent, meaning that the maximum crosswind component is not exceeded more than 5 percent of the time. At IMM, each runway maintains higher than 95 percent wind coverage independently based on the crosswinds components associated with each particular runway. When calculated together, nearly 100 percent wind coverage is achieved in both the all-weather, VFR, and IFR weather conditions.

### 2.6.2. Aircraft Noise

Noise is generally the most apparent impact an airport has on the environment. The FAA recommends the average day-night sound level (DNL) in decibel values as the national standard for measuring airport noise. The FAA has determined that a sound level of 65 DNL or less is compatible with most residential land uses. Therefore, noise levels greater than this measurement should be contained within an airport's property limits to the greatest extent possible. In areas around an airport where noise levels exceed 65 DNL, other methods of mitigation such as land acquisition, zoning requirements, and the purchase of easements may be used as possible remedies for incompatible land uses. Currently, IMM does not have an aircraft noise analysis or DNL footprint. This is due to a rural environment and a limited number of non-jet operations occurring daily do not create a significant nuisance to the community.

### 2.6.3. Soils and Geology

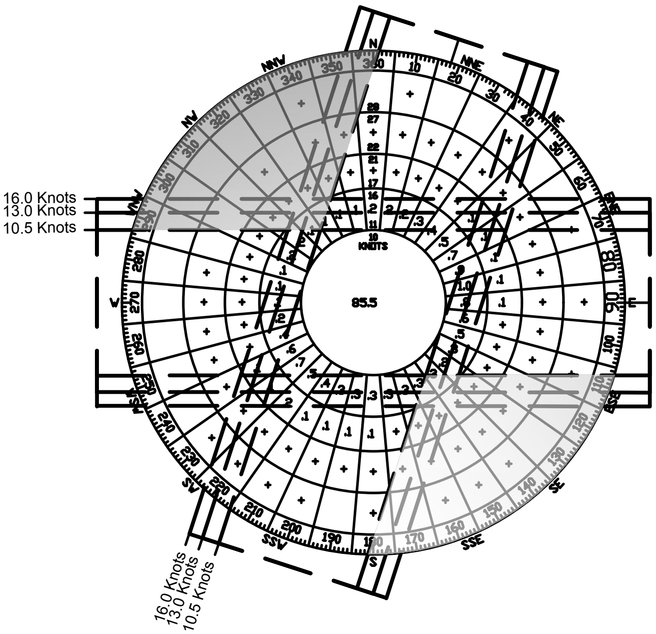
The United States Department of Agriculture (USDA) Collier County Soils Survey (2016), indicates that within the region of IMM there are twelve different soil types. A significant percentage of the areas on and around IMM are made up of types of fine sand, which is extremely typical in southwest Florida soils profile. A map depicting these soil types at IMM is depicted in **Figure 2-15.** Most soils on the Airport's property are comprised of Immokalee Fine Sand with other significant areas being made of up of Myakka Fine Sand, and Holopaw Fine Sand.

### 2.6.4. Floodplains

Floodplains are defined in the U.S. Environmental Protection Agency (EPA) Executive Order (EO) 11988, *Floodplain Management*, 1977. They include lowland areas adjoining inland and coastal waters, especially those areas subject to a one percent of greater change of flooding in any given year. EO 11988 directs Federal agencies to take action to reduce the risk of flood loss, minimize the impact of floods on human safety, health, and welfare, and restore and preserve the natural and beneficial value served by floodplains.

Under the EO, the Federal Emergency Management Agency (FEMA) has produced flood insurance rate maps (FIRMs) for communities participating in the National Flood Insurance Program. Detailed maps illustrate the 100-year and 500-year base flood elevations. **Figure 2-16** indicates that most of the airport area

## ALL WEATHER

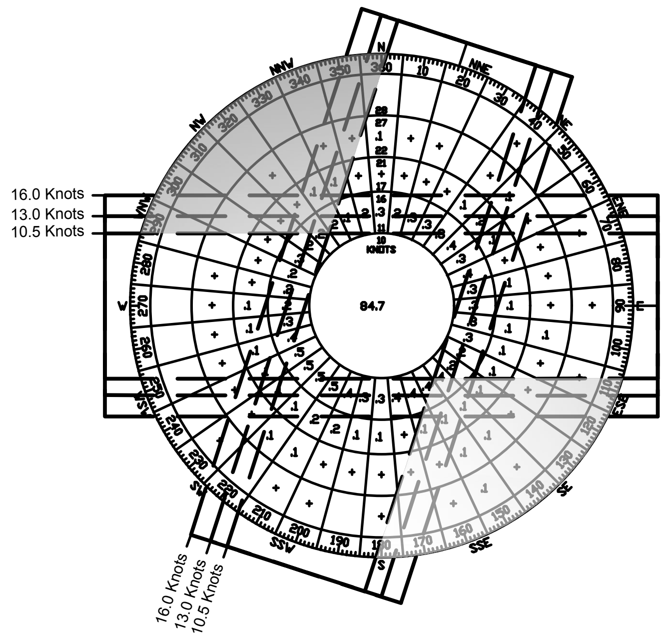



RUNWAY 9-27 & 18-36 WIND COVERAGE

| CROSS WIND COMPONENT | ALL WEATHER COVERAGE |
|---|---|
| 10.5 Knots | 99.24% |
| 13.0 Knots | 99.86% |
| 16.0 Knots | 99.24% |

Station: Southwestern Florida International Airport (722108)
Source: National Climatic Data Center/National Oceanic and Atmospheric Administration

## IFR

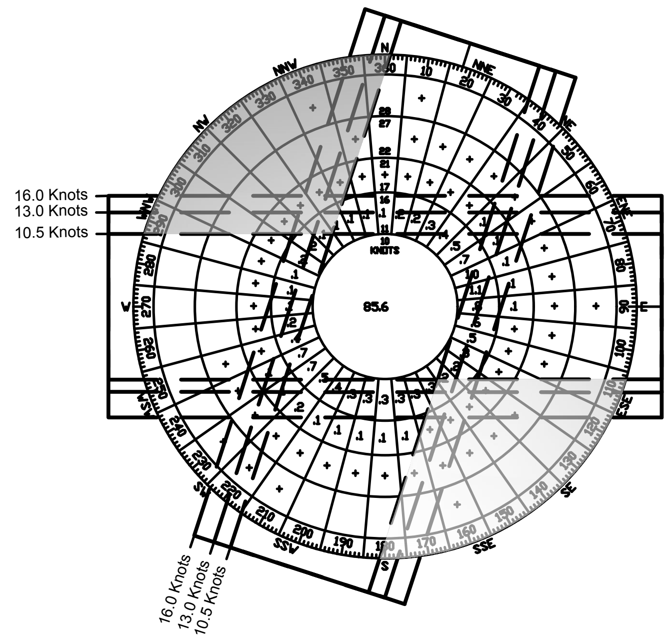



RUNWAY 9-27 & 18-36 WIND COVERAGE

| CROSS WIND COMPONENT | ALL WEATHER COVERAGE |
|---|---|
| 10.5 Knots | 98.14% |
| 13.0 Knots | 99.31% |
| 16.0 Knots | 99.70% |

Station: Southwestern Florida International Airport (722108)
Source: National Climatic Data Center/National Oceanic and Atmospheric Administration

## VFR




RUNWAY 9-27 & 18-36 WIND COVERAGE

| CROSS WIND COMPONENT | ALL WEATHER COVERAGE |
|---|---|
| 10.5 Knots | 99.35% |
| 13.0 Knots | 99.92% |
| 16.0 Knots | 99.99% |

Station: Southwestern Florida International Airport (722108)
Source: National Climatic Data Center/National Oceanic and Atmospheric Administration

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COLLIER COUNTY AIRPORT AUTHORITY

Immokalee Regional Airport
Airport Layout Plan Update

Weather Wind Roses

Figure X-X

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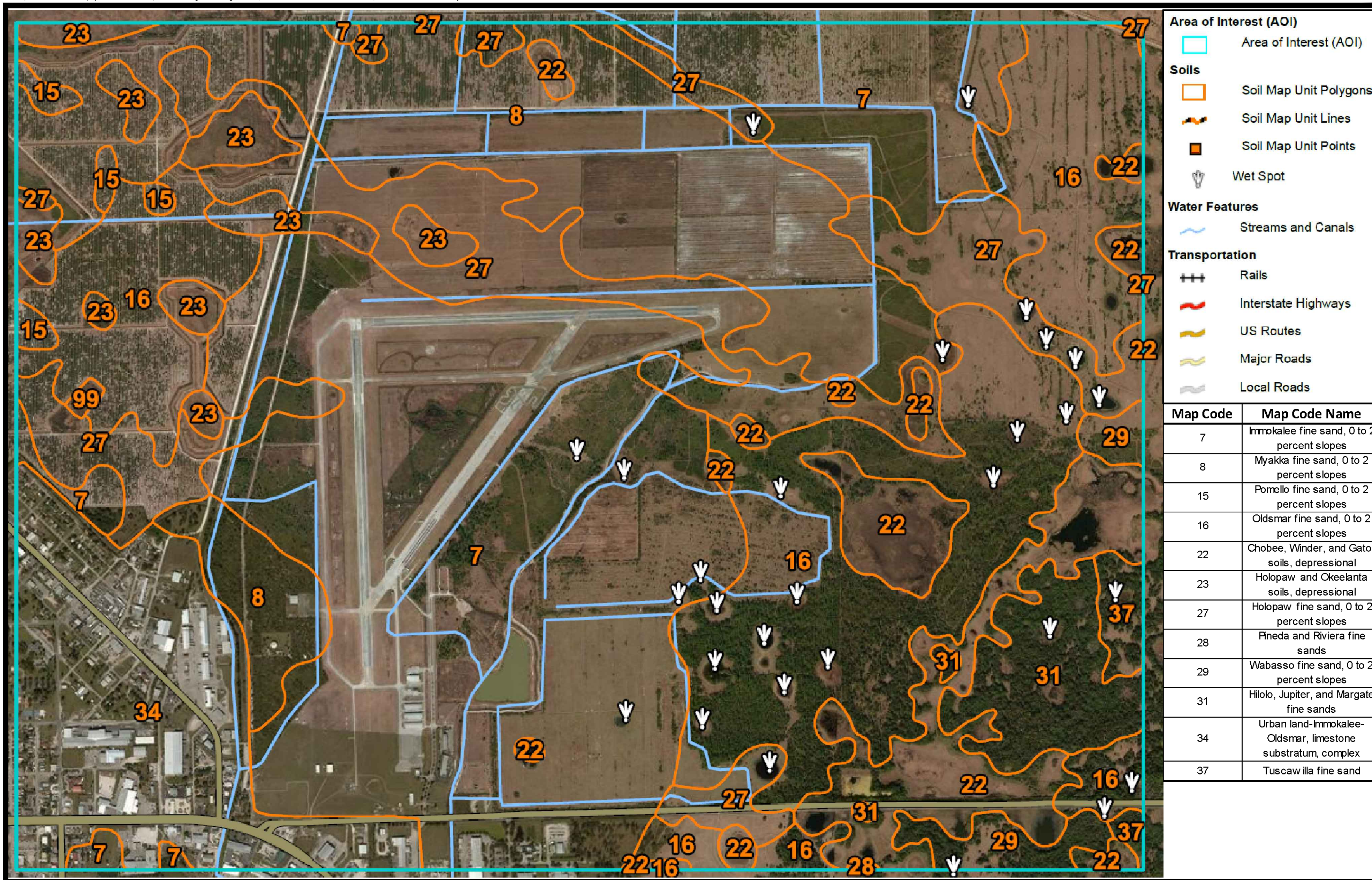


| Map Code | Map Code Name |
|---|---|
| 7 | Immokalee fine sand, 0 to 2 percent slopes |
| 8 | Myakka fine sand, 0 to 2 percent slopes |
| 15 | Pomello fine sand, 0 to 2 percent slopes |
| 16 | Oldsmar fine sand, 0 to 2 percent slopes |
| 22 | Chobee, Winder, and Gator soils, depressional |
| 23 | Holopaw and Okeelanta soils, depressional |
| 27 | Holopaw fine sand, 0 to 2 percent slopes |
| 28 | Pineda and Riviera fine sands |
| 29 | Wabasso fine sand, 0 to 2 percent slopes |
| 31 | Hilolo, Jupiter, and Margate fine sands |
| 34 | Urban land-Immokalee-Oldsmar, limestone substratum, complex |
| 37 | Tuscawilla fine sand |

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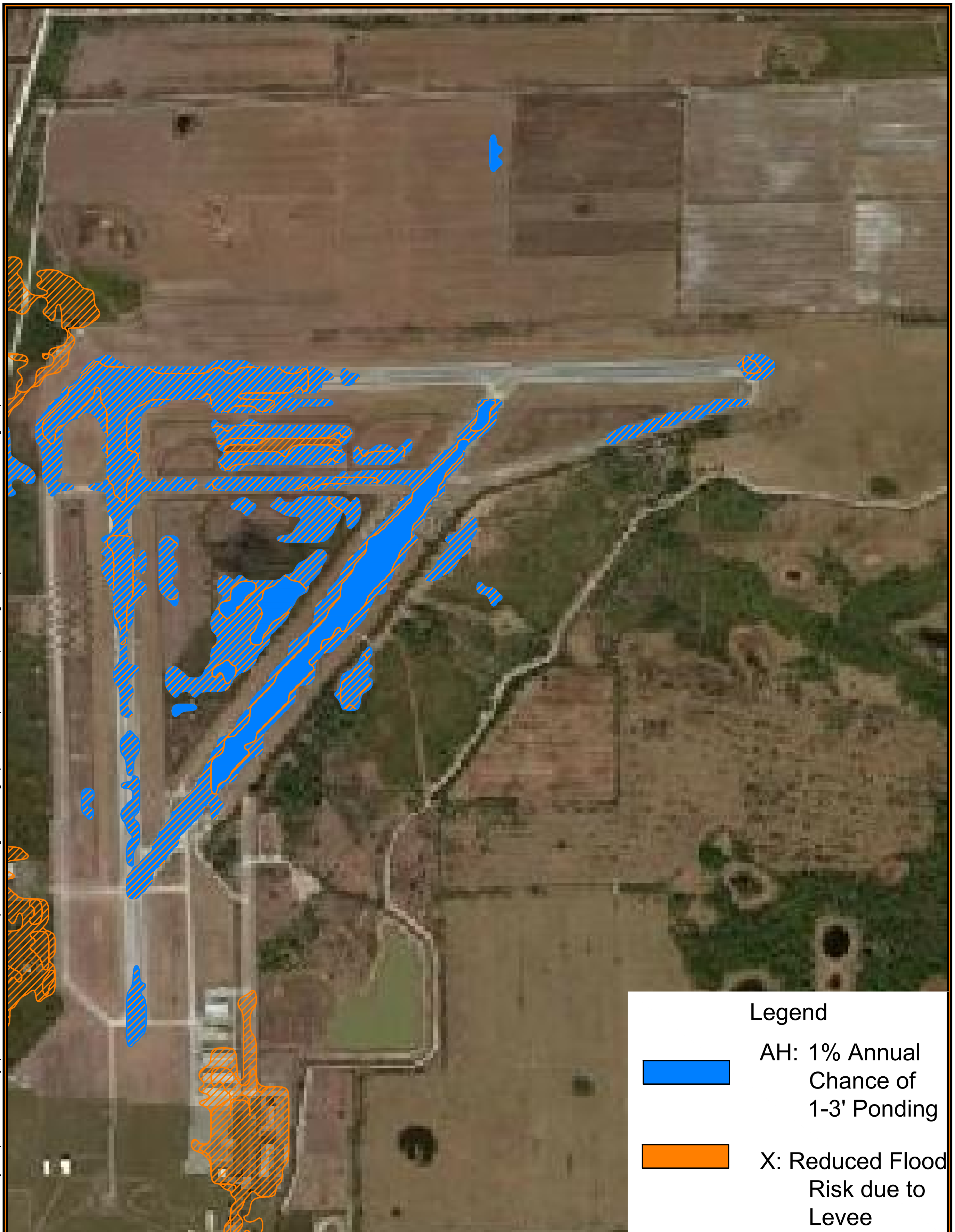
Immokalee Regional Airport
Airport Layout Plan Update

IMM Area □oil□Map

Figure 2-15

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Immokalee Regional Airport
Airport Layout Plan Update

COLLIER COUNTY AIRPORT AUTHORITY

FEMA FIRM Map

Figure. 2-16

is categorized as Zone AE Special Flood Hazard Area (SFHA), which is delineates areas where there is a one percent annual chance of flooding, or those which fall within the 100-year flood plain.

### 2.6.5. Wetlands

Under Executive Order (EO) 11990, *Protection of Wetlands* (1977), Federal agencies are prohibited from undertaking or providing assistance for activities, including new construction, located in wetlands unless no practicable alternatives and measures to minimize harm to wetlands have been implemented.

The U.S. Army Corps of Engineers (CoE) and EPA share responsibility for wetland protection and permitting under the Clean Waters Act of 1972. Both define a wetland as, “those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.” Such areas typically include swamps, marshes, and bogs.

Other agencies with non-regulatory responsibilities to create or protect wetlands include the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and the Soil Conservation Service. Based on the U.S. Fish and Wildlife’s National Wetlands Inventory, depicted in **Figure 2-17,** there are a significant amount of wetlands of varying types on and around the airport property. All wetland areas shown have been verified by US. Army Corps of Engineers and locations and extents of wetlands are approximate. The largest wetland feature at IMM includes the large freshwater forested/shrub wetland (PSS1/3Ad). The total acreage of this wetland is 5.58 acres and is in the center of the airport property (east of Runway 18-36, south of Runway 9-27). Small wetland locations include freshwater emergent wetlands (PEM1Fd), which are located north of Runway 9 approach end and on the Airport’s east side. Both locations are under 5 acres.

## 2.7. Existing Utilities and Infrastructure

The availability and capacity of the utilities serving IMM are important factors to consider when evaluating future development opportunities. The primary concern is the availability of adequate power, water, and sewer sources.

### 2.7.1. Electricity

Power is available from Lee County Electric Cooperative Inc. This organization supplies power for the Airport and surrounding communities.

### 2.7.2. Wastewater

Wastewater management is provided to Immokalee Regional Airport through Immokalee Water and Sewer District. This District operates and maintains the water and sewer plants and systems as an Independent Special District of the State of Florida.

### 2.7.3. Potable Water

Water service is provided to Immokalee Regional Airport through Immokalee Water and Sewer District. A water treatment plant is located on the west portion of IMM property, and is maintained by Immokalee Water and Sewer District. The plant can be accessed through Airport Access Road.

### 2.7.4. Natural Gas

There are currently no natural gas sources available at IMM.

# 3. Forecast of Aviation Demand

## 3.1. Introduction

The ultimate goal of the groups and agencies involved in running and overseeing an airport is to best serve the needs of current and future customers. Critical to meeting this objective is having the appropriate facilities to accommodate travelers' needs. Because of the scale, expense, complexities and safety requirements that factor into any airport's capital improvement projects, those projects need to be planned, and ideally begun, well in advance of when the number of travelers using the airport requires increased capacity. Thus, the importance of developing forecasts of aviation demand. This section will present the existing and projected socio-economic conditions of the area and the forecasts of anticipated unconstrained aviation demand that is expected at Immokalee Regional Airport (IMM) through 2037. Forecasts form the basis for the type, amount and timing of facilities developed for an airport. The forecasts presented in this section will help guide the site evaluation presented in the remaining chapters of this report.

### 3.1.1. Characteristics of Activity

The characteristics and types of aeronautical activity an airport accommodates determines the facilities required. These factors broadly include annual operations and based aircraft information, and more specifically the variation between local and itinerant operations, the mix of aircraft being based at the airfield, and the peaking characteristics of operations – on an annual, monthly, and hourly basis. Each of these characteristics will be quantified by the forecast of demand and further evaluated through the development of facility requirements.

### 3.1.2. Measuring Operational Activity

With no control tower located at IMM, it is difficult to validate historical operational information reported to the Federal Aviation Administration (FAA). Further, since a procedure to count future operations at IMM is not practical, the Collier County Airport Authority (CCAA) should continue to monitor based aircraft and fuel sales to identify changes in demand over time. Furthermore, the potential impact of new tenants at the airfield could affect this forecast and its associated findings. Thus, the activity forecasts should be re-evaluated and updated as conditions change so that airport activity may be accurately reflected.

## 3.2. Data Sources

The projections of aviation demand relied on a wide range of information about IMM, the aviation industry, and the U.S. economy. The primary data sources utilized in the development of this study are described below.

**Woods & Poole Economics, Inc.**

Woods & Poole Economics, Inc. is an independent vendor and nationally recognized firm that provides expert economic and demographic analysis. Historical and forecast data of socio-economic data including population, per capita income, and employment were provided by this resource.

**Federal Aviation Administration**

- Airport Master Record (Form 5010) provides information on based aircraft and fleet mix for the base year (2016).

- The 2017 TAF for IMM, The State of Florida, FAA Southeastern Region, and the U.S. was downloaded from the FAA website. The TAF contains data on a federal fiscal year (12 months ended September 30) for enplanements (air carrier and regional), operations (air carrier, air taxi/commuter, general aviation and military), and based aircraft.

**Flightwise.com**

Flightwise.com maintains a database of all operations which complete a VFR or IFR flight plan. The database includes arrival and departure information such as time, date, and locations, as well as aircraft type and N-number information. Flightwise serves as a valuable resource at non-towered airports to analyze fleet mix and establish a critical aircraft.

**Florida Department of Transportation Airport System Plan**

The most recent and up to date version of the Florida Aviation System Plan (FASP) predicts a forecast from 2011 to 2030. This document provides projected forecasts for most Florida Airports and gives a comprehensive overview of operations forecasts over the planning period.

## 3.2.1. Emerging Trends in U.S. Aviation

Each year, the FAA publishes its national aerospace forecast. Included in this publication are forecasts for air carriers, regional/commuters, general aviation, and air cargo activity. The forecast is prepared to meet budget and planning needs of the FAA and to provide information that can be used by state and local authorities, the aviation industry, and by the general public. The current edition used in this analysis is the *FAA Aerospace Forecast- Fiscal Years 2016-2036.* The FAA forecasts use the economic performance of the United States, as well as trends within the aviation industry, as an indicator of future aviation industry growth. The following subsections identify some notable trends in the U.S. aviation industry which could be reasonably expected to impact the activity of IMM.

### 3.2.1.1. General Aviation Trends

Significant achievements in the advancement of aviation technology have been occurring since the beginning of American aviation history over a century ago. These technological advancements have regularly changed the way in which our aviation system operates, and these types of changes will undoubtedly continue to impact airports of all sizes and uses in the future. In many cases, the general aviation (GA) airports are much more adaptive to technological changes than larger commercial service airports, which can be slower to institutionalize new technologies. Continual monitoring of GA trends will assist the planning of future needs. Current trends in GA with the potential to impact operations at IMM include the general steady growth of the Gross Domestic Product (GDP), which is showing in increased sales of turbine and rotorcraft aircraft. Experimental GA hours have also contributed to a projected increase of 1.2 percent of hours flown in all of GA hours. The emerging market of light-sport-aircraft (LSA) is also projected to grow by 4.5 percent annually, within the 20-year forecast period.

### 3.2.1.2. Airspace and Navigation Trends

Noteworthy airspace and navigational trends revolve almost exclusively around the proposed Next Generation Air Transportation System (NextGen) currently under the implementation stages in some areas, with full operation in others. NextGen represents a comprehensive overhaul of our National Airspace System (NAS) to make air travel more convenient and dependable, while ensuring safety and security of the system. NextGen is largely the result of new technologies introduced into the aviation industry within the last decade. GPS technologies, along with improved radar and communication systems, have created an environment where the historic model for air navigation and pilot/air traffic control communication seem outdated and inefficient. The FAA is using NextGen technologies to build into the capacity of the NAS the ability to guide and track air traffic more precisely and more efficiently allowing for a more proactive approach to preventing accidents, will save aircraft operators money through fuel-savings, will reduce aircraft emissions, and provide for a safer and less congested airspace. ADS-B coverage for the United States was completed in May 2016.

### 3.2.1.3. Developing Trends - UAS

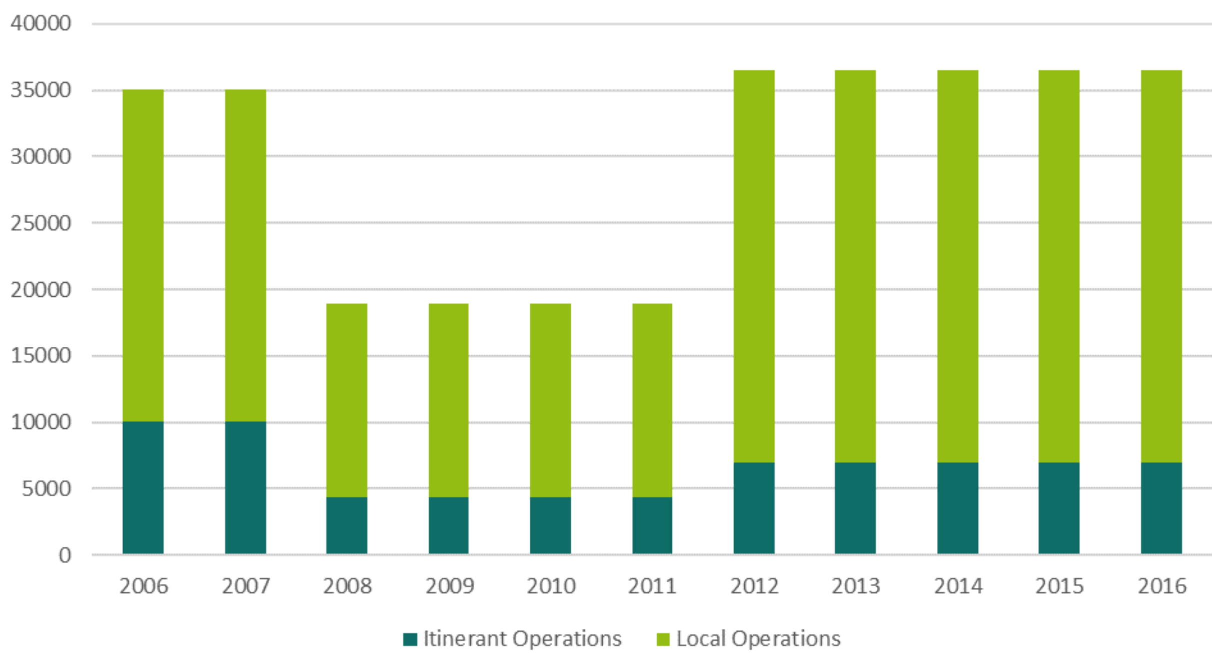
International industry development, growth, and investment over the past several years have allowed Unmanned Aircraft Systems (UAS) to evolve from remotely piloted vehicles with limited capabilities to semi and fully autonomous systems for commercial applications. More focused on Small Unmanned Aircraft Systems (sUAS), the FAA has projected that from a fleet size of 101,300 in 2017 it will increase to a fleet size of 542,500 by 2020. Currently, the FAA has established a UAS Focus Area Pathfinders initiative which will help explore opportunities to ease regulations for UAS operations while keeping a high level of safety in our NAS. The projected fleet size listed previously takes in account the easement of UAS regulations, allowing for the exponential increase of total fleet size.

IMM is well suited for future UAS operations as IMM and it is fair to assume that IMM could be expected to potentially facilitate UAS operations over the planning period. At this time the FAA does not count and forecast for Unmanned Aerial Vehicles (UAV) and UAS as based aircraft and operations at specific airports, primarily due to uncertainties in application, market served and potential for sustained and predictable growth. Until the FAA makes changes to the “based aircraft” designation, UAS vehicles, UAS based and operating at IMM will not impact the based aircraft or airport operations counts and forecasts. Therefore, the forecasts within this report will not consider UAS operations.

## 3.3. Historical Aeronautical Activity and Based Aircraft

This section provides a discussion of IMM’s historical activity levels to begin a context for the forecast of aviation demand at the Airport. It answers the question of who IMM serves and why. The past is not always a good prognosticator for the future; however, an analysis of historical data provides the prospect to comprehend those factors which have historically caused traffic to increase or decrease and how those factors may change in the future, thus influencing the forecast. **Figure 3-1,** *Historical Aircraft Operations at IMM,* and **Figure 3-2,** *Historical Based Aircraft,* depict the historical operational trends at the airport.

**Figure 3-1 Historical Aircraft Operations**

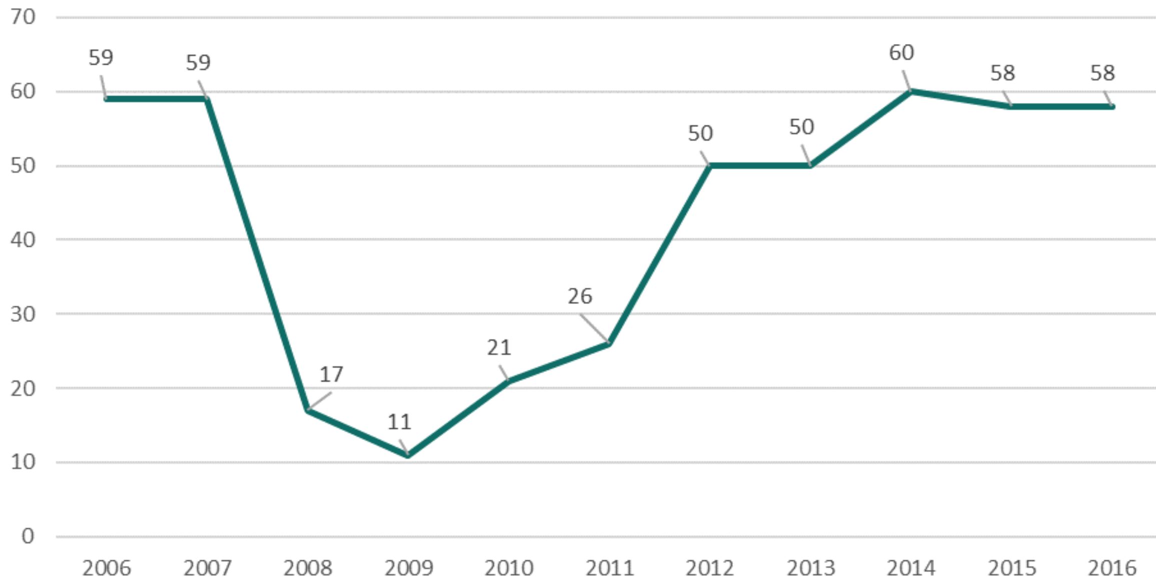



Source: FAA Terminal Area Forecast (TAF), 2017.

Approximately 36,000 operations (arrivals and departures) were recorded at IMM in FY2016. Itinerant taxi operations accounted for 19 percent of total operations, and local GA operations accounted for 81 percent of total annual operations.

The number of based aircraft at IMM have fluctuated significantly over the past 10 years from a low of 11 in 2009 to a high of 60 in 2014.

**Figure 3-2 Historical Based Aircraft**




Source: FAA Terminal Area Forecast (TAF), 2017.

## 3.4. Based Aircraft Projections

Typically, the number of based aircraft is dependent on the local demand for aircraft storage facilities, the amenities provided by an airport, and the capacity of other airports in the vicinity with comparable facilities. A projection of GA aircraft that will be based at IMM is required for the proper planning of future airside requirements such as runway usage, aircraft parking apron, and the number of hangars needed. Based aircraft can also be indicative of the level of operational activity expected at an airport. The forecast of based aircraft was developed using the forecasting techniques as described in the following sections.

### 3.4.1. FAA TAF

The FAA publishes a based aircraft forecast as part of its annual Terminal Area Forecast (TAF) for Immokalee; however, at the present time (February, 2017), the FAA does not have a suitable or realistic forecast for IMM, but rather projects no operational growth at the airfield in the future. That zero growth is inconsistent with both historical airport trends and local, state, and regional aviation trends.

### 3.4.2. Market Share – Based Operations

The market share analysis methodology is a top-down approach to examine the Airport's historical share of the national, state, and regional market. This approach assumes the growth in activity at an airport to be proportionate to the activity of the nation, state, and region. Therefore, as market shares are held constant over the forecast period, the resulting increases in the activity occur based on the growth rates established in the FAA's Aerospace Forecasts and TAF. Once a market share projection is developed, it can then be reflected as an increase or decrease in the share of the national, state, and regional market for the airport. The results of the market share analysis are shown in **Table 3-1**, and described in the following paragraphs.

IMM and the Southern Region: The Airport's historical share of based GA aircraft for the Southern Region has slightly fluctuated during the past 10 years. Applying the FY 2016 ratio (1.2 percent), total based GA aircraft at IMM are projected to reach 69 by FY 2037, an average annual growth rate of 0.8 percent.

IMM and the State of Florida: The Airport's historical share of based GA aircraft for the State of Florida has also fluctuated from a high of 0.5 percent to a low of 0.1 percent during the past 10 years. Applying the FY 2016 ratio (0.5 percent), total based GA aircraft are projected to reach 76 by FY 2037, an average annual growth rate of 1.32 percent.

IMM and the U.S.: The Airport's historical share of based GA aircraft for the entire U.S. has also fluctuated during the last 10 years. Applying the FY 2016 ratio (0.035 percent), total based GA aircraft are projected to reach 69 by FY 2037, an average annual growth rate of 0.8 percent.

The results of the market share analysis are included in **Table 3-1.** The IMM market share of the State of Florida was selected as the preferred GA forecast of based aircraft and is discussed in more detail within the section identified as the preferred based aircraft forecast.

**Table 3-1 IMM Market Share Forecast - Based Aircraft**

| Year | FAA TAF | | | | IMM Market Share | | |
|---|---|---|---|---|---|---|---|
| | Southern Region | State of Florida | U.S. Total | IMM | Southern Region | State of Florida | Share of U.S. |
| **Historical** | | | | | | | |
| 2006 | 36,534 | 13,269 | 197,301 | 59 | 1.18% | 5.05% | 0.06% |
| 2007 | 36,297 | 13,170 | 199,608 | 59 | 1.16% | 5.03% | 0.06% |
| 2008 | 32,482 | 11,238 | 175,579 | 17 | 1.30% | 5.34% | 0.07% |
| 2009 | 32,670 | 10,624 | 177,432 | 11 | 1.29% | 5.29% | 0.07% |
| 2010 | 30,853 | 10,931 | 165,472 | 21 | 1.21% | 5.02% | 0.07% |
| 2011 | 29,277 | 10,832 | 160,374 | 26 | 1.21% | 5.01% | 0.07% |
| 2012 | 30,202 | 11,292 | 163,333 | 50 | 1.36% | 5.48% | 0.08% |
| 2013 | 31,163 | 11,554 | 166,953 | 50 | 1.39% | 5.47% | 0.08% |
| 2014 | 32,190 | 11,838 | 170,375 | 60 | 1.20% | 4.71% | 0.07% |
| 2015 | 30,814 | 11,360 | 163,994 | 58 | 1.15% | 4.60% | 0.07% |
| 2016 | 31,094 | 11,536 | 165,480 | 58 | 1.15% | 4.57% | 0.06% |
| **Forecast** | | | | | **1.15%** | **4.57%** | **0.07%** |
| 2017 | 31,348 | 11,700 | 166,822 | 58 | 58 | 59 | 58 |
| 2018 | 31,606 | 11,853 | 168,247 | 58 | 59 | 60 | 59 |
| 2022 | 32,668 | 12,517 | 173,903 | 58 | 61 | 63 | 61 |
| 2027 | 34,026 | 13,382 | 181,076 | 58 | 63 | 67 | 63 |
| 2032 | 35,388 | 14,264 | 188,280 | 58 | 66 | 72 | 66 |
| 2037 | 36,825 | 15,206 | 195,856 | 58 | 69 | 76 | 69 |
| **Average Annual Growth Rate** | | | | | | | |
| 2006-2016 | -1.60% | -1.39% | -1.74% | -0.17% | | | |
| 2017-2037 | 0.81% | 1.32% | 0.81% | 0.00% | 0.81% | 1.32% | 0.81% |

Source: FAA TAF 2017, Atkins Analysis 2017

### 3.4.3. Preferred Based Aircraft Operations

When selecting the preferred forecast of based aircraft, the previously mentioned forecasting methods were considered. Forecasts were analysed, reviewed, and compared to determine how they compare to the expected growth at the Airport. The selected based aircraft forecast should be the best representation of what is expected to occur at IMM. As mentioned above, the market share analysis produced results of what is likely to occur at IMM during the planning horizon. Specifically, the IMM share of the State of Florida 2016 market share results was taken to project future based aircraft at the Airport. The market share forecast for based aircraft identified growth (1.32 percent) is higher than those projected by the FAA's no growth forecast provided in the TAF (0 percent). However, the State of Florida is a unique environment for GA activity and IMM is expected to grow in step with the state growth in based aircraft.

**Table 3-2 Preferred Based Aircraft Forecast**

| Year | Preferred Forecast | FAA TAF |
|---|---|---|
| 2017 | 59 | 59 |
| 2018 | 60 | 59 |
| 2022 | 63 | 59 |
| 2027 | 67 | 59 |
| 2032 | 72 | 59 |
| 2037 | 76 | 59 |
| **AAGR 2017-2032** | **1.32%** | **0.00%** |

Source: FAA TAF 2017, Atkins Analysis 2017

### 3.4.4. Based Aircraft by Type

The forecast of based aircraft presented in **Table 3-3** was used to predict the types of based aircraft (the fleet mix) that can be reasonably anticipated at IMM. The current fleet mix (2011) was identified by aircraft class: single-engine piston, multi-engine piston, jet aircraft, and rotorcraft. This information was sourced from the Airport's master record (FAA form 5010). The future fleet mix was projected by applying the 2011 fleet mix. As shown in **Table 3-3**, *Based Aircraft by Type Forecast*, the share of each of the aircraft types at IMM is anticipated to remain constant throughout the forecast period.

**Table 3-3 Based Aircraft by Type Forecast**

| Year | Single Engine Piston | % of Total | Multi-Engine Piston | % of Total | Jet | % of Total | Helicopter | % of Total | Total |
|---|---|---|---|---|---|---|---|---|---|
| 2016 | 40 | 68.97% | 4 | 6.90% | 4 | 6.90% | 4 | 6.90% | 58 |
| **Forecast** | | | | | | | | | |
| 2017 | 41 | 68.97% | 4 | 6.90% | 4 | 6.90% | 4 | 6.90% | 59 |
| 2022 | 43 | 68.97% | 4 | 6.90% | 4 | 6.90% | 4 | 6.90% | 63 |
| 2027 | 46 | 68.97% | 5 | 6.90% | 5 | 6.90% | 5 | 6.90% | 67 |
| 2032 | 49 | 68.97% | 5 | 6.90% | 5 | 6.90% | 5 | 6.90% | 72 |
| 2037 | 53 | 68.97% | 5 | 6.90% | 5 | 6.90% | 5 | 6.90% | 76 |

*Source: Atkins, 2017.*

## 3.5. Aviation Activity Projections

Forecasts for aviation operations and activity for IMM will serve as the basis for airport facility planning over a 20-year planning horizon and beyond. Although the prepared forecasts cover an extended timeframe, aviation, social, and economic trends identified and considered to affect aviation demand at IMM can only be reasonably projected for the first five years. It is difficult to predict with a great deal of certainty the year-to-year trend changes in a dynamic aviation industry while forecasting activity 20 years into the future. Unexpected events in any of these trends, which cannot be factored into the assumptions of the forecast, can cause dramatic changes across the twenty-year period. Therefore, aviation activity forecasts must continually be evaluated and updated on a regular basis, approximately every five years.

## 3.5.1. Methodologies

The most reliable approach to estimating future aviation demand is to use one or more analytical techniques. Various methods of forecasting aviation demand exist and are widely used throughout the industry including, trend line analysis, regression analysis, and market share analysis. National and local trends and influences were also considered in projecting aircraft activity for the Airport and are reflected in the prepared forecasts. These methods have been applied to develop the most accurate forecast possible for IMM and are further described in more.

### 3.5.1.1. Operations per Based Aircraft Analysis

Forecasts of total GA operations were prepared using a ratio of local GA aircraft operations per based aircraft (OPBA) from historical data. The OPBA is then applied to forecasts of based aircraft to develop estimates of future local annual operations. Then the local versus itinerant split percentage is applied to calculate itinerant and total operations. This methodology is a common forecast technique because it directly links the based aircraft to their average level of annual utilization at the Airport. This number is particularly useful in facility planning and is an important indicator in the aviation forecasting process.

As shown in **Table 3-4,** the historical GA OPBA has fluctuated since FY 2006 from a high of 1,725 in FY 2009 to a low of 595 in FY 2006. For the purposes of projecting future aircraft operations at IMM, it was assumed that the 5-year average OPBA value (from 2012 to 2016) of 665 would be used to forecast future operations. Applying this average OPBA, total annual GA operations reach 50,570 by FY 2037. Although the OPBA approach is a common forecast technique and a typical indicator of future GA operations, it was not the preferred method for this forecast due to the major fluctuations in the historical OPBA values.

**Table 3-4 Operations Per Based Aircaft Forecast**

<table>
<tr><th rowspan="2"></th><th rowspan="2">Total Based Aircraft</th><th rowspan="2">Total GA Operations (TAF)</th><th colspan="3">Operations Per Based Aircraft</th></tr>
<tr><th>Historical</th><th>10 Year Average</th><th>5 Year Average</th></tr>
<tr><td colspan="6">Historical</td></tr>
<tr><td>2006</td><td>59</td><td>35,096</td><td>595</td><td rowspan="11">817</td><td rowspan="6"></td></tr>
<tr><td>2007</td><td>59</td><td>35,096</td><td>595</td></tr>
<tr><td>2008</td><td>17</td><td>18,980</td><td>1,116</td></tr>
<tr><td>2009</td><td>11</td><td>18,980</td><td>1,725</td></tr>
<tr><td>2010</td><td>21</td><td>18,980</td><td>904</td></tr>
<tr><td>2011</td><td>26</td><td>18,980</td><td>730</td></tr>
<tr><td>2012</td><td>50</td><td>36,500</td><td>730</td><td rowspan="5">665</td></tr>
<tr><td>2013</td><td>50</td><td>36,500</td><td>730</td></tr>
<tr><td>2014</td><td>60</td><td>36,500</td><td>608</td></tr>
<tr><td>2015</td><td>58</td><td>36,500</td><td>629</td></tr>
<tr><td>2016</td><td>58</td><td>36,500</td><td>629</td></tr>
<tr><td colspan="6">Forecast</td></tr>
<tr><td>2017</td><td>59</td><td rowspan="6">-</td><td rowspan="6">-</td><td>48,088</td><td>39,141</td></tr>
<tr><td>2018</td><td>60</td><td>49,049</td><td>39,923</td></tr>
<tr><td>2022</td><td>60</td><td>51,502</td><td>41,920</td></tr>
<tr><td>2027</td><td>61</td><td>54,772</td><td>44,581</td></tr>
<tr><td>2032</td><td>62</td><td>58,859</td><td>47,908</td></tr>
<tr><td>2037</td><td>63</td><td>62,129</td><td>50,570</td></tr>
<tr><td colspan="6">Average Annual Growth Rates</td></tr>
<tr><td>2006-2016</td><td>-0.17%</td><td>0.39%</td><td rowspan="2">-</td><td>-</td><td>-</td></tr>
<tr><td>2017-2037</td><td>1.00%</td><td>-</td><td>2.6%</td><td>1.6%</td></tr>
</table>

Source: FAA TAF 2017, Atkins Analysis 2017

#### 3.5.1.2. Federal Aviation Administration Terminal Area Forecast

The FAA publishes an annual Terminal Area Forecast (TAF) for each airport listed in the National Plan of Integrated Airport Systems (NPIAS); however, at the present time (February, 2017), the FAA does not have a suitable or realistic forecast for IMM, but rather projects no operational growth at the airfield. That zero growth outlook is inconsistent with both historical airport trends and local, state, and regional aviation trends. Therefore, the FAA TAF for IMM is not considered to be a reliable forecast method.

#### 3.5.1.3. FDOT Aviation System Plan Forecast

The most recent and up to date version of the Florida Aviation System Plan (FASP) projects a forecast from 2011 to 2030. That document provides projected forecasts for most Florida Airports and gives a comprehensive overview of operations forecasts over the planning period. As this was applied to IMM's forecasting effort, it was found that within the FASP a 1.5% average annual growth rate (AAGR) was identified by the FDOT for operational growth over the next 20 years. Applying that AAGR of 1.5% to the base year 2016 operations results in an operational growth to 49,895 operations by 2037. That forecast is outlined in **Table 3-5.**

**Table 3-5 FDOT System Plan Forecast**

| Forecast Year | Operations |
|---|---|
| **FDOT Forecast** | |
| 2018 | 18,980 |
| 2028 | 20,027 |
| **AAGR** | **1.5%** |
| **Modified FDOT Forecast** | |
| 2017 | 37,047 |
| 2018 | 37,603 |
| 2022 | 39,910 |
| 2027 | 42,994 |
| 2032 | 46,316 |
| 2037 | 49,895 |
| **AAGR** | **1.5%** |

Source: FDOT Airport System Plan, 2010 & Atkins Analysis 2017

#### 3.5.1.4. Operational Trend Line Analysis

Trend line analysis examines historical growth trends in activity and applies these identified trends to current demand levels to produce projections of future activity. Trend line analysis assumes that activity, and the factors that have historically affected activity, will continue to influence demand levels at similar rates over an extended time period. Linear trend projections are typically used to provide baseline forecasts that reflect stable market conditions.

Based on a review of historical aeronautical activity at IMM, an AAGR of 0.4 percent was determined for the 10-year historical timeframe between 2006 and 2016. An AAGR of 14 percent was determined for a 5-year period between the years 2011 and 2016. Due to recent large fluctuations in operations and based aircraft, the operational trend line analysis was not considered the preferred forecast as the 5 and 10 year trends varied significantly.

#### 3.5.1.5. Regression Analysis

The market data which was acquired through Woods & Poole Economics Inc. for the State of Florida was utilized for a regression analysis for both operations and based aircraft at IMM. A regression analysis allows for the examination of variables to possibly identify any relationship between the two. After retrieving population, employment, and per capita income (PCI) of the determined airport service area, a regression analysis of each data set was conducted. This analysis regressed individual elements of population, employment, earnings, and per capita income from historical data compared to the number of airport operations to determine if a positive relationship existed that could serve as the basis for a forecast. The three socioeconomic variables of population, employment, and per capita income produced $R^2$ values of 0.19, 0.31, 0.21, respectively. Overall, the regression methodology resulted in low correlation coefficients across all the categories. Given that GA operations have fluctuated since 2006, as regression variables (population, employment, etc.) have steadily increased these factors are not a valid tool for predicting future GA operations at IMM.

It was determined that any possible relationship between the three data sets from the market data and historical aircraft operations and based aircraft amounts are not reliable enough to utilize in this study.

### 3.5.1.6. Market Share Analysis

The results of the market share analysis are shown in **Table 3-6**, and described in the following paragraphs.

**Table 3-6 Market Share Analysis - Operations**

| Year | FAA TAF | | | | IMM Market Share | | |
|---|---|---|---|---|---|---|---|
| | Southern Region | State of Florida | U.S. Total | IMM | Southern Region | State of Florida | Share of U.S. |
| **Historical** | | | | | | | |
| 2006 | 17,229,047 | 6,754,183 | 80,148,503 | 35,096 | 0.20% | 0.52% | 0.04% |
| 2007 | 17,366,661 | 6,885,700 | 80,185,281 | 35,096 | 0.20% | 0.51% | 0.04% |
| 2008 | 17,112,143 | 6,717,194 | 78,020,289 | 18,980 | 0.11% | 0.28% | 0.02% |
| 2009 | 16,013,813 | 6,309,482 | 73,598,797 | 18,980 | 0.12% | 0.30% | 0.03% |
| 2010 | 15,439,990 | 5,799,356 | 71,230,624 | 18,980 | 0.12% | 0.33% | 0.03% |
| 2011 | 15,528,304 | 5,859,864 | 69,900,768 | 18,980 | 0.12% | 0.32% | 0.03% |
| 2012 | 15,514,588 | 5,948,404 | 69,577,152 | 36,500 | 0.24% | 0.61% | 0.05% |
| 2013 | 15,605,360 | 6,109,491 | 68,808,247 | 36,500 | 0.23% | 0.60% | 0.05% |
| 2014 | 15,533,256 | 6,085,670 | 68,183,393 | 36,500 | 0.23% | 0.60% | 0.05% |
| 2015 | 15,625,588 | 6,135,264 | 68,334,308 | 36,500 | 0.23% | 0.59% | 0.05% |
| 2016 | 15,660,151 | 6,109,590 | 68,365,883 | 36,500 | 0.23% | 0.60% | 0.05% |
| **Forecast** | | | | | | | |
| 2017 | 15,744,090 | 6,180,506 | 68,583,877 | 36,500 | 36,696 | 36,924 | 36,616 |
| 2018 | 15,787,856 | 6,217,632 | 68,817,281 | 36,500 | 36,798 | 37,145 | 36,741 |
| 2022 | 15,832,235 | 6,255,315 | 69,054,567 | 36,500 | 37,220 | 38,067 | 37,258 |
| 2027 | 15,877,251 | 6,293,578 | 69,295,434 | 36,500 | 37,784 | 39,300 | 37,946 |
| 2032 | 15,922,890 | 6,332,408 | 69,538,767 | 36,500 | 38,389 | 40,633 | 38,688 |
| 2037 | 15,969,195 | 6,371,846 | 69,785,784 | 36,500 | 39,042 | 42,076 | 39,492 |
| **Average Annual Growth Rate** | | | | | | | |
| 2006-2016 | -1.0% | -1.0% | -1.6% | 0.4% | | - | |
| 2017-2037 | 0.3% | 0.7% | 0.4% | 0.0% | 0.3% | 0.7% | 0.4% |

Source: FAA TAF, Atkins Analysis 2017

**IMM and the Southern Region:** The Airport's historical share of operations by GA aircraft for the Southern Region has fluctuated over the previous 10 years from a low of 0.1 percent in FY 2008 to a high of 0.23 percent in FY 2016. Utilizing the 2016 percentage share of 0.23 percent, total GA operations at IMM are projected to reach 39,042 by FY 2037, reflecting an AAGR of 0.3 percent.

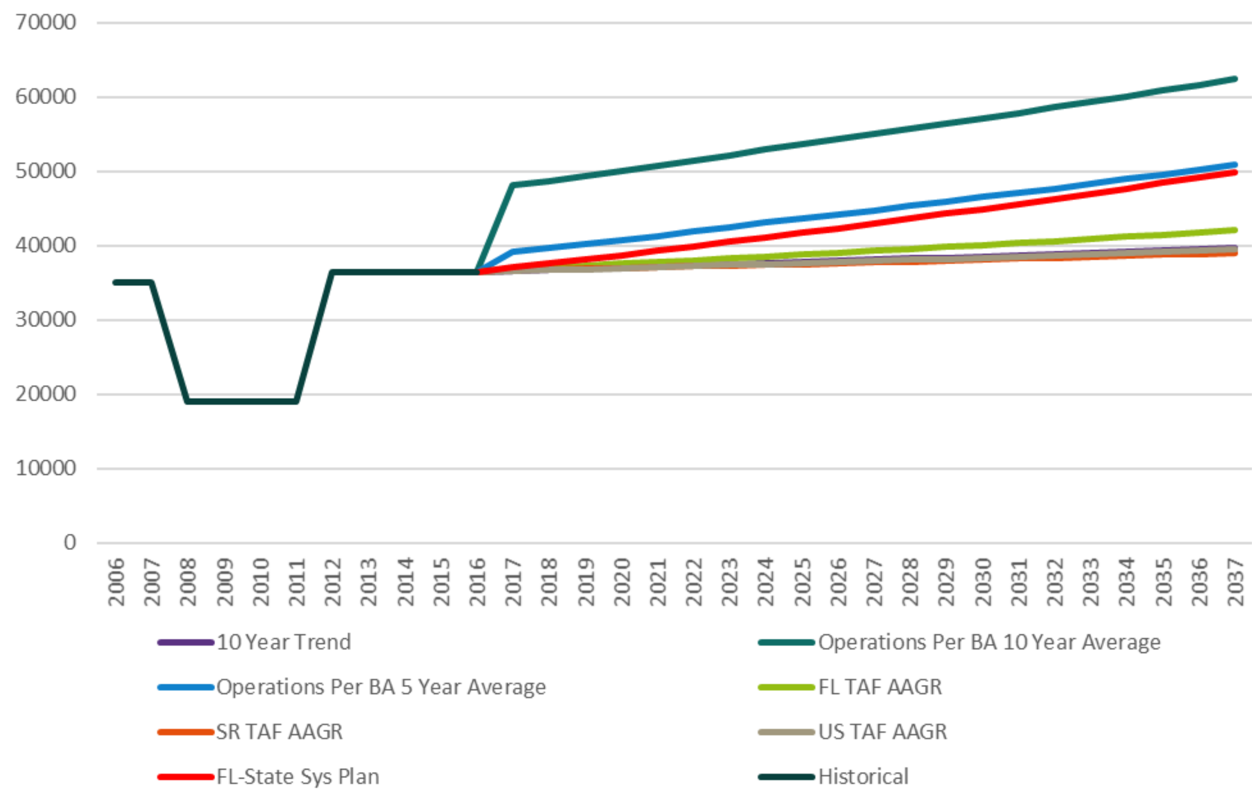
**IMM and the State of Florida:** The Airport's historical share of operations by GA aircraft for the State of Florida grew from 0.28 percent in FY 2008 to 0.61 percent in FY 2012. Utilizing the FY2016 percentage share of 0.6 percent, total GA operations at IMM are projected to reach 42,076 by FY 2037, reflecting an AAGR of 0.7 percent.

**IMM and the U.S.:** The Airport's historical share of operations by GA aircraft for the entire nation grew from 0.026 percent in FY 2008 to 0.053 percent in FY 2016. Utilizing the FY 2016 percentage share, total GA operations at IMM are projected to reach 39,492 by 2037, reflecting an AAGR of 0.4 percent.

## 3.5.2. Selected Methodology and Preferred Aeronautical Forecast

The selected forecast is based on the Florida Airport System Plan forecasts which were supported by the projected income and population growth of the Airport Service Area. Specifically, the preferred forecast presented below in **Figure 3-3**, *Preferred Forecast Methodology*, depicts all the methodologies used in the operations forecast analysis. The "FL- State Sys Plan" being represented as the preferred forecast for aircraft operations. This approach considers current trends within the surrounding community and the potential for growth from growing populations and income in the region. **Table 3-7** compares the preferred forecast with the FAA's 2016 TAF for IMM.

**Figure 3-3 Preferred Forecast Methodology**




Source: Atkins Analysis, 2017

**Table 3-7 Preferrd Operations Forecast vs. FAA TAF**

| Forecast | Year | ALP Update | 2011 FAA TAF | % Difference from TAF |
|---|---|---|---|---|
| Base Forecast Year | 2017 | 37,047 | 36,500 | 1.50% |
| Base Year + 5 Years | 2022 | 39,910 | 36,500 | 9.34% |
| Base Year + 10 Years | 2027 | 42,994 | 36,500 | 17.79% |
| Base Year + 15 Years | 2032 | 46,316 | 36,500 | 26.89% |

Source: Atkins Analysis, FAA TAF, 2017.

### 3.5.3. Aeronautical Forecast by Type

Applying the forecasted growth profile to the existing distribution of users at IMM allows an understanding of how each type of airport user will need to be accommodated in the future. In the case of IMM, there was one recorded instance in 1992 where two Air Taxi and Commuter operations were marked for the airport. All other recordings were GA operations; therefore, all projections will be considered as GA operations within the aeronautical forecast by type. The 10-year average for distribution of operational types at IMM is as follows:

- Itinerant GA 22.3%
- Local GA 77.7%

**Table 3-8** applies each type of user to the preferred forecast for IMM, keeping the distribution of users constant throughout the planning period.

**Table 3-8 Preferred Forecast by Operation Type**

| Year | Itinerant | | Local | | Total Operations |
|---|---|---|---|---|---|
| | Operations | Share | Operations | Share | |
| **Historical** | | | | | |
| 2006 | 10,045 | 29% | 25,051 | 71% | 35,096 |
| 2007 | 10,045 | 29% | 25,051 | 71% | 35,096 |
| 2008 | 4,380 | 23% | 14,600 | 77% | 18,980 |
| 2009 | 4,380 | 23% | 14,600 | 77% | 18,980 |
| 2010 | 4,380 | 23% | 14,600 | 77% | 18,980 |
| 2011 | 4,380 | 23% | 14,600 | 77% | 18,980 |
| 2012 | 7,000 | 19% | 29,500 | 81% | 36,500 |
| 2013 | 7,000 | 19% | 29,500 | 81% | 36,500 |
| 2014 | 7,000 | 19% | 29,500 | 81% | 36,500 |
| 2015 | 7,000 | 19% | 29,500 | 81% | 36,500 |
| 2016 | 7,000 | 19% | 29,500 | 81% | 36,500 |
| **10-Year Average** | 6,601 | 22% | 23,273 | 78% | 29,874 |
| **Forecast** | | | | | |
| 2017 | 8,266 | 22% | 28,781 | 78% | 37,047 |
| 2022 | 8,905 | 22% | 31,005 | 78% | 39,910 |
| 2027 | 9,593 | 22% | 33,401 | 78% | 42,994 |
| 2032 | 10,335 | 22% | 35,982 | 78% | 46,316 |
| 2037 | 11,133 | 22% | 38,762 | 78% | 49,895 |

Source: Atkins Analysis, FAA TAF, 2017.

### 3.5.4. Fleet Mix

FAA Order 5090.3B, *Field Formulation of the National Plan of Integrated Airport Systems (NPIAS)*, defines "substantial use" as 500 or more annual aircraft operations or scheduled commercial service (an operation is classified as either an arrival or departure). The critical aircraft is typically defined as that of making substantial use of the airport. Without an ATCT at IMM, it is difficult to obtain the fleet mix information as reporting is minimal by the FAA. The only data available for the current fleet mix and based aircraft was identified by analyzing raw flight data from Flightwise.com from 3/24/2012 – 3/24/2017. It is important to note that Flightwise only captures flights that had filed flight plans prior to departing, therefore a significant number of VFR operations go unrecorded in the Flightwise system. Despite existing operations being 36,500 only 2,486 operations were captured in the Flightwise system within the queried observation period. For this reason, Flightwise information is best used as a data sample of operations at IMM in which to infer overall fleet mix.

Within the IMM Flightwise data sample, there were no aircraft that meet the NPIAS substantial use threshold. However, utilizing a family grouping of aircraft employing ADG and AAC to group Flightwise operations, paired with a representative aircraft of that group, an overall fleet mix can be generated for IMM. **Table 3-9** represents the Fleet Mix findings for IMM for FY 2016

**Table 3-9 Fleet Mix Analysis**

| ADG | AAC | Representative Aircraft | Recorded Operations (Flightwise) | % of Total Recorded Operations | % Applied to FY 2016 Operations |
|---|---|---|---|---|---|
| A | I | Cessna 172 | 1,954 | 78.6% | 28,689 |
| B | I | Cessna 182 | 230 | 9.3% | 3,377 |
| B | II | Citation X | 272 | 10.9% | 3,994 |
| B | III | Falcon F7X | 6 | 0.2% | 88 |
| C | I | Learjet 45 | 2 | 0.1% | 29 |
| C | II | Cessna Citation Sovereign | 22 | 0.9% | 323 |
| | | **Total** | **2486** | **100%** | **36,500** |

Source: Flightwise Data 2012-2017, Atkins Analysis 2017

## 3.6. Peaking Characteristics

Many of the facility planning requirements calculations that will be presented in subsequent chapters are based on accommodating peak periods of activity. Peaking characteristics are usually defined as peak month, average day, and peak hour activity. A peak month has been established by utilizing fueling data received from the CCAA. The fueling data received covered a period between 2003 and 2016, with a breakdown of gallons sold per month within the year.

The FAA defines the theoretical "peak-hour operations" as the total number of aircraft operations expected to occur at an airport, averaged for two adjacent peak hours of typical peak time. Peaking characteristics are determined from peak monthly activity, average daily activity within the peak month, and then estimating the peak hourly activity from the average day peak month (ADPM) calculation.

The first step in this analysis is to identify IMM's peak month. Based on a review of available airport fueling data, April was revealed as the peak month, accounting for 13 percent of the annual fuel sales. That percentage was applied to determine future peak month total operations at IMM. As shown in **Table 3-10**, approximately 4,745 operations occurred during IMM's peak month in 2016. By 2037 the peak month operations are expected to total approximately 6,486.

**Table 3-10 Peaking Characteristics**

| Year | Total Operations | Peak Month Operations | Average Day Operations | Peak Hour Operations |
|---|---|---|---|---|
| 2016 | 36,500 | 4,745 | 158 | 16 |
| **Forecast** | | | | |
| 2017 | 37,047 | 4,816 | 161 | 16 |
| 2022 | 39,910 | 5,188 | 173 | 17 |
| 2027 | 42,994 | 5,589 | 186 | 19 |
| 2032 | 46,316 | 6,021 | 201 | 20 |
| 2037 | 49,895 | 6,486 | 216 | 22 |

*Source: Atkins, 2017.*

The peak month operations are divided by the average number of days in a month to calculate an airport's ADPM level of operations, which in this case in 30 days. Therefore, IMM's average daily operations were approximately 158 in 2016 and expected to increase to 216 by 2037.

The Peak Hour is the busiest hour during the average day of the peak month. Typically, between 10 and 20 percent of the daily activity occurs during the peak hours at GA airports. This analysis utilized 10 percent of the ADPM for the peak hour calculations. As shown in **Table 3-8**, the peak hour operations in 2016 were 16 and are expected to increase to 22 by 2037.

It is important to remember that these calculations are for planning purposes only and represent totals used in FAA approved planning procedures. It is acceptable and probably likely that the peak hour, day and month calculations do not exactly match up to actual conditions.

## 3.7. Summary

Each annual aircraft growth rate was selected while keeping in mind many aspects which apply directly to the Airport and its operations forecast. Since the population for Collier County and the surrounding counties is anticipated to grow significantly within the forecast period, there can be a conclusion drawn from this that the demand for aviation services will increase, including GA operations and based aircraft amounts across the Airport Service Area. To supplement this growth in population to the airport service area, the predicted per capita income shows large growth potential within the forecast period. It is also important to note that with that expected growth in local GA, surrounding airport facilities that cater to GA traffic are starting to reach capacity. As this occurs, it can be reasoned that such traffic will flow over to IMM as a suitable alternative.

The major composition of aircraft that operate at IMM include aircraft from ADG/AAC A I, to B II. A conclusion can be drawn from this forecast chapter that the critical aircraft at IMM will remain as the present set Citation X. It was predicted that ADG/AAC B II will conduct close to 4,000 annual operations in the years to come.

# 4. Design Criteria and Facility Requirements

## 4.1. Introduction

This chapter presents design criteria that will be used for airport-specific facility planning, as well as the basis of the demand/capacity and facility requirements analysis for the Airport. All design standards presented in this section have been established by the Federal Aviation Administration (FAA) for developing airport facilities to meet existing and forecast levels of activity.

This chapter compares the projected aviation demand to the existing capacity of the facilities at Immokalee Regional Airport (IMM). This comparison is then used to determine future facility requirements over the 20-year planning period. The facility improvements are directly related to the forecasted aviation activity, and will allow the Airport and surrounding community to be adequately prepared to accommodate the potential demand over the 20-year planning period. This chapter examines how anticipated activity levels translate into the Airport's ability to serve forecasted traffic, focusing on the following distinct elements:

- Demand and Capacity Calculations
- Airside Facility Requirements
- Landside Facility Requirements
- Support Facility Requirements.

Any shortcomings in the ability to serve the forecast demand are identified, and recommendations are made regarding physical improvements that may be needed to mitigate recognized deficiencies.

## 4.2. Demand and Capacity

### 4.2.1. Airspace Capacity

Airspace capacity at an airport is of concern when the flight paths of traffic at nearby airports or local navigational aids (NAVAIDs) interacts to adversely impact operations at the airport of study. Another concern is the need to alter flight paths to avoid obstructions during aircraft approaches.

While numerous public and private general aviation (GA) airports were identified within 30 nautical miles of IMM, only one private airport and no public airports were located within 5 nautical miles. The largest airport in IMM's vicinity lies 20 nautical miles north west (RSW; Southwest Florida International). Along with this, there are currently no present military operations in the area, which can negatively impact capacity due to special use airspace. In conclusion, the airspace surrounding IMM is not congested with commercial, military, and/or special use airspace. GA airports in the region are far enough from IMM to not negatively impact operations or capacity.

### 4.2.2. Airside Capacity

A demand and capacity analysis of airfield or airside systems and facilities, such as IMM's runways and taxiways, results in separate calculated hourly capacities for Visual Flight Rules (VFR) and Instrument Flight Rules (IFR) conditions. Additionally, an annual service volume (ASV), which identifies the total annual number of aircraft operations that may be accommodated at the Airport without excessive delay, is calculated. The Federal Aviation Administration (FAA) defines total airport capacity as a reasonable estimate of an airport's annual capacity, which accounts for runway use, aircraft mix, weather conditions, etc. that would be encountered over a year's time. The parameters, assumptions, and calculations required for this analysis are included in the following sections.

#### 4.2.2.1. Runway Orientation, Utilization, and Wind Coverage

IMM's two bi-directional runways, Runway 9-27, Runway 18-36 were evaluated to determine the overall capacity of the airfield, which is defined as the sum of capacities determined for each aircraft operation (takeoff or landing). Each operation is defined by its direction which is most commonly influenced by wind direction and speed, available instrument approaches, airspace restrictions, and/or other operating parameters. The Airport's capacity calculations considered all runway ends (9, 27, 18, and 36) available for operations during VFR or IFR conditions.

The overall runway utilization rates were calculated based on the past ten years of historical wind data associated with the Airport's closest automated weather observing system (AWOS) which is at Page Field Airport (FMY). Immokalee has its own AWOS, however its historical data is insufficient to make such calculations as there are not ten years of data collected from the IMM station. **Table 4-1** identifies the Airport's approximate existing runway utilization rates, as determined through such analysis.

**Table 4-1 IMM Runway Utilization Rates**

| Runway | Percent of Operations Served |
|---|---|
| 9 | 70.0% |
| 27 | 10.0% |
| 18 | 10.0% |
| 36 | 10.0% |
| **Total** | **100.00%** |

*Sources: Atkins, 2017. WX Data from KRSW AWOS Published by the FAA*

Providing adequate wind coverage is an important criterion for determining a runway's orientation. Runways should be provided at an airport to maximize the opportunity for aircraft to take-off and land heading into the wind. When a bi-directional runway orientation provides less than 95 percent wind coverage for any aircraft using an airport on a regular basis, a crosswind runway is required by the FAA. If provisions for a crosswind runway cannot be met, the FAA recommends that the runway be widened to the next largest airport reference code (ARC). Per *Change 1* of FAA Advisory Circular (AC) 150/5300-13A, *Airport Design*, the 95 percent wind coverage is computed based on the crosswind not exceeding 10.5 knots and 13 knots for smaller aircraft and 16 knots and 20 knots for larger aircraft. As can be seen from the all-weather, VFR, and IFR wind roses depicted in **Figure 2-14**, the existing airfield configuration at IMM exceeds the 95 percent combined wind coverage requirement. However, looking at each runway's individual 10.5 knot crosswind coverage during IFR conditions, each covers approximately 91 percent. Combined, their IFR crosswind coverage exceeds 98 percent.

#### 4.2.2.2. Aircraft Mix Index

The FAA has developed a classification system for grouping aircraft, based on size, weight, and performance. **Table 4-2** illustrates the classification categories as they are presented in FAA AC 150/5060-5, *Airport Capacity and Delay*.

**Table 4-2 FAA Aircraft Certifications**

| Aircraft Class | Max. Cert. Takeoff Weight (lb) | Number of Engines | Wake Turbulence Classification |
|---|---|---|---|
| A | 12,500 or less | Single | Small (S) |
| B | 12,501 – 41,000 | Multi | Small (S) |
| C | 41,000 – 300,000 | Multi | Large (L) |
| D | Over 300,000 | Multi | Heavy (H) |

*Source: FAA AC 150/5060-5, Airport Capacity and Delay.*

The classification system presented previously in **Table 4-2** is used to develop an aircraft mix which is the relative percentage of operations conducted by each of the four classes of aircraft (A, B, C, and D). The aircraft mix is used to calculate a mix index which is then used for airfield capacity studies. The FAA defines the mix index as a mathematical expression, representing the percent of Class C aircraft, plus three times the percent of Class D aircraft (C+3D). The FAA has established mix index ranges for use in capacity calculations as listed below:

- **0 to 20** *(IMM's mix index)*
- 21 to 50
- 51 to 80
- 51 to 120
- 121 to 180

A review of the aviation demand forecast from the previous chapter indicates that the Airport experiences most of its traffic from aircraft falling into either the A or B weight classifications outlined previously. Per historical and forecast data, the mix index range is between zero and twenty throughout the planning period, as operating aircraft with a maximum certified takeoff weight between 41,000 and 300,000 pounds are not expected to consist of more than 20% of the Airport's total annual operations.

#### 4.2.2.3. Arrivals Percentage

The percentage of arrivals is the ratio of arrivals to total operations. It is typically safe to assume that the total annual arrivals will equal total departures and that average daily arrivals will equal average daily departures. Additionally, the percentage of arrivals for IMM was estimated to be approximately 50 percent based on a review of IMM's flight plan records and operational understandings. Therefore, a factor of 50 percent arrivals was used in the capacity calculations for IMM.

#### 4.2.2.4. Touch-and-Go Percentage

The touch-and-go percentage is the ratio of landings with an immediate takeoff to total operations. This type of operation is typically associated with flight training. The number of touch-and-go operations normally decreases as the number of total operations approach runway capacity and/or weather conditions deteriorate. Typically, touch-and-go operations are assumed to be between zero and 50 percent of total operations.

Given the GA nature of IMM and that it is known to be a popular flight training destination, touch-and-go operations are anticipated to account for 40 percent of the Airport's total operations.

#### 4.2.2.5. Taxiway Factors

Taxiway entrance and exit locations are an important factor in determining the capacity of an airport's runway system. Runway capacities are highest when there are full-length, parallel taxiways, ample runway entrance and exit taxiways, and no active runway crossings available. These components reduce the amount of time an aircraft remains on a runway. FAA AC 150/5060-5, Airport Capacity and Delay identifies the criteria for determining taxiway exit factors, which are generally based on the mix index and the distance between taxiway exits and runway landing threshold and other connector taxiways. Connector taxiways that are between 2,000 and 4,000 feet from the threshold of each runway and spaced at least 750 feet apart contribute to the taxiway exit factor. Taxiways that met these parameters were considered in completing the capacity calculations for all directions and for all conditions.

Taxiway exits were evaluated for operations in all directions on both Runway 9-27 and Runway 18-36. Both runways are equipped with partial parallel taxiways with at least one exit being located between 1,000 and 3,500 feet away from the runway thresholds. However, the overall taxiway placement on the airfield may cause constraints. In terms of flow of operations, nearly all the Airport's aircraft support and storage facilities are in the southern most area. To reach that area, aircraft operators landing on Runway 9-27 must take parallel Taxiway "Bravo" across the Runway 18 approach end onto Taxiway "Alpha". From there, pilots would taxi southbound via “Alpha” to the approach end of Runway 36 where another runway crossing is needed to gain access to Taxiway “Charlie”. That taxiway accesses the IMM FBO on the airfield.

#### 4.2.2.6. Instrument Approach Capabilities

Instrument approach capability is qualified based upon the ability of the airport to safely accommodate aircraft operations during periods of inclement weather. Weather, in this regard, is characterized by two measures, local visibility in statute miles and height of a substantial cloud ceiling above airport elevation. These two measures are termed “approach minima”. All of IMM’s runways are supported through RNAV (GPS) procedures. In addition to this, VOR procedures are supported for Runway 18.

#### 4.2.2.7. Weather Influences

Weather data obtained from the National Climatic Data Center (NCDC) identified that IFR conditions (ceilings less than 1,000 feet above ground level [AGL] and/or visibility less than 3 miles) occur roughly five percent of the time at IMM. Operational limitations during such times of inclement weather were accounted for in the ASV computation.

#### 4.2.2.8. Airfield Capacity Calculations

The airfield capacity calculations in this section were performed using the parameters and assumptions discussed in the previous sections. The calculations also utilize data from the preferred aviation demand forecast, as presented in Chapter 3, *Aviation Demand Forecast,* for portions of the capacity projections. The following sections outline the hourly capacities in VFR and IFR conditions, as well as the ASV for IMM. For simple, long range planning purposes, the FAA’s *Airport Capacity and Delay* AC provides Figure 2-1. Airport operations are estimated to occur on one runway at a time based on weather; simultaneous runway operations are not expected to occur on a regular basis.

**Hourly Capacity**

The hourly VFR capacity for IMM was calculated based on the guidance and procedures in FAA AC 150/5060-5, *Airport Capacity and Delay*. Hourly VFR capacities were calculated to be 107 operations during VFR conditions and 58 operations during IFR conditions.

**Annual Service Volume**

An airport’s ASV is the maximum number of annual operations that can occur at an airport before an assumed reasonable operational delay value is encountered. ASV is calculated based on the existing runway configuration, aircraft mix, and the parameters and assumptions identified herein; and incorporates the hourly VFR and IFR capacities calculated previously. Utilizing this information and the guidance provided in FAA AC 150/5060-5, *Airport Capacity and Delay,* the ASV for existing conditions at IMM was calculated to be 222,563 operations. It should be noted that the ASV represents the existing airfield capacity in its present configuration, with one east-west runway, one north-south runway, existing taxiway infrastructure, and VOR and GPS instrument approach capabilities. The equation and calculations used to obtain the ASV were taken from the aforementioned AC, and are presented as follows:

The weighted hourly capacity (Cw) is an expression of hourly capacity which considers the percentage of time each runway use configuration is used for both VFR and IFR conditions. The Annual/Daily Demand (D) represents the ratio of annual demand to average daily demand during the peak month. The Daily/Hourly Demand (H) represents the ratio of average daily demand to average peak hour demand during the peak month.

ASV Equation: Weighted Hourly Capacity (Cw) x Annual/Daily Demand (D) x Daily/Hourly Demand (H) = Annual Service Volume (ASV)

Cw x D x H = ASV → 103.176 x 231.012 x 6.25 = 148,969

The current aviation demand in number of aircraft operations for the base year 2016 at IMM, as presented in Chapter 3, *Aviation Demand Forecast*, is 36,500 operations. This equals approximately 16.4 percent of the present ASV. Per the FAA, the following guidelines should be used to determine necessary steps as demand reaches designated levels of airfield capacity:

- 60 percent of ASV: threshold at which planning for capacity improvements should begin
- 80 percent of ASV: threshold at which planning for improvements should be complete and construction should begin

100 percent of ASV: threshold at which the total number of annual operations (demand) that can be accommodated has been reached and capacity-enhancing improvements should be made to avoid extensive delays

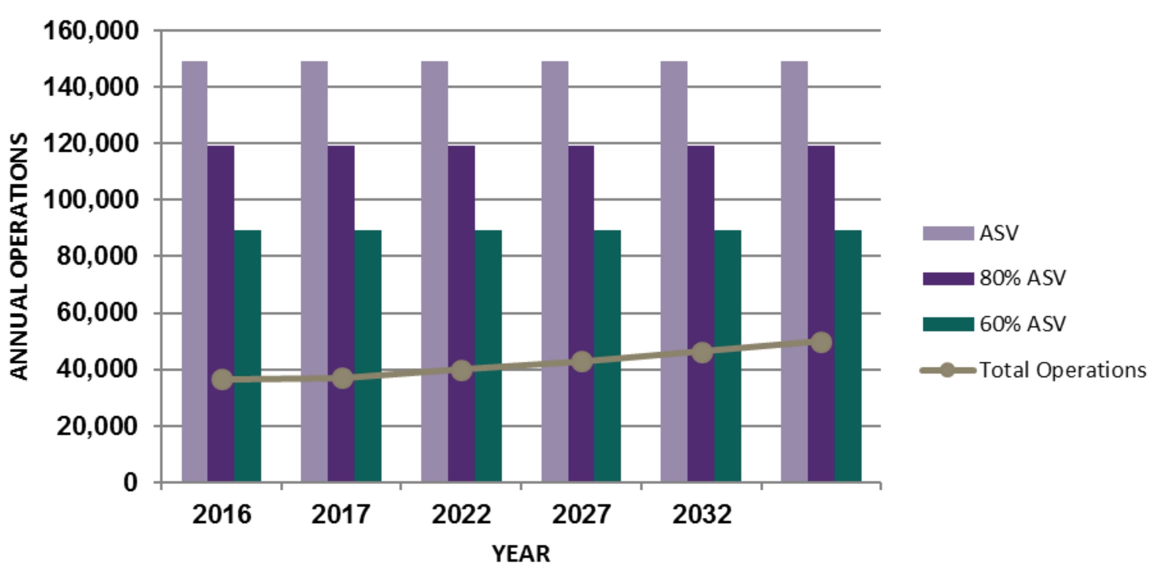
**Table 4-3& Figure 4-1** illustrate the preferred aviation demand forecast for IMM and its relation to IMM's ASV.

**Table 4-3 Annual Service Volume vs. Annual Demand**

| Year | Annual Operations | Annual Service Volume | Percent of Annual Service Volume |
|---|---|---|---|
| **Base Year** | | | |
| 2016 | 36,500 | 148,969 | 24.50% |
| **Forecast** | | | |
| 2017 | 37,047 | 148,969 | 24.87% |
| 2022 | 39,910 | 148,969 | 26.79% |
| 2027 | 42,994 | 148,969 | 28.86% |
| 2032 | 46,316 | 148,969 | 31.09% |
| 2037 | 49,895 | 148,969 | 33.49% |

*Source: Atkins, 2017.*

**Figure 4-1 Annual Service Volume vs. Annual Demand**



Based on the calculated relationship between the Airport's existing ASV and forecast of aviation demand, the airfield is well suited to handle future capacity demands.

## 4.3. Critical Aircraft

An initial step in identifying an airport's potential runway and taxiway facility requirements is the establishment of fundamental development guidelines for the largest or most critical aircraft anticipated to make use of the airfield facility or portion thereof. Thus, airport improvements are planned and developed according to the established Airport Reference Code (ARC) for the airport and then for each particular runway. An airport's ARC is determined by the critical aircraft (aircraft with the widest wingspan, tallest tail, and fastest approach speeds) that consistently makes substantial use of the Airport. FAA Order 5090.3B, *Field Formulation of the National Plan of Integrated Airport Systems (NPIAS)*, defines "substantial use" as 500 or more annual aircraft operations or scheduled commercial service (an airport operation is classified as either an arrival or departure). An airfield's critical aircraft affects key aspects of airport design, such as the sizing of runways, taxiways/lanes, and the location of aircraft parking areas, hangar facilities, and safety and clearance surfaces.

The current Critical Aircraft at IMM is identified as the Cessna Citation X for the both of IMM's runways, as identified by the Airport's existing Airport Layout Plan (ALP). The Cessna Citation X is identified as a B-II aircraft. Therefore, Runways 9-27, 18-36, and all supporting taxiways and safety clearances, are required to conform to the design standards established by the FAA for B-II aircraft.

Based on a review of the aeronautical forecast, the operating conditions of the Airport and the trends in aeronautics on different scales, prompts the current ARC at the airport to remain constant throughout the planning period. It is unlikely that an aircraft with a larger ARC will reach beyond the qualifications for critical aircraft in the foreseeable future. This is due to the ideal that IMM will primarily be a GA airport, serving the GA community in the region. The critical aircraft of the Cessna Citation X is prompted by the consistently rising population in the airport service area, as well as the rising per capita income in the same airport service area. It can be reasoned that airports such as Naples (APF) and Marco Island (MKY) will soon reach capacity due to both the projected increase of aviation demand in the State of Florida, as well as the increasing population and per capita income. Both airports are within 30 nautical miles of IMM. However, the ARCs at APF and MKY are higher compared to IMM.

## 4.4. Airside Facility Requirements

Airport design standards, as established by Change 1 of the FAA's AC 150/5300-13A, were employed in this Development Plan for developing airport facilities capable of meeting existing and forecast levels of aviation activity.

### 4.4.1. Runway Design Code (RDC)

Runway Design Code (RDC) is a code signifying the design standards to which the runway is to be built. Aircraft Approach Category (AAC), Airplane Design Group (ADG), and approach visibility minimums are combined to form the RDC of a specific runway. The first component of the RDC, AAC, is depicted by a letter. The AAC portion of the RDC relates to the aircraft approach speed, as depicted in **Table 4-4**. The second component, called the Aircraft Design Group ADG is depicted by a Roman numeral as depicted in **Table 4-5**. The ADC portion of the RDC relates to the aircraft wingspan or tail height. The third and final component of the RDC relates to the visibility minima for the Runway Approach as depicted in **Table 4-6**. The existing and future design aircraft for Runways 9-27 and 18-36, Cessna Citation X, has an RDC of B-II-4000.

### 4.4.2. Airport Reference Code (ARC)

Per FAA AC 150/5300-13A, *Airport Design*, the Airport Reference Code (ARC) is a coding system used to relate airport design criteria to the operational based on physical characteristics of the airplanes intended to operate at an airport. Airport improvements are planned and developed per the established ARC for an entire airport, instead of individual runways. The ARC is based on a combination of aircraft approach speed, wingspan, and tail height, as depicted in **Tables 4-4 & 4-5**. The existing and future ARC for IMM is B-**II**.

**Table 4-4 Aircraft Approach Category**

| Aircraft Approach Category | Approach Speed |
|---|---|
| A | Approach speed less than 91 knots |
| B | Approach speed 91 knots or more but less than 121 knots |
| C | Approach speed 121 knots or more but less than 141 knots |
| D | Approach speed 141 knots or more but less than 166 knots |
| E | Approach speed 166 knots or more |

Source: FAA AC 150/5300-13A, Prepared by Atkins 2017

**Table 4-5 Airplane Design Group**

| Group # | Tail Height (ft [m]) | Wingspan (ft [m]) |
|---|---|---|
| I | < 20' (< 6 m) | < 49' (< 15 m) |
| II | 20' - < 30' (6 m - < 9 m) | 49' - < 79' (15 m - < 24 m) |
| III | 30' - < 45' (9 m - < 13.5 m) | 79' - < 118' (24 m - < 36 m) |
| IV | 45' - < 60' (13.5 m - < 18.5 m) | 118' - < 171' (36 m - < 52 m) |
| V | 60' - < 66' (18.5 m - < 20 m) | 171' - < 214' (52 m - < 65 m) |
| VI | 66' - < 80' (20 m - < 24.5 m) | 214' - < 262' (65 m - < 80 m) |

Source: FAA AC 150/5300-13A, Prepared by Atkins 2017

**Table 4-6 Visibility Minimums**

| RVR (ft) | Flight Visibility Category (statute mile) |
|---|---|
| VIS | Visual Approach |
| 4000 | Lower than 1 mile but not lower than ¾ mile (APV ≥ 3/4 but < 1 mile) |
| 2400 | Lower than 3/4 mile but not lower than 1/2 mile (CAT-I PA) |
| 1600 | Lower than 1/2 mile but not lower than 1/4 mile (CAT-II PA) |
| 1200 | Lower than 1/4 mile (CAT-III PA) |

Source: FAA AC 150/5300-13A, Prepared by Atkins 2017

### 4.4.3. Runway Requirements

This section of the report will look specifically at IMM’s two runways and their future requirements. Specifically, the runways’ general characteristics will be analyzed with respect to FAA design and safety requirements and conformance with the recommendations. Runway designation and length requirements will also be reviewed.

#### 4.4.3.1. Runway Protective Surfaces

**Runway Safety Area**

A Runway Safety Area (RSA) is a graded surface centered on a runway, free of any objects, except for those objects which are 'fixed by function'. The purpose of the RSA is to protect aircraft in the event of an under-shoot, over-shoot or excursion from a runway during landing or takeoff operations. In case of an emergency, the area must be able to support emergency vehicle operations and maintenance vehicles. The width and length of an RSA depend upon an airport's ARC and approach visibility minima. The RSA has specific requirements to be graded to slope away from the runway at 1.5 to 5 percent. Meeting RSA requirements is one of the FAA's highest priorities in maintaining safety at the nation's airports. **Table 4-7** lists the Airport's existing and future RSA requirements.

**Table 4-7 Runway ARC Designations & Required Safety Areas**

| | Airport Reference Code (ARC) | Safety Area Width | Safety Area Length Beyond Runway End |
|---|---|---|---|
| Runway 9-27 | B-II | 150' | 300' |
| Runway 18-36 | B-II | 150' | 300' |

Source: FAA AC 150/5300-13A Change 1, *Airport Design* & Atkins Analysis 2017

The RSAs for Runway 9-27 and 18-36 currently meet the requirements set forth by the FAA for B-II runways. Any future runway extensions should be planned in accordance with standard RSA surfaces.

**Runway Object Free Area - ROFA**

Similar to the RSA, the Runway Object Free Area (ROFA) must be free of objects except those required to support air navigation and ground maneuvering operations. The function of the ROFA, also centered on the runway, is to enhance the safety of aircraft operating on the runway. It is not permissible to park an airplane within the ROFA. The width and length of the ROFA depend upon an airport's ARC and approach visibility minima. The ROFA does not have specific slope requirements, but the terrain within the ROFA must be relatively smooth and graded to be at or below the edge of the RSA. **Table 4-8** notes the ROFA dimensions for IMM:

**Table 4-8 Runway Object Free Area**

| Runway | Airport Reference Code (ARC) | Object Free Area Width | Object Free Area Length Beyond Runway End |
|---|---|---|---|
| Runway 9-27 | B-II | 500' | 300' |
| Runway 18-36 | B-II | 500' | 300' |

Source: FAA AC 150/5300-13 Change 1, *Airport Design* & Atkins Analysis 2017

The ROFA for Runways 9-27 and 18-36 currently meet the requirements set forth by the FAA for B-II runways.

**Runway Protection Zones**

A Runway Protection Zone (RPZ) is an area centered symmetrically on an extended runway centerline. The RPZ has a trapezoidal shape and extends prior to each runway end. The RPZ is aimed at enhancing the safety of people and property on the ground by limiting and/or restricting the construction of certain structures within its bounds. This area should be free of land uses that create glare, smoke, or other hazards to air navigation. Also, the construction of residences, fuel-handling facilities, churches, schools, and offices are not recommended in the RPZ. New roadway construction is also required to remain clear of RPZs.

The inner and outer widths and the length of an RPZ depend on an airport's ARC and approach visibility minima. With no proposed reductions in approach with visibility minima the size and dimensions of the existing RPZ's at IMM are not anticipated to change throughout the planning period. **Table 4-9** illustrates the RPZ requirements for B-II ARC's, along with the future proposed approach minima.

**Table 4-9 Runway Protection Zones (RPZ's)**

| | Approach Visibility Minimums | Aircraft Approach Category | Length (ft) | Inner Width (ft) | Outer Width (ft) |
|---|---|---|---|---|---|
| **Approach RPZ** | | | | | |
| Runway 9-27 | >1SM | B-II | 1,000 | 500 | 700 |
| Runway 18 | >1SM | B-II | 1,000 | 500 | 700 |
| Runway 36 | >3/4 SM | B-II | 1,000 | 500 | 1,510 |
| **Departure RPZ** | | | | | |
| Runway 9-27 | >1SM | B-II | 1,000 | 500 | 700 |
| Runway 18 | >1SM | B-II | 1,000 | 500 | 700 |
| Runway 36 | >3/4 SM | B-II | 1,000 | 500 | 700 |

Source: FAA AC 150/5300-13 Change 1, *Airport Design* & Atkins Analysis 2017

It is recommended by the FAA that an airport operator control the land use within their RPZ's in order ensure that these areas do not develop in a hazardous or incompatible manner. Currently, the Collier County owns most of the RPZ's, however, the Airport does not currently own or maintain easements for portions of Runway 36's RPZs. It is proposed that any future development plans incorporate the acquisition of an easement for 6.2 acres of the Runway 36 RPZ which are not within the airport property line.

#### 4.4.3.2. Runway 18-36

The critical aircraft for Runway 18-36 has also been identified as the Cessna Citation X with the required ARC design standards of B-II. Runway 18-36 is currently 4,450 feet long and 150 feet wide which conforms to the standard of B-II runway width requirements.

Due to the poor condition of the Runway 18-36's pavement, it is a constant safety and maintenance issue due to the amount of foreign object debris (FOD) that the crumbling pavement produces. Pieces of pavement are likely to be dislodged anywhere on the runway at any time, and safe operations requires constant vigilance on the part of airport operations staff. There is no question that all the runway pavement is in poor condition, and it is recommended that it be rehabilitated as soon as possible.

#### 4.4.3.3. Runway 9-27

As previously identified, the critical aircraft for Runway 9-27 is the Cessna Citation X which requires airfield infrastructure design to ARC B-II standards. The runway is currently 5,000 feet long and 100 feet wide which meets the width requirement for an B-II runway. The B-II designation of Runway 9-27 also requires standard lengths and widths for the protective surfaces associated with the runway.

#### 4.4.3.4. Runway Length

Runway length requirements are developed based upon the airport role and local conditions. According to FAA AC 150/5325-4B, Runway Length Requirements for Airport Design, recommended runway length is a function of airport elevation (noted in mean sea level- MSL); mean maximum temperature of the hottest month, (degrees Fahrenheit), aircraft maximum takeoff weight (MTOW) (in pounds), number of passenger seats, aircraft engine performance, and the maximum elevation difference in runway longitudinal gradient.

A runway length analysis was conducted for Runway 9-27 in accordance with FAA AC 150/5325-4B. This analysis found that due to high ambient temperatures and frequent rainy conditions creating surface contamination, the existing runway length of 5,000 feet is insufficient to accommodate the jets currently operating at the airfield without significant load penalties. Therefore, a runway length of 7,000 feet is recommended in order to accommodate the increasing get traffic at the airport. Details of this analysis are included in **Appendix A.** of this report.

#### 4.4.3.5. Runway Designations

A runway designation is identified by the whole number nearest the magnetic azimuth of the runway when oriented along the runway centerline as if on approach to that runway end. This number is then rounded off to the nearest unit of ten. Magnetic azimuth is determined by adjusting the geodetic azimuth associated with a runway to compensate for magnetic declination. Magnetic declination is defined as the difference between true north and magnetic north. The value of magnetic declination varies over time and global location. Magnetic declination is a natural process and does periodically require the re-designation of runways.

Current information for magnetic declination was derived from the National Geophysical Data Center (NGDC) database in April 2017. Magnetic declination for the Airport's reference point (ARP) was calculated as being 5.98° west and changing by 0.10° west per year. The true bearing for each runway was identified through the development of the ALP set and its sourced survey data. Using the "west is best – east is least" method for adjusting a bearing for magnetic declination would result in the magnetic bearing and runway designation shown in **Table 4-10**.

**Table 4-10 Runway Magnetic Bearing**

| Runway | True Bearing | Magnetic Declination | Magnetic Bearing | Runway Designation Required |
|---|---|---|---|---|
| 9 | N 88° 12' 39.36" E | 5° 58' 48" West | 94° 10' 54.681" | 9 |
| 27 | N 268° 12' 39.36" E | 5° 58' 48" West | 274° 11' 27.36" | 27 |
| 18 | S 178° 12' 6.68" E | 5° 58' 48" West | 184° 10' 54.68" | 18 |
| 36 | S 358° 12' 6.68" E | 5° 58' 48" West | 4° 10' 54.68" | 36 |

*Source: Atkins, 2017.*

Considering the Airport's runway's current true bearing and existing magnetic declination, re-designation of the runways is expected to be needed towards the end of the planning period. Runway 9-27 is expected to need re-designation around year 2032, whereas Runway 18-36 is expected to need re-designation around year 2026. It is important to note that magnetic declination can vary over time due to fluctuations in the earth's magnetic fields. It is critical that the declination be checked on a semiannual basis and before any runway work requiring marking modifications.

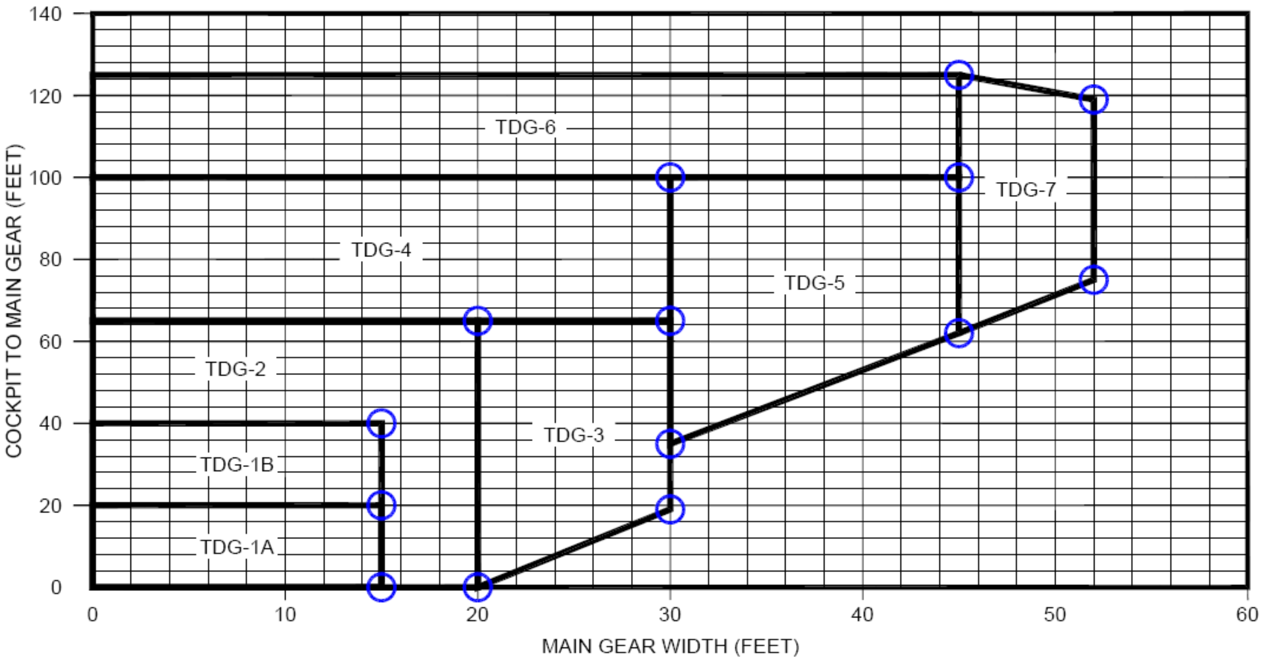
#### 4.4.3.6. Runway Strength

The existing runway strength of Single Wheel - 35,000 pounds, Dual Wheel - 60,000 pounds, and 2 Dual Wheels in Tandem of 110,000 pounds should be suitable to support the projected fleet mix throughout the forecast period. Should any runway extension or rehabilitation occur within the forecast period, new pavement should be designed with similar weight bearing characteristics.

### 4.4.4. Taxiway Requirements

Taxiway Design Group (TDG) was introduced by the FAA with their release of AC 150/5300-13A in 2012. As depicted in **Figure 4-2**, there are eight TDGs which are determined by aircraft undercarriage (gear) dimensions such as main gear width and the distance between the cockpit and main gear. **Table 4-11** presents the Airport's anticipated critical aircraft during the planning period, along with the associated TDG dimensions.

**Figure 4-2 FAA AC 150/5300-13A – Taxiway Design Groups (TDGs)**




Source: FAA AC 150/5300-13A Change 1, Airport Design 2017.

**Table 4-11 Critical Aircraft & Respective TDG**

| Airplane Design Group | | | |
|---|---|---|---|
| **Aircraft Manufacture/Model** | **Main Gear Width (ft.)** | **Cockpit to Main Gear (ft.)** | **TDG** |
| Cessna Citation X | 13 | 27 | 1B |

### 4.4.4.1. Full Length Parallel Taxiway Serving Runway 18-36

The northern portion of the current airfield at IMM is only accessible via a parallel taxiway located to the west of Runway 18-36. Taxiing originating from the southern located FBO to Runway 9-27 requires the crossing of Runway 18-36 twice. This has been identified as a safety concern in the Airport's current layout. Crossing a runway twice allows for an increased chance of incursions during operations. Additionally, such crossing of Runway 18-36 can be seen to decrease capacity due to the additional time needed for taxiing operations. To best mitigate these currently identified issues, there shall be a proposed full length parallel taxiway located to the east of Runway 18-36. This will allow for the free flow of operations from Runway 9-27 to the FBO apron with no runway crossing. The proposed taxiway will attach existing Taxiway Bravo and extend south approximately 2,670 feet, with a width approximately 50 feet.

### 4.4.4.2. Airfield Lighting

Section 2.2.1.4 describes the existing condition of airfield lighting equipment at IMM. In the future, the implementation of an approach lighting system should be considered for both runways. Such a system would create additional safety for aircraft operations during times of inclement weather or poor visibility. Approach lighting systems often coupled with ILS approaches and WAAS enabled GPS approaches include: ALSF-II, ALSF, MALSR, MALS, and ODALS. Each has different lighting configurations and spatial requirements. It should be noted that any future improvements to the airfield should include airfield lighting as necessary. To reduce the overall energy demand of the lighting systems at IMM, LED technologies should be used where able and when practical.

#### 4.4.4.3. Signage

Section 2.2.1.5 describes the existing condition of airfield signage equipment at IMM. While no specific recommendations for signage improvement are identified, airfield signage should be expanded and updated as necessary in conjunction with any airfield improvement project.

#### 4.4.4.4. Airfield Marking

Section 2.2.1.5 describes the existing condition of airfield markings at IMM. While no specific recommendations for marking improvements are identified, airfield markings should be expanded and updated as necessary in conjunction with any airfield improvement project.

## 4.5. Landside Facility Requirements

### 4.5.1. GA Terminal

The existing GA terminal is described in Section 2.2.2.1 of this report. Chapter 5 of ACRP Report 113, *Guidebook on General Aviation Facility Planning,* provides general guidance as to the sizing of general aviation terminals. The primary consideration is that the facility can support the number of pilots, passengers, and visitors which could reasonably be expected during peak hour operations. GA facility sizing can range from 100 to 150 square feet of space per person, which is considered to accommodate the peak hour operations. It was concluded that 100 square feet per person would be adequate for IMM. For planning purposes, the ACRP suggests using a factor of 2.5 people per peak-hour operation (pilots and passengers). However, this factor has been lowered to 1.75 as there are little to no air taxi operations currently occurring with predominantly single engine aircraft. The requirements for the General Aviation Terminal Building can be found in **Table 4-12.** The Terminal facilities are slated to become deficient in square footage between 2022 and 2027, this deficiency becomes larger over the planning period as the peak hour operations are forecast to increase at IMM.

**Table 4-12 GA Terminal Building Requirements**

| | Base Year | Forecast | | | |
|---|---|---|---|---|---|
| | 2016 | 2022 | 2027 | 2032 | 2037 |
| Peak Hour Operations | 16 | 17 | 19 | 20 | 22 |
| Required General Terminal Building Space (sq ft.) | 2800 | 2975 | 3325 | 3500 | 3850 |
| Current Capacity | 3000 | 3000 | 3000 | 3000 | 3000 |
| **Surplus/Deficiency** | **200** | **75** | **325** | **500** | **850** |

Source: Atkins Analysis, 2017

### 4.5.2. General Aviation Aprons

General aviation aprons are areas that provide for the tie-down and storage of aircraft, as well as provide access to terminal and fuel facilities. FAA AC 150/5300-13, *Airport Design*, provides guidelines for sizing aircraft aprons based on the number of aircraft anticipated to be utilizing the aircraft on a busy day. At IMM, the total operations can be classified in two categories: based aircraft operations and itinerant operations. Aircraft aprons were analyzed across each category in accordance with FAA guidance.

One primary apron areas exist at IMM. The South FBO apron is located near the midpoint of Taxiway C and covers an area of approximately 15,400 square yards. This apron is generally intended for use by itinerant aircraft as it is connected to the GA terminal and supports limited hangar access, however some based aircraft utilize this apron for aircraft storage.

At present, a total of five based aircraft at IMM are stored at the south FBO apron, representing 8 percent of the based aircraft fleet. For planning purposes, it is reasonable to assume such a utilization rate will continue. The FAA indicates that planning at least 300 square yards for each based aircraft will provide sufficient tie-down space for a mix of aircraft. Using these assumptions, **Table 4-13** depicts the based aircraft apron requirements for IMM over the planning period.

Itinerant apron space is intended for relatively short-term parking periods, usually less than 24 hours. For the purpose of this study, it is assumed the average itinerant aircraft occupies the apron for five hours. Utilizing the peaking characteristics established in Section 3.6 of this report, recognizing that itinerant operations represent approximately 30 percent of total airport operations, and applying the FAA recommendation of 360 square yards per itinerant aircraft, **Table 4-13** identifies the itinerant apron requirements at IMM over the planning period.

**Table 4-13 GA Apron Requirements**

| | Base Year | Forecast | | | | |
|---|---|---|---|---|---|---|
| | 2016 | 2017 | 2022 | 2027 | 2032 | 2037 |
| **Based Aircraft Apron Requirements** | | | | | | |
| Total Based Aircraft | 58 | 59 | 61 | 63 | 66 | 69 |
| Based Aircraft on Apron (15% of total) | 5 | 5 | 5 | 5 | 5 | 6 |
| **Total Based Aircraft Apron Required (sq. yards)[1]** | **1,670** | **1,699** | **1,757** | **1,814** | **1,901** | **1,987** |
| **Itinerant Aircraft Apron Requirements** | | | | | | |
| Average Day Peak Hour Operations | 16 | 16 | 17 | 19 | 20 | **22** |
| Average Day Peak Hour Itinerant Operations | 4 | 4 | 4 | 4 | 4 | 5 |
| Transient Aircraft Positions Required (5-hour avg. stay) | 18 | 18 | 19 | 21 | 22 | 24 |
| **Total Transient Apron Required (sq. yards)[1]** | **7,603** | **7,603** | **8,078** | **9,029** | **9,504** | **10,454** |
| **Total Apron Requirements** | | | | | | |
| Total Apron Required (sq. yards)[1] | **9,274** | **9,302** | **9,835** | **10,843** | **11,405** | **12,442** |
| Existing Aircraft Apron (sq. yards) | 14,600 | 14,600 | 14,600 | 14,600 | 14,600 | 14,600 |
| **Surplus/Deficiency (sq. yards)** | **5,326** | **5,298** | **4,765** | **3,757** | **3,195** | **2,158** |

[1]*Includes 20% planning buffer.*

*Source: Atkins, 2017.*

## 4.5.3. Aircraft Hangars

ACRP Report 113 notes that an airport should plan to accommodate between 75 and 90 percent of based aircraft in hangar facilities. Currently IMM has 58 based aircraft with approximately 34 of those aircraft stored in hangar facilities. The remaining aircraft are stored on the apron, in shade structures, or on turf tie down areas.

### 4.5.3.1. T-Hangars

Future T-hangar requirements will be representative of the type and sophistication of future based aircraft and the preferences of aircraft owners. Existing T-hangar facilities at IMM cater exclusively to small (Group I) aircraft – most often single aircraft. At present, roughly 30 single engine aircraft are stored in T-hangars accounting for 75 percent of all based single engine aircraft at the Airport, with a small waiting list for T-

Hangar facilities. It is reasonable to anticipate that the T-Hangar storage requirement rates will continue to close to their current rate, therefore it is forecast that 80 percent of future based single-engine aircraft stored in hangars will require T-hangar storage. Utilizing these assumptions, **Table 4-14** projects the need for additional T-hangar units at IMM over the planning period.

**Table 4-14 T-Hangar Requirements**

| | Base Year | Forecast | | | |
|---|---|---|---|---|---|
| | **2016** | **2022** | **2027** | **2032** | **2037** |
| Based Single-Engine Aircraft | 40 | 43 | 46 | 49 | 53 |
| Single-Engine Aircraft Requiring T-Hangar/T-Shed Storage | 32 | 34 | 37 | 39 | 43 |
| Current Capacity (units) | 30 | 30 | 30 | 30 | 30 |
| **Surplus/Deficiency** | **2** | **4** | **7** | **9** | **13** |

*Source: Atkins, 2017.*

### 4.5.3.2. Conventional Hangars

Those single engine aircraft not forecast to be based on the apron or in a T-hangar/T-shed unit are assumed to be based in a conventional hangar. Further it is assumed that all multi-engine and jet aircraft, as well as all rotorcraft, based at the Airport will require storage in a conventional hangar. For planning purposes the spatial requirements for each aircraft type is as follows:

- Single-Engine Aircraft – 1,800 Square Feet
- Multi-Engine Aircraft – 3,200 Square Feet
- Jet Aircraft – 5,200 Square Feet
- Rotorcraft– 3,200 Square Feet

Utilizing those planning metrics, **Table 4-15** projects the need for conventional hangar space at IMM across the planning period.

**Table 4-15 Conventional Hangar Requirements**

| | Base Year | Forecast | | | | |
|---|---|---|---|---|---|---|
| | **2016** | **2017** | **2022** | **2027** | **2032** | **2037** |
| Based Multi-Engine Requiring Hangar Space | 4 | 4 | 4 | 5 | 5 | 5 |
| Based Jet Requiring Hangar Space | 4 | 4 | 4 | 5 | 5 | 5 |
| Based Helicopter Requiring Hangar Space | 4 | 4 | 4 | 5 | 5 | 5 |
| **Total Aircraft Hangar Space Required (sq. ft.)** | **45,600** | **45,600** | **45,600** | **57,000** | **57,000** | **57,000** |
| Total Existing Hangar Space (sq. ft.) | 30,850 | 30,850 | 30,850 | 30,850 | 30,850 | 30,850 |
| **Surplus / Deficiency (sq. ft.)** | **14,750** | **14,750** | **14,750** | **26,150** | **26,150** | **26,150** |

*Source: Atkins, 2017.*

## 4.5.4. Automobile Parking and Access

Clearly defined parking areas near an airport's terminal building and hangar facilities are essential elements of an airport. One primary parking area exists at IMM as described in Section 2.2.2.4 of this report. This includes the GA Terminal / FBO Lot which has 13 standard vehicle spaces and 2 handicap spaces. When summed, the FBO parking lot provides approximately 514 square yards of area, with parking for approximately 15 vehicles. The number of automobile parking spaces required is generally calculated as a function of peak hour users as well as tenant and employee demand. Parking requirements are shown in **Table 4-16**

**Table 4-16 Parking Requirements**

| | Base Year | Forecast | | | | |
|---|---|---|---|---|---|---|
| | 2016 | 2017 | 2022 | 2027 | 2032 | 2037 |
| GA Peak Hour Airport Users | 16 | 16 | 17 | 19 | 20 | 21 |
| Employees | 4 | 4 | 5 | 5 | 6 | 6 |
| Simultaneous Parking Area Users | 20 | 20 | 22 | 24 | 26 | 27 |
| **Parking Area Required (sq. yards)[1]** | **840** | **840** | **924** | **1,008** | **1,092** | **1,134** |
| Existing (sq. yards) | 514 | 514 | 514 | 514 | 514 | 514 |
| **Surplus / Deficiency (sq. yards)** | **326** | **326** | **410** | **494** | **578** | **620** |

Notes: 1/ Includes 20% planning buffer.
*Source: Atkins, 2007.* `

# 4.6. Support Facilities

## 4.6.1. Security and Fencing

The characteristics of the Airport's existing fencing are described in **Section 2.2.2.5** of this report. Currently the Airport has a partial perimeter fence of varying types and heights. However, FAA AC 107-1 provides guidance for perimeter fence line for security purposes and recommends a standard six-feet high, full perimeter fence around airfield facilities with razor wire lining the top in a tiered setup. Consideration should be made to upgrade the existing deteriorating line to meet AC 107-1 acceptable standards. At a minimum any additional fence improvements or additions should match the existing south side fence structure in both height and equipment. Additional gate access may be required in conjunction with any new development on the Airfield.

## 4.6.2. Contract Tower

An air traffic control tower (ATCT) does not currently exist at IMM. It is prudent however to preserve space in the future for a tower should traffic levels and/or operational conditions indicate its necessity. In recent years most new ATCTs have not been FAA towers, but rather contract towers. Contract towers are ATCTs staffed by contracted personnel. The FAA does participate in a share of the construction and operation of a contract tower after a formal justification and cost-benefit analysis are prepared. For the purpose of updating the ALP, space will be reserved for the potential construction of an ATCT at the Airport. FAA AC 150/5300-13, *Airport Design*, recommends an ATCT being on a one to four-acre site, have unobstructed views of the airport's airspace, and have unobstructed views to all airport movement areas. These considerations were considered when choosing the location of a potential ATCT.

# Appendices

# Appendix A. Runway Length Analysis

FAA Advisory Circular (AC) 150/5325-4B, Runway Length Requirements for Airport Design, states, "Airport authorities working with airport designers and planners should validate future runway demand by identifying the critical design airplanes. In particular, it is recommended that the evaluation process assess and verify the airport's ultimate development plan for realistic changes that could result in future operational limitations to customers. In summary, the goal is to construct an available runway length for new runways or extensions to existing runways that is suitable for the forecasted critical design airplanes." Federally funded projects require that critical design airplanes have at least 500 or more annual itinerant operations at the airport for an individual airplane or a family grouping of airplanes.

In addition to the above mentioned runway lengthening criteria, AC 150/5325-4B paragraph 306 states, "General Aviation (GA) airports have witnessed an increase use of their primary runway by scheduled airline service and privately owned business jets. Over the years business jets have proved themselves to be a tremendous asset to corporations by satisfying their executive needs for flexibility in scheduling, speed, and privacy. In response to these types of needs, GA airports that receive regular usage by large airplanes over 12,500 pounds maximum take-off weight (MTOW), in addition to business jets, should provide a runway length comparable to non-GA airports. That is, the extension of an existing runway at a GA airport can be justified by the need to accommodate heavier airplanes on a frequent basis."

## A.1. Fleet Mix and Critical Aircraft

In order to evaluate the runway lengths at IMM, data from FlightAware.com was utilized to generate a fleet mix and critical aircraft. **Table 1** lists the jet fleet mix obtained from an analysis of flightwise.com data. The data analysed captured a sample of the aircraft operations at IMM between February 2012 – February 2017.

The FlightWise.com operational analysis, only yields an ARC of A-I which has than 500 operations documented in the data sample. Therefore, the predominant surveyed ARC for IMM is that of a A-I. However, existing operations by larger aircraft (B-I, B-II, B-III, C-II) that require additional runway length are steadily growing at IMM. According to Flightwise.com operations by these types of jet aircraft The jet fleet mix studied in this analysis is outlined in Table 1, along with the Airport Reference Code (ARC), Maximum Take-off Weight (MTOW), and maximum range for each aircraft.

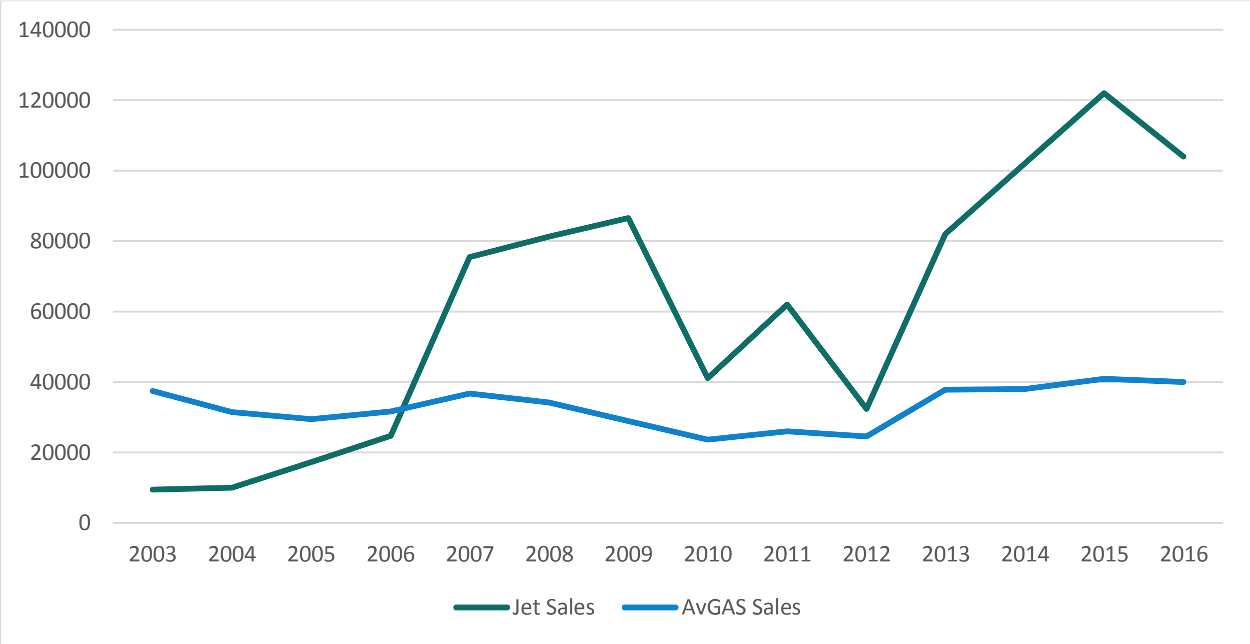
**Table 1. Surveyed Jet Fleet Mix**

| Aircraft | ARC | MTOW | Aircraft Type | Maximum Range (NM) |
|---|---|---|---|---|
| Lear Jet 25 | C-I | 15,000 | Jet | 1,767 |
| Hawker 1000 | C-II | 25,000 | Jet | 1,796 |
| Gulfstream IV | C-II | 73,200 | Jet | 2,300 |
| Citation III | B-II | 22,000 | Jet | 2,345 |
| Citation X | B-II | 35,700 | Jet | 3,441 |
| Citation V | B-II | 16,300 | Jet | 1,960 |
| Citation 550 | B-II | 20,200 | Jet | 3,441 |
| Citation 525 | B-I | 17,110 lb | Jet | 2,165 |
| Citation Mustang | B-I | 8645 | Jet | 1,167 |

Source: Flightwise.com 2012-2017, Atkins Analysis 2017

As stated in the forecast analysis section of this report, FlightWise.com is not a comprehensive source for operational data due to database limitations. Therefore, fuel records were analysed for the years 2003 until 2016 to verify the growth of jet operations. These records are indicative of the increase in jet traffic with jet fuel sales (in gallons) growing at an average annual growth rate of 15.5% over the 10-year period, while sales of Avgas sales volumes have remained stagnant. **Figure 1** depicts the growth in Jet fuel sales at IMM over for the past 15 years.

**Figure 1. IMM Fuel Sales history (gallons sold)**




Source CCAA Records 2017, Atkins Analysis, 2017

In accordance with AC 150/5325-4B, a family grouping of aircraft was chosen to obtain the future proposed ADG. Being that IMM has shown an increasing number of operations by aircraft larger than 60,000 lbs on a frequent basis, it is suggested at this time that Runway 9-27 be extended to meet the demands of those types of aircraft.

As stated in AC 150-5325-4B, the evaluation process should assess the airport's ultimate development plan for realistic changes that could result in future operational limitations to customers. Consideration must be given to current operational constraints on existing users, anticipated and committed demand by aircraft that require additional runway length and the estimated future growth of such aircraft types. In addition, the AC states that, "the extension of an existing runway at a GA airport can be justified by the need to accommodate heavier airplanes on a frequent basis."

## A.2. Runway Length

The proposed runway length for this project is based on criteria established in FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*.

AC 150/5325-4B uses a five-step procedure to determine recommended runway lengths for a selected list of critical design airplanes. The five steps (somewhat abbreviated) are listed below.

1. Identify the list of critical design airplanes that will make regular use of the proposed runway for an established planning period of at least five years. For federally funded projects, the definition of the term "*substantial use"* quantifies the term *"regular use".*
2. Identify the airplanes that will require the longest runway lengths at MTOW. This will be used to determine the method for establishing the recommended runway length. When the MTOW of listed

airplanes is over 60,000 lbs., the recommended runway length is determined according to individual airplanes.

3. Use Table 1-1 in the AC (**Table 4** in this document) and the airplanes identified in step #2 to determine the method that will be used for establishing the recommended runway length. MTOW is used because of the significant role played by airplane operating weights in determining runway lengths.
4. Select the recommended runway length from among the various runway lengths generated by step #3 per the process identified in chapters 2, 3, or 4 of the AC, as applicable.
5. Apply any necessary adjustment to the obtained runway length, when instructed by the applicable chapter of the AC, to the runway length generated by step #4 to obtain a final recommended runway length. Adjustments to the length may be necessary for runways with non-zero effective gradients, excessive temperatures, wind conditions, airport elevation, etc.

As depicted in **Table 2**, most of the jet aircraft currently operating at IMM fall within the range of 12,500 pounds to 60,000 pounds. Therefore, it is appropriate to assume a family grouping of aircraft design approach when calculating runway length requirements.

**Table 2. Airplane Weight Categorization for Runway Length Requirements**

<table>
<tr><th colspan="3">Airplane Weight Category</th><th rowspan="2">Design Approach</th><th rowspan="2">Location of Design Guidelines</th></tr>
<tr><th colspan="3">Maximum Certificated Takeoff Weight (MTOW)</th></tr>
<tr><td rowspan="4">12,500 pounds (5,670 kg) or less</td><td colspan="2">Approach Speeds less than 30 knots</td><td>Family grouping of small airplanes</td><td>Chapter 2; Paragraph 203</td></tr>
<tr><td colspan="2">Approach Speeds of at least 30 knots but less than 50 knots</td><td>Family grouping of small airplanes</td><td>Chapter 2; Paragraph 204</td></tr>
<tr><td rowspan="2">Approach Speeds of 50 knots or more</td><td>With Less than 10 Passengers</td><td>Family grouping of small airplanes</td><td>Chapter 2; Paragraph 205 Figure 2-1</td></tr>
<tr><td>With 10 or more passengers</td><td>Family grouping of small airplanes</td><td>Chapter 2; Paragraph 205 Figure 2-2</td></tr>
<tr><td colspan="3">Over 12,500 pounds (5, 670 kg) but less than 60,000 pounds (27,200 kg)</td><td>Family grouping of large airplanes</td><td>Chapter 3; Figures 3-1 or 3-2 1 and Tables 3-1 or 3-2</td></tr>
<tr><td colspan="3">60,000 pounds (27,200 kg) or more or Regional Jets 2</td><td>Individual large airplane</td><td>Chapter 4; Airplane Manufacturer Websites (Appendix 1)</td></tr>
<tr><td colspan="5">Note 1: When the design airplane's APM show a longer runway length than what is shown in Figure 3-2, use the airplane manufacturer's APM. However, users of an APM are to adhere to the design guidelines found in Chapter 4.</td></tr>
<tr><td colspan="5">Note 2: All regional jets regardless of their MTOW are assigned to the 60,000 pounds (27,200 kg) or more weight category.</td></tr>
</table>

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

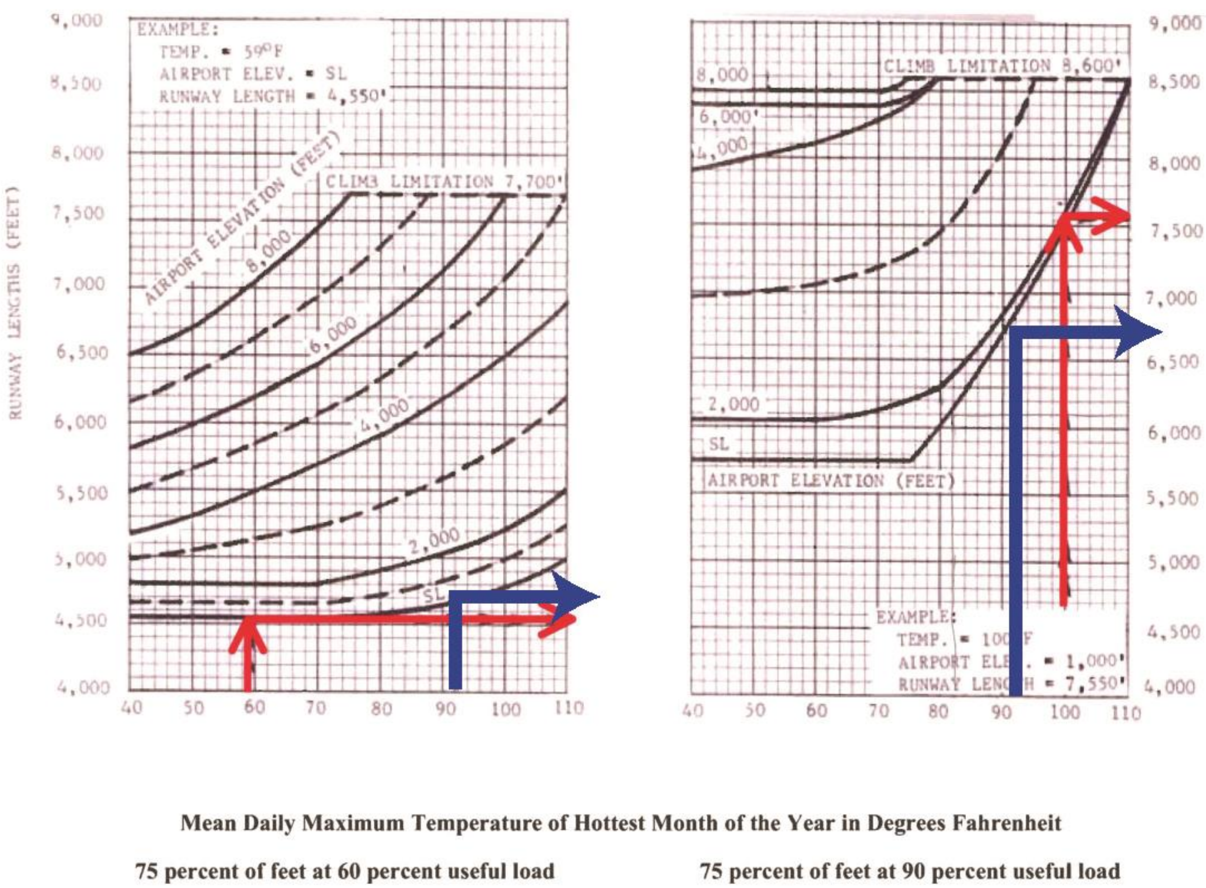
Based on FlightWise.com data, and fueling trends it is apparent that operations by a jet aircraft are increasing. Therefore, the runway design curves found in Chapter 3 of AC 150/5325-4B were used to analyse the existing length of Runway 9-27. The design procedure for this aircraft weight category requires the following information: airport elevation above mean sea level (MSL), mean daily maximum temperature of the hottest month at the airport, and the critical design airplanes under evaluation with their respective useful loads. Once this information is obtained is it plotted on a set of performance curves developed from FAA-approved airplane flight manuals in accordance with the provisions of 14 Code of Federal Regulations, Part 25, *Airworthiness Standards: Transport Category Airplanes,* and Part 91, *General Operating and Flight Rules*.

The elevation at IMM is 36.5-feet above MSL. The mean daily maximum temperature of the hottest month at the airport is 93.0°F. By plotting all this information on the FAA performance curves in AC 150/5325-4B, the following Runway Lengths were obtained. Figure 2 depicts these calculations with Red lines representing FAA example calculations, and blue lines representing conditions at IMM.

- In order to accommodate 75% of IMM's B-II fleet at 60% useful load a runway length of 4,800 feet is required.

- In order to accommodate 75 % of the fleet at 90% useful load a runway length of 6,700 feet would be necessary.

**Figure 2. 75 Percent of Fleet at 60 or 90 Percent Useful Load**




Source: AC 150/5325-4B, Atkins Analysis, 2016

## A.3. Aircraft Take-off Performance in Warm Climates

As stated in Section 3.3, the mean daily maximum temperature of the hottest month at IMM is 93.0° F. Immokalee maintains a warm tropical climate typically 9 months out of the year. These temperatures reduce aircraft performance, causing an increase in aircraft take-off distance required. The runway length evaluation in Section 3.3 takes into account elevated temperatures in its graphed calculations. In order to verify these results, individual aircraft performance charts for aircraft operating at IMM were evaluated in ISO standard take-off conditions, and adjusted for an 85-degree day.

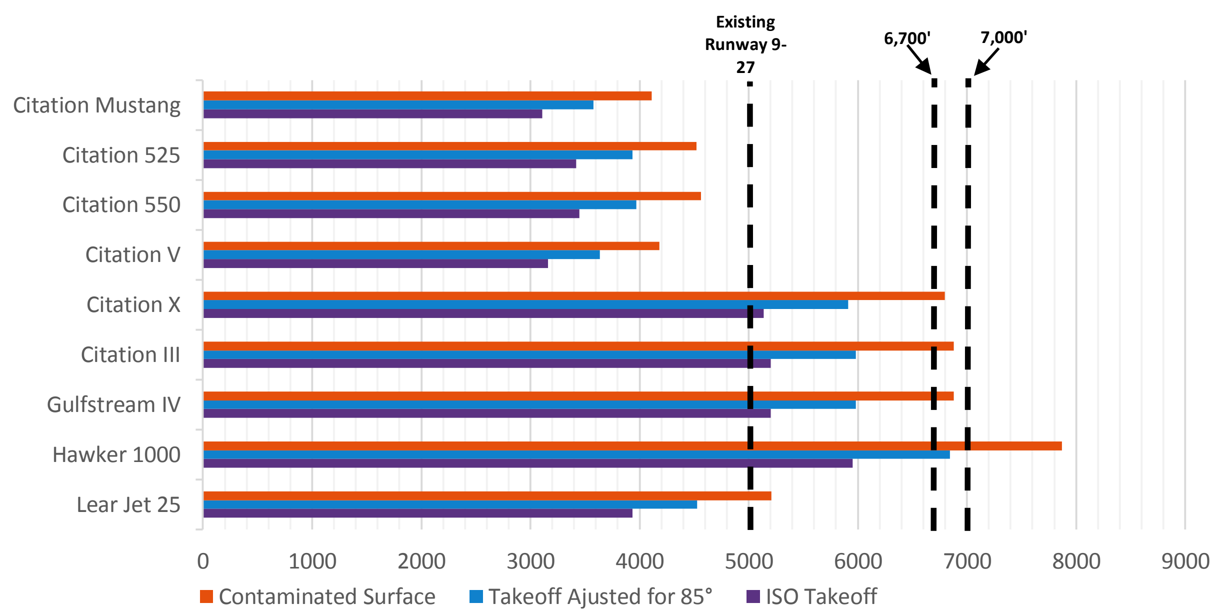
These results of this analysis are compiled in **Figure 3**. As seen in **Figure 3**, performance is consistent on hot days in the studied aircraft. Additional runway lengths required on an 85-degree day ranged from 14% to 19% in most aircraft.  Extending the Runway to 6,700 feet as calculated using 150/5325-4B would allow for most of the surveyed aircraft to depart Immokalee on a typical 85-degree day with limited load restrictions.

## A.4. Runway Length Adjustments for Contaminated Surface

The Runway lengths which are derived from **Figure 2** and **Figure 3** are based on a dry, zero effective gradient runway scenario. Typically, when using AC 150/5325-4B, adjustments are made to the findings to compensate for contaminated and sloping runway surfaces. The effective gradient on Runway 9-27 at Immokalee is extremely small (0.1. %), therefore no adjustment is necessary to combat effective gradient. However, IMM receives on average 49.8 inches of rainfall per year, therefore some of the aircraft which operate at IMM are limited in operational capabilities and payload due to runway surfaces frequently being contaminated by rainfall. Therefore, adjustments have been made to the runway length numbers obtained in **Figures 2 and 3** to compensate for runway contaminates.

AC 150/5325-4B Section 304.b. defines the methodology for runway length adjustment for wet and slippery runways. This section states “By regulation, the runway lengths for turbojet powered airplanes obtained from the ’90 percent useful load’ curves are also increased by 15 percent or up to 7,000 feet (2,133 meters), whichever is less.”

When this 15 percent adjustment is applied to the 6,700-foot recommended runway length for 75 percent at 90 percent useful load calculated in **Section 3.3**, a length of 7,705 feet is obtained. However, according to 150/5300-4B, the wet and slippery runway adjustment factor is capped at 7,000 feet. Therefore, a runway length of 7000 at IMM feet is recommended in order to accommodate the increasing jet traffic at IMM.



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