

## CHAPTER FOUR

# Airport Capacity and Facility Needs

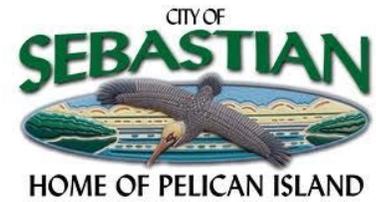
### Chapter Overview

This chapter evaluates airspace, airfield and landside capacity and facility needs for the Airport based upon the critical aircraft, forecast demand, emerging trends in aviation as well as recommended and required facility design criteria. Sebastian Municipal Airport currently supports a variety of general aviation activities including flight training, recreation, skydiving, and air taxi operations. The Airport is also home to several light sport aircraft manufacturers. According to the most recent FAA Aerospace Forecast, demand for light sport aircraft is expected to remain strong for the next 20+ years. FAA forecasts strong growth not only for light sport aircraft but turbine engine aircraft as well. In reviewing historical, existing and anticipated operations based upon the business plans of on-site tenants at the Airport, these type of aircraft are and will continue to drive facility demand.

Using the FAA approved forecasts, airspace and airfield capacity was evaluated using guidance provided from FAA AC 150/5060-5, Airport Capacity and Delay, to determine annual service volume and capacity. Using the FAA's current methodology, the average Annual Service Volume for Sebastian Municipal Airport (X26) was approximately 252,000 operations. Applying the Annual Service Volume to annual forecast demand, showed that X26 has excess airspace and airfield capacity and can support greater demand than illustrated by the activity forecasts.

Since the FAA Demand Capacity advisory circular (AC) is in the process of being updated, the consulting team also applied some analysis recommendations contained in ACRP Report 79, Evaluating Airfield Capacity as well as ACRP Report 104, Defining and Measuring Aircraft Delay and Airport Capacity Thresholds, to evaluate airfield capacity. Using the methodologies outlined in the ACRP reports still show that the Airport can support additional capacity beyond forecast demand. Therefore, the City should

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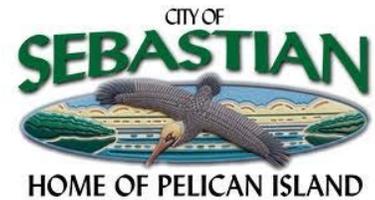


continue to market the airport and look for opportunities for additional compatible development.

Facility requirements were identified based upon forecast demand including based aircraft, operations, critical aircraft, etc. The facility requirements also considered the impacts and opportunities associated with emerging technology (i.e. NextGen, light sport aircraft, sport pilot’s license, unmanned aerial vehicles, etc.) as well as design requirements provided by both FAA and FDOT. Facility recommendations are briefly outlined in Table 4-1.

<b>TABLE 4-1 2037 FACILITY REQUIREMENTS SUMMARY</b>	
Airport Facility	2037 Demand
<b>Hangar Demand:</b>	
<b>Shade Hangar</b>	40
<b>T-Hangar</b>	36
<b>Corporate/Box Hangar</b>	8
<b>Conventional Hangar</b>	4* (development is driven by business demand)
<b>Apron Tie-Down</b>	
<b>Based aircraft tie-downs</b>	7
<b>Transient aircraft tie-downs</b>	2* (Based upon peak hour demand)
<b>Fuel Demand (14 day peak fuel demand)</b>	
<b>100 LL</b>	2,656 gallons
<b>Jet A</b>	17,935 gallons
<b>Terminal Building Area</b>	4,050 SF
<b>Auto Parking Spaces (Peak Hour Demand)</b>	113
<b>Support Facilities:</b>	
<b>Airfield Fencing/Security</b>	Relocate and possible expansion depending upon recommended development
<b>Roadway Access</b>	Expansion
<b>Utilities</b>	Extend and expand lines to support planned development (water, sewer, electricity, phone/cable, etc.)

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**TABLE 4-1  
2037 FACILITY REQUIREMENTS SUMMARY**

Airport Facility	2037 Demand
<b>Land Acquisition</b>	To support runway approach and departure protection zones.
<b>Obstruction Mitigation</b>	Remove trees and add obstruction lighting as needed to immovable objects

*Source: TKDA 2017*

A runway length analysis was also performed for Runway 10-28 and 5-23. However, neither require an extension to support forecast demand during the twenty year planning period. Further, since aircraft engines are becoming more efficient and quieter, more advanced aircraft are able to operate on shorter runways. These improved efficiencies have opened up airports to new traffic and provides greater operational efficiencies.

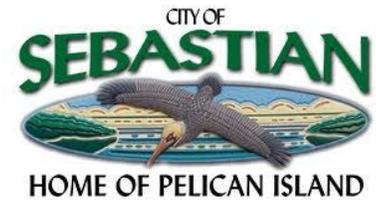
The detailed discussion of the airport demand capacity evaluation and facility needs are provided in the following paragraphs. This information provides the baseline for recommended development options provided in **Chapter 5, Airport Alternatives and Recommended Development**.

## Airport Demand Capacity Analysis

Demand/capacity analysis is important to determine if the existing airfield configuration can accommodate future demand. By comparing the theoretical operational capacity with projected operations levels, the type and timing of airfield capacity improvements can be estimated.

Airport capacity is defined by the Federal Aviation Administration (FAA) as an estimate of the number of aircraft that can be processed through the airfield system during a specific period, with acceptable levels of delay. Estimates of existing airfield capacity at COI were developed in accordance with the methods presented in **FAA Advisory Circular (AC) 150/5060-5, Airport Capacity and Delay**. This methodology does not account for every possible situation at an airport, but rather the most common situations observed at U.S. airports when this AC was adopted.

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The capacity AC provides a methodology for determining the hourly runway capacity, the annual service volume (ASV) and average expected delays. Each of these factors was calculated for existing conditions and for key years over the 20-year planning period. An airport’s hourly runway capacity expresses the maximum number of aircraft that can be accommodated under conditions of continuous demand during a one-hour period. It should be noted that the hourly capacity cannot be sustained for long periods or an airport will experience substantial increases in delay. The ASV estimates the annual number of operations that the airfield configuration should be capable of handling with minimal delays. The ASV considers that over a 12-month period a variety of conditions are experienced, including periods of high volume and low volume activity. The average anticipated delay was based on a ratio of the forecast demand to the calculated ASV. These calculations were based upon the airfield configuration as well as operational and meteorological characteristics, which are described in detail within the following sections.

## Airspace Capacity

Airspace capacity is an essential element of any airport, especially with respect to maintaining existing and proposed operational characteristics. As noted in **Chapter 2, Existing Conditions**, the airspace surrounding X26 is Class G. Class G airspace extends from the airport surface to 700 feet above ground level (AGL). Class E airspace covers an area outside of the Class D with a floor elevation of 700 feet above ground level (AGL) and continues upward until it meets Class A airspace as shown in **Figure 4-1**.

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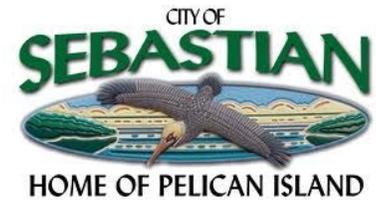


Figure 4-1  
U.S. Airspace Classes



Source: FAA Pilot's Handbook of Aeronautical Knowledge, 2008.

As illustrated in **Figure 4-2**, Airspace Sectional, X26 is located north of Vero Beach Regional Airport's Class D airspace and under the Glass G umbrella. Several miles east of the airport is a military restricted area, designated W-497B, and to the west is the Marianna Military Operating Area (MOA) used by Avon Park. Flying directly north, aircraft will enter Melbourne International Airport Class D airspace.

There is no Terminal Radar Approach Control (TRACON) at Sebastian Municipal Airport. The main function of a TRACON is to control the airspace around airports with high traffic density. The TRACON area of coverage is approximately 35-mile radius from the airport. In the case of X26, the closest TRACON is the Central Florida TRACON, designated F11, located in Orlando Florida. The Miami Air Route Traffic Control Center (MIA ARTCC) controls all air traffic enroute to or from the Sebastian Airport area. Since the last Master Plan Update, the capacity of the airspace surrounding X26 has remained unchanged. Unless the level and type of operations changes, it is anticipated that current airspace capacity will continue to accommodate operations at X26 throughout the 20-year planning period.

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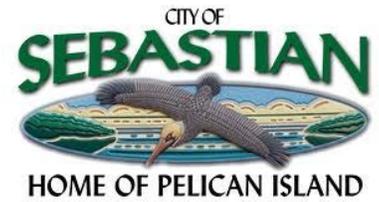
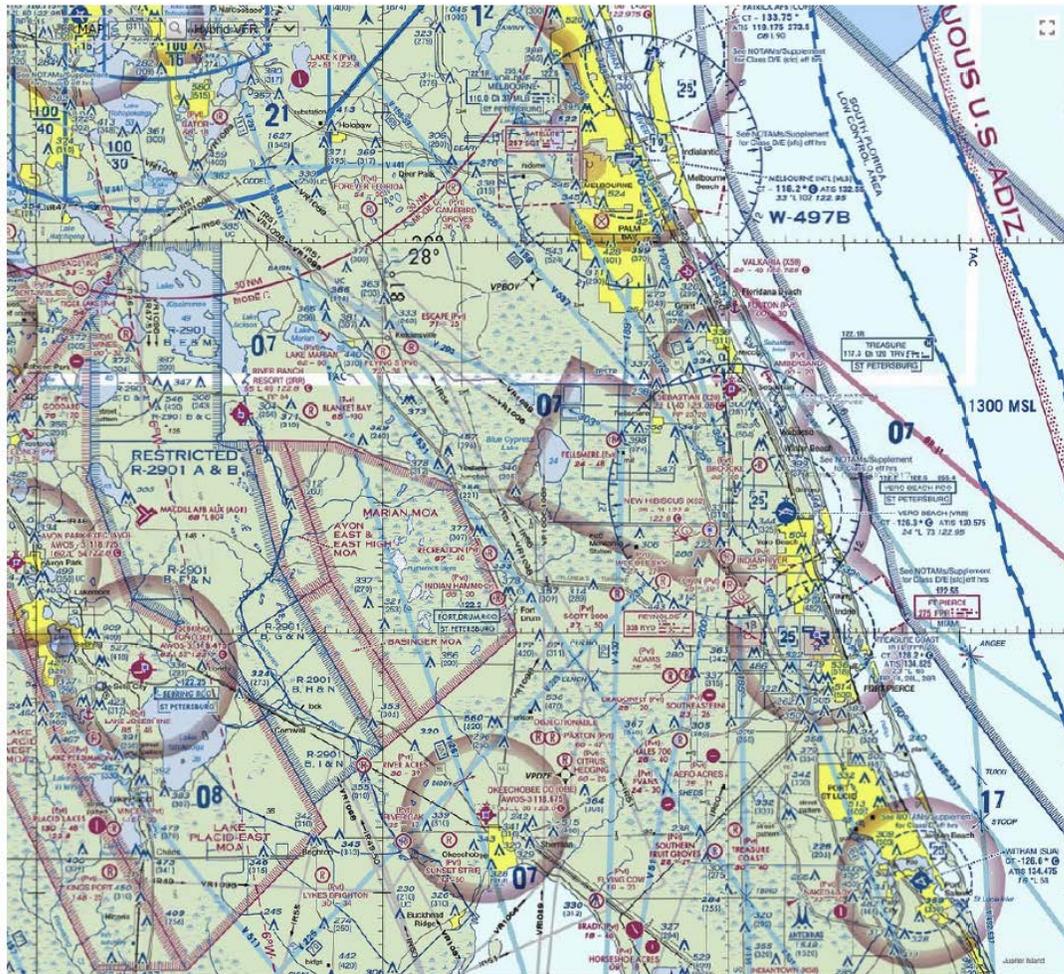
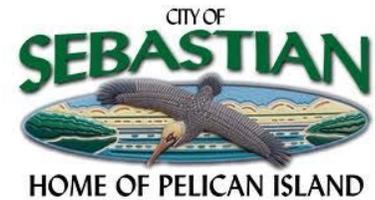


FIGURE 4-2  
SECTIONAL MAP



Source: FAA Miami VFR Sectional Map, 2017

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## Airfield Capacity Methodology

The primary determinant of airport capacity is the airfield configuration. Runways are used for aircraft to arrive and depart from the airport, while taxiways enable aircraft to maneuver to and from runways and landside facilities, such as hangars and apron areas. The number of operations that an airport can accommodate is dependent upon how quickly aircraft can move to or from active runways. The runway and taxiway configuration at X26 is further discussed within the following sections.

## Airfield Characteristics

In addition to the aviation activity forecasts, identification of existing and future airfield characteristics and operational conditions are required to accurately determine airport annual service volume for the twenty-year planning period. Elements that affect an airfield's capacity include:

- Runway configuration;
- Taxiway configuration;
- Aircraft mix index;
- Operational characteristics; and
- Meteorological conditions.

## Runway Configuration and Utilization

As noted in **Chapter 2**, the Airport is equipped with two runways: Runway 5-23 and 10-28. Runway 5-23 has dimensions of 4,023 x 75 feet and has a published pavement strength of 22,000 lbs. single wheel. The runway is equipped with Precision Approach Path Indicator, 2-box lighting system (PAPI-2) on each end as well as low intensity runway lighting (LIRLs). The runway is marked to support non-precision instrument approaches (NPI), and both Runway 5 and 23 support Global Positioning System (GPS) Area Navigation (RNAV) approaches with no less than 1-mile visibility.

Runway 10-28, which previously was a taxiway, provides crosswind coverage and has dimensions of 3,199 x 75 feet. The runway pavement strength is unpublished, so it was assumed to support aircraft with gross weights of 12,500 lbs. or less. Runway 10-28 is also equipped with 2-box PAPIs on either end, but is not equipped with any edge lighting. The runway is marked as "basic," and it supports visual approaches only, which

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requires a cloud ceiling at or above 1,000 feet AGL and visibility of three miles or greater at the airport. **Figure 4-3** provides a graphical depiction of the current airfield layout.

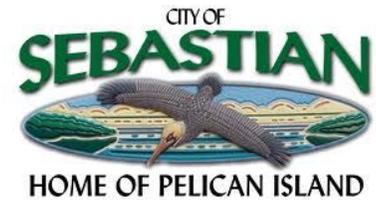
**FIGURE 4-3  
AIRFIELD LAYOUT**



*Source: FDOT Airport Directory, 2017*

Two runways were closed and converted to taxiways or apron during or soon after completion of the prior master plan update. Former Runway 18-36 located on the west side of the airfield was converted into Taxiway A and associated aprons. Since the 2002 Master Plan update, Runway 13-31 was closed since it did not provide 95 percent wind coverage at 10.5 knots in conjunction with Runway 5-23. The pavement is currently in poor condition, and a discussion of reuse for proposed development is provided in Chapters 5-8 of this report.

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A crossing runway configuration as shown in Figure 9 of **FAA AC 150/5060-5**, *Airport Capacity and Delay*, was used to calculate the appropriate capacity levels based upon existing and forecast operations. According to the AC, the standard airport service volume (ASV) for this type of runway configuration is 230,000 operations. However, according to the 2004 Florida Aviation System Plan, the capacity for X26 was calculated as 172,500 operations. For this reason as well as changes in aircraft type, the ASV was recalculated.

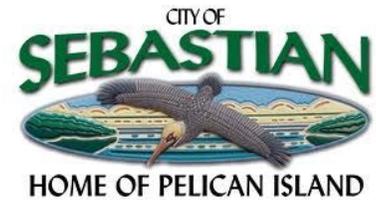
## Taxiway Exits

The distance between taxiway locations and runway ends contributes to airfield and aircraft delays. The longer an aircraft occupies the runway, the more delay will be created for aircraft waiting to land or depart. Additional taxiway connectors allow landing aircraft to clear the runway quicker. Conventional taxiways have a 90° angle to the runway and require slower aircraft speeds to access, while high-speed connectors form an acute angle with the runway thus decreasing runway occupancy by allowing aircraft to continue roll out onto the taxiway without having to slow to less than 20 knots.

The current airfield configuration as of August 25, 2017 includes a full parallel taxiway to Runway 10-28 (Taxiway B) as well as a full apron edge taxiway located on the west side of the airfield designated Taxiway A. Taxiway A connects development to the northeast to threshold of Runway 10 and Runway 5. The Airport also has taxiway pavement connecting the threshold of Runway 23 to the former Runway

However, during this master plan process, Taxiways C, D and E were designed and construction is set to begin in Fiscal Year 2018. Taxiway C is being constructed on the north side of Runway 5-23 and will provide full parallel coverage. Taxiway D runs perpendicular to the south side of Runway 5-23 to provide access to corporate and conventional hangar development. Taxiway E provides a connection between Runway thresholds 28 and 23. Existing and proposed taxiway exit locations are provided in **Table 4-2**.

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**TABLE 4-2  
TAXIWAY EXITS**

Taxiway Connector	Distance From			
	Runway 5 Threshold	Runway 23 Threshold	Runway 10 Threshold	Runway 28 Threshold
<b>Existing Taxiways*</b>				
Taxiway A	~241 ft.	~3782 ft	0 ft	3,199 ft
Taxiway C-1	~0 feet	~4,199 ft	NA	NA
Taxiway C	NA	NA	~1564 ft	~1635 ft
Closed Runway/Taxiway B1	~2797 Ft.	~1226 Ft	~1836 ft	~1363 FT
Taxiway B-2	NA	NA	3199 feet	0 ft
Former Taxiway E	~3793 ft	~230 ft	NA	NA
Runway Intersection	~2739 ft	~1284 ft	~1890 ft	~1309 ft
<b>New Taxiways (Design/Construction 2018)</b>				
Taxiway C-2	~1284 ft	~2739 ft	NA	NA
Taxiway C-3	~2135 ft	~1888 ft	NA	NA
Taxiway C-4	~4199 ft	~0 ft	NA	NA
Taxiway D	~2342 ft	~1681 ft	NA	NA
Taxiway E	NA	NA	3,199 ft	0 ft
<i>Sources: Infrastructure Consulting and Engineering (ICE) Design and TKDA 2017</i>				

The taxiway exit factor is maximized when a runway has approximately 4 exit taxiways within a specific range based upon the runway critical aircraft. For crossing runways (Figure 9, FAA AC 150/5060-5) serving a mix index between 0% and 20%, taxiway exit factors ranged from 2,000 to 4,000 feet.

## Aircraft Mix Index

The mix index is calculated with the following formula:  $\%(C+3D)$ , where Class C represents aircraft with certified Maximum Takeoff Weight (MTOW) ranging from 12,500 to 300,000 pounds and Class D represents aircraft with MTOW greater than 300,000 pounds. Aircraft operating at X26 consist of a combination of Class A, B and C aircraft as illustrated in **Figure 4-3**.

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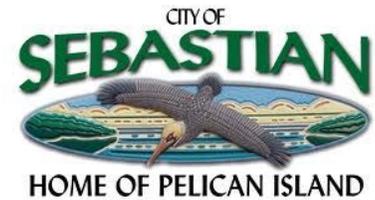


TABLE 4-3 AIRCRAFT DEMAND/CAPACITY CLASSIFICATIONS		
Aircraft Classification	Description	Sample Aircraft
<b>Class A</b>	Small Single Engine Aircraft with Maximum Gross Weights of 12,500 lbs. or less	<p><b>Piper P-28</b></p> 
<b>Class B</b>	Small Multi-Engine Aircraft with Maximum Gross Weights of 12,500 lbs. or less	<p><b>DHC-6 Twin Otter</b></p> 
<b>Class C</b>	Large Aircraft with Maximum Gross Weight of more than 12,500 lbs. but less than 300,000 lbs.	<p><b>Beech King Air 350i</b></p> 

*Sources: Airport Manufacturer Data, Sebastian Airport Records, and TKDA 2017*

Based upon the fleet mix forecasts identified in **Chapter 3**, the mix index used to determine the airport service volume was: 4% in 2017 based upon current operations by DH6-300-600 and B200D and 9% in 2037 based upon anticipated operations by DH6, B200D, B350i and Phenom 300.

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## Operational Characteristics

The operational characteristics that can affect an airfield capacity include percentage of aircraft arrivals, sequencing of aircraft departures, and percentage of touch-and-go operations.

### Percentage of Aircraft Arrivals

The percentage of aircraft arrivals is the ratio of landing operations to the total operations of the airport. Arriving aircraft require greater runway occupancy time than departing aircraft. For general planning purposes, 50 percent of arrivals were utilized as an estimate to determine the capacity at X26.

### *Percentage of Touch-and-Go Operations*

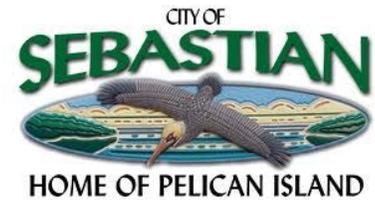
Touch-and-go operations are aircraft that land and, without stopping on the runway, take off again on the remaining runway. Touch-and-go operations are counted as one landing and one takeoff (i.e., two operations) and are normally associated with flight training activities. FAA guidelines for calculating ASV require an estimate of the percentage of touch-and-go operations occurring at the airport.

Based upon discussions and observations of flight training operations associated with Flight Safety, Paris Air, and Florida Institute of Technology, all of whom use X26 for training operations, touch-and-go operations represent approximately 40 percent of total operations resulting in a VFR Touch and Go factor of 1.40. IFR Touch and Go operations do not currently nor are expected to occur at X26 through the planning period; therefore, the Touch and Go factor for IFR operations was 1. These percentages were utilized in the calculation of the ASV and was anticipated to remain consistent throughout the planning period.

### *Runway Utilization Percentage*

The current airfield configuration consists of two runways: 5-23 and 10-28. Runway utilization from observations was determined as: 26 percent Runway 5; 21 percent Runway 23; 34 percent Runway 10; and 19 percent Runway 28. The airport experiences IFR conditions only 2 percent of the time, during which 60 percent of operations occur on Runway 5, and 39 percent of operations utilize the circling approach to Runway 23. The remaining 0.5 percent of the time, the airport experiences weather minimums below IFR capabilities when aircraft traffic is unable to operate at the airport.

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## Meteorological Conditions

According to weather data obtained from the National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Centers<sup>1</sup> and operational data obtained from airport operations, historical runway utilization was approximately:

- 26 percent VFR operations on Runway 5;
- 21 percent VFR operations on Runway 23;
- 34 percent VFR operations on Runway 10
- 19 percent VFR operations on Runway 28
- 60.5 percent of IFR operations on Runway 5
- 39 percent of IFR operations on Runway 23; and
- Meteorological conditions are below operating minima approximately 0.5 percent annually at which point the airport is officially closed.

Meteorological conditions influence the capacity for the airfield. Runway utilization at airports typically is determined by wind conditions, as aircraft must land and take off into the wind for optimal aircraft performance, while cloud ceiling and forward visibility dictates approach spacing requirements. The following operational conditions are an element of calculating airport capacity:

- Visual Flight Rules (VFR) – Cloud ceiling is greater than 1,000 feet above ground level (AGL) and the visibility is at least three statute miles;
- Instrument Flight Rules (IFR) – Cloud ceiling is at least 600 feet AGL but less than 1,000 feet AGL and/or the visibility is at least half a statute mile but less than three statute miles; and
- Poor Visibility and Ceiling (PVC) – Cloud ceiling is less than 500 feet AGL and/or the visibility is less than half a statute mile.

VFR, IFR and All Weather wind roses are provided in **Figures 4-4** through **4-6**, respectively. Runway 5-23 and 10-28 are required at X26 to provide 95 percent wind coverage to support smaller aircraft operations. As noted in Figures 4-4 through 4-6, this was calculated using a 10.5 knots crosswind component to address smaller and

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<sup>1</sup> Station: Sebastian Station GHCND: US1FLIR0019, NOAA National Climatic Center, October 2008 through August 2017.

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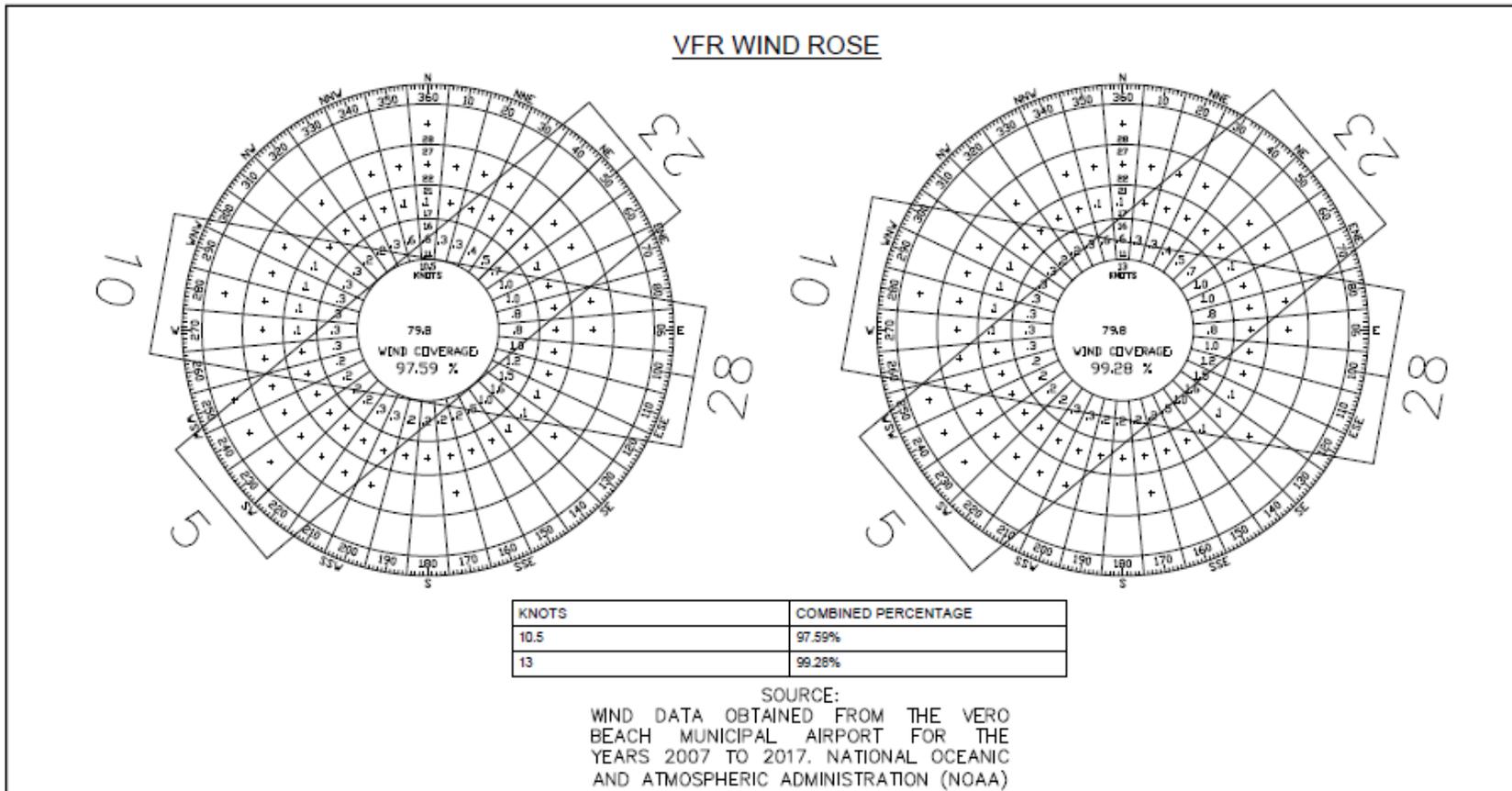
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lighter (less than 12,500 lbs.) aircraft needs as well as for a 13 knot crosswind component. The 13 knot crosswind component was used to identify potential impacts to larger and heavier aircraft.

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FIGURE 4-4



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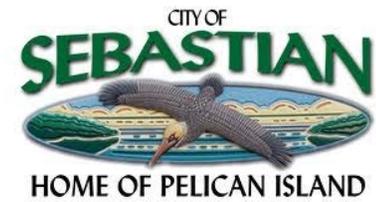
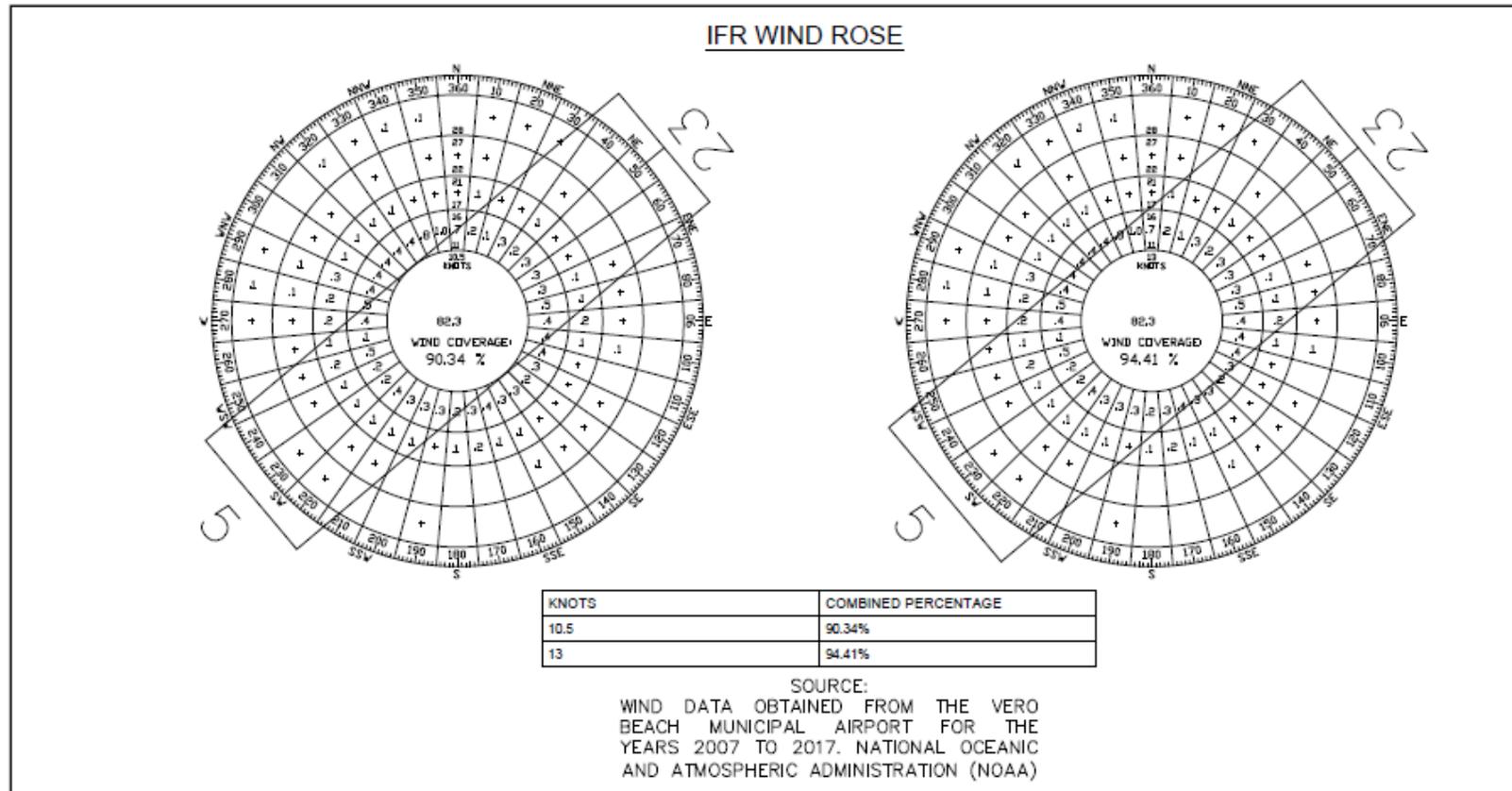
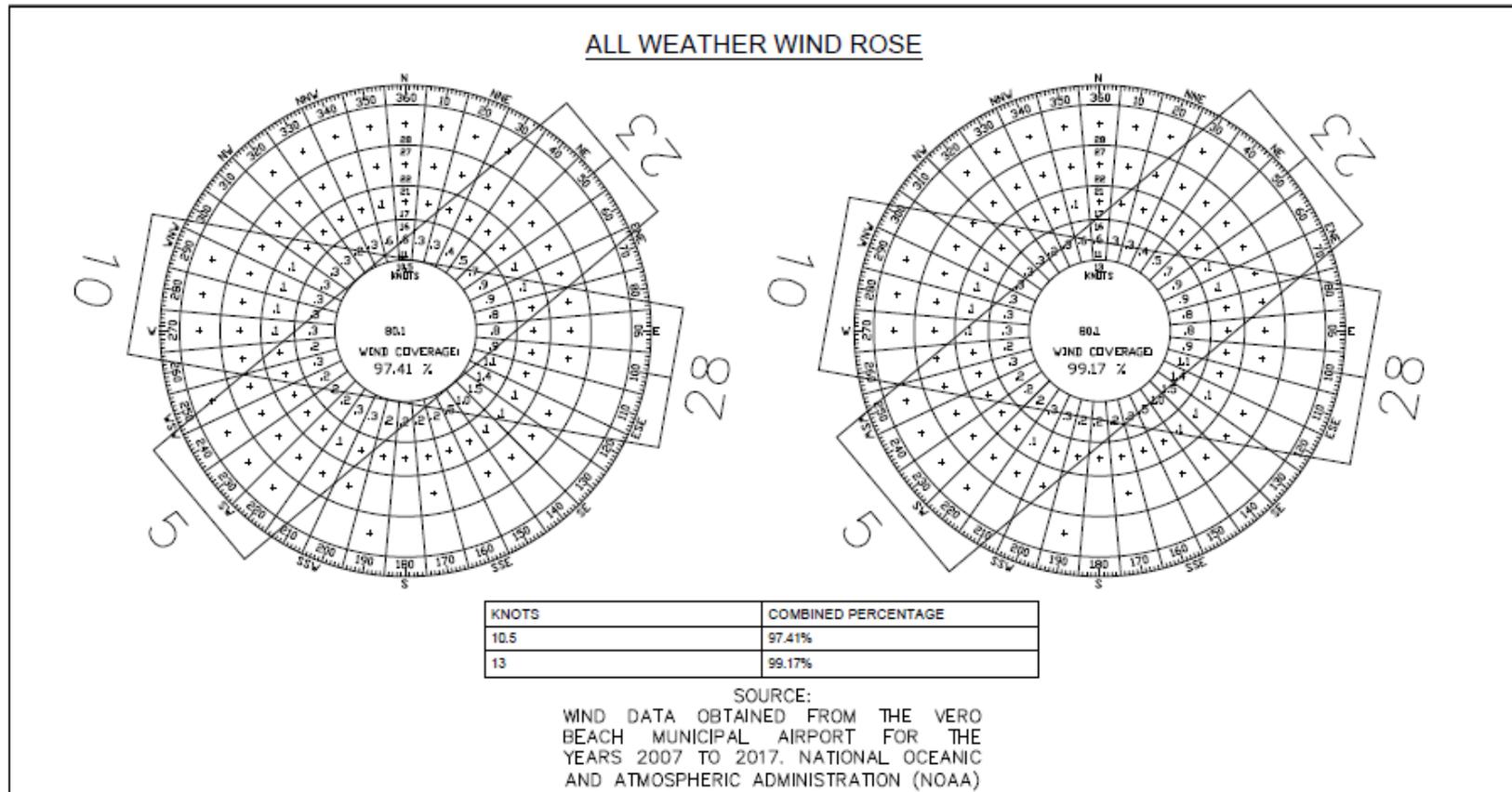


FIGURE 4-5

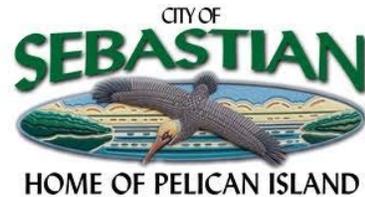


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FIGURE 4-6



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X26 has an RNAV/GPS published instrument approach to both Runway 5 and 23. Runway 5's GPS/RNAV approach allows for Localizer Performance (LP) Minimum Descent Altitude (MDA) minima of 380 feet above ground level (AGL) and Lateral Navigation (LNAV) MDA of 400 feet AGL, both with forward visibility of one mile. Runway 23 is also equipped with both LP and LNAV approaches. However, the LP MDA on Runway 23 is 380 AGL and the LNAV MDA is 480 AGL primarily related to some obstructions within the approach. Both approaches have a 1 statute mile visibility requirement or greater depending upon aircraft design category (A, B, C or D).

According to NOAA Weather Data obtained for the area, X26 experiences VFR conditions approximately 97.5 percent of the time, IFR 2.0 percent and below IFR minimums 0.5 percent of the time. When the meteorological conditions are below these minimums, aircraft are unable to depart or land.

## Airfield Capacity

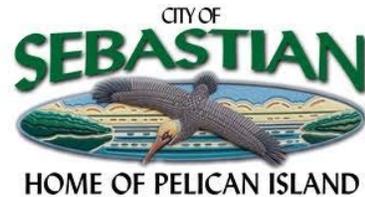
The preceding airfield characteristics were used in conjunction with the methodology outlined in **FAA AC 150/5060-5** to determine airfield capacity. As mentioned previously, this FAA methodology generates the hourly capacity of runways and the annual service volume for measuring airfield capacity.

Using the guidance outlined, **Figure 9** in Chapter 4 of AC 150/5060-5 represents the current and future airfield runway design at the Airport. Generally, the airport capacity of this orientation is approximately 230,000 operations. However, as noted earlier, the airport capacity analysis provided within the 2004 Florida Aviation System Plan published an ASV of 172,500 operations. Considering the differentiation and the anticipated change in the fleet mix, a new VFR and IFR hourly capacity and ASV was determined using the data provided in Chapter 3 of **FAA AC 150/5060-5**.

## Hourly Runway Capacity

Hourly runway capacity measures the maximum number of aircraft operations that can be accommodated by the runway configuration in one hour. Based on the FAA methodology, hourly capacity for runways is calculated by analyzing the appropriate VFR and IFR figures for the airport's runway configuration. From these figures, the aircraft mix index and percent of aircraft arrivals are utilized to calculate the hourly capacity base. A touch and go factor is also determined based on the percentage of

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touch and go operations combined with the aircraft mix index. These figures also consider the taxiway exit factor.

For both VFR and IFR conditions, the hourly capacity for runways is calculated by multiplying the hourly capacity base, touch-and-go factor, and taxiway exit factor. This equation is:

$$\text{Hourly Capacity} = C^* \times T \times E$$

where:            C\*     = hourly capacity base  
                      T     = touch and go factor  
                      E     = exit factor

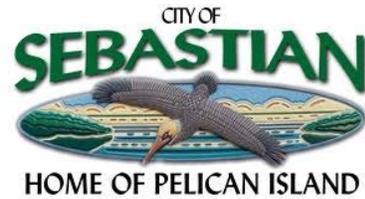
Sebastian Airport's current and future airfield configuration consists of two crossing runways (5-23 and 10-28). Using this configuration, illustrated in Figure 4-9 in the Advisory Circular, along with the existing and future aircraft fleet mix, the hourly base capacity for VFR operations is 98 and 59 for IFR operations. Since no physical changes are expected to be made to the runway configuration over the planning period, this configuration is used for the hourly capacity calculations throughout the entire planning period. Anticipated hourly capacity for IFR and VFR operations based upon existing and long-term forecast demand is illustrated in **Tables 4-4 and 4-5**, respectively.

This data was then used to determine the weighted hourly capacity for 2017 and 2037. Weighted hourly capacity (Cw) is calculated as follows:

$$C_w = \{(C_1 \times W_1 \times P_1) + (C_2 \times W_2 \times P_2) \dots + (C_n \times W_n \times P_n)\} \div \{(W_1 \times P_1) + (W_2 \times P_2) \dots + (W_n \times P_n)\}$$

Where:            C = hourly capacity  
                      W = weighted factor  
                      P = percent of runway use

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Weighted hourly capacity was calculated for the base year (2017) and final forecast year (2037) illustrated in **Tables 4-4 and 4-5**, respectively.

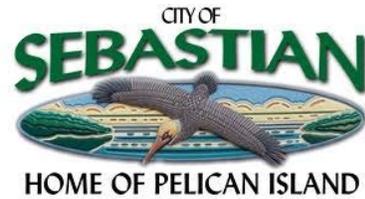
TABLE 4-4 2017 HOURLY CAPACITY MATRIX CALCULATIONS							
Runway Use Condition	Hourly Capacity Base (C*)	Touch and Go Factor (T)	Exit Rating (E)	Hourly Capacity	Weight Factor (W)	Percentage Use (VFR)	Percentage Use (IFR)
5 VFR	98	1.40	0.84	115.248	1	26%	0
5 IFR	59	1.00	1	59	1		60.50%
23 VFR	98	1.40	0.84	115.248	1	21%	0
23 IFR	59	1.00	1	59	1		39.00%
10 VFR	98	1.40	0.92	126.224	1	34%	0
28 VFR	98	1.40	0.92	126.224	1	19%	0.00%
Closed	0	0.00	0	0	4		0.50%

*Sources: AC 150/5060-5, Aircraft historical data, aircraft observation (January and April 2017) and TKDA*

TABLE 4-5 2037 HOURLY CAPACITY MATRIX CALCULATIONS							
Runway Use Condition	Hourly Capacity Base (C*)	Touch and Go Factor (T)	Exit Rating (E)	Hourly Capacity	Weight Factor (W)	Percentage Use (VFR)	Percentage Use (IFR)
5 VFR	98	1.40	0.92	126.224	1	26%	0
5 IFR	59	1.00	1	59	1		60.50%
23 VFR	98	1.40	0.92	126.224	1	21%	0
23 IFR	59	1.00	1	59	1		39.00%
10 VFR	98	1.40	0.92	126.224	1	34%	0
28 VFR	98	1.40	0.92	126.224	1	19%	0.00%
Closed	0	0.00	0	0	4		0.50%

*Sources: AC 150/5060-5, Aircraft historical data, aircraft observation (January and April 2017) and TKDA*

# Sebastian Municipal Airport Master Plan Update



Thus, based upon existing and anticipated demand and runway utilization, weighted hourly capacity for 2017 was calculated at 89.2 and for 2037 at 91.78. This data was then used to determine airport service volume at Sebastian Airport through the twenty year planning period.

## Annual Service Volume

The most important value to be computed in order to evaluate the throughput at an airport is the ASV. ASV represents an estimate of the number of annual operations that the airport can support without undue delay. ASV is not an absolute capacity limit for the airport, but an average based on one year’s worth of meteorological conditions and operational conditions. ASV is calculated by multiplying the weighted hourly capacity for each runway configuration,  $C_w$ , with average daily demand during the peak month,  $D$ , and average peak hour demand during the peak month,  $H$ , as follows:

$$\text{Annual Service Volume} = C_w \times D \times H$$

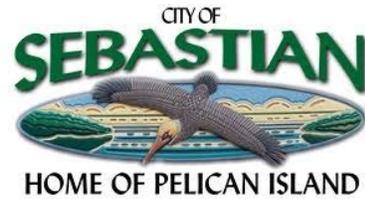
- where:
- $C_w$  = weighted hourly capacity
  - $D$  = ratio of annual operations to average daily operations during the peak month
  - $H$  = ratio of average daily operations to average peak hour operations during the peak month

TABLE 4-6 ANNUAL SERVICE VOLUME AND DEMAND						
Year	Cw	D	H	ASV	Annual Ops	% Capacity
2017	89.21601985	326.4926471	8.5	247,591	44,403	18%
2018	89.21601985	325.9928058	8.6875	252,665	45,313	18%
2022	91.77617866	326.5533333	8.333333333	249,748	48,983	20%
2027	91.77617866	325.097561	8.631578947	257,534	53,316	21%
2032	91.77617866	325.6123596	8.476190476	253,298	57,959	23%
2037	91.77617866	326.0621762	8.391304348	251,108	62,930	25%

*Sources: Historical Airport Records and TKDA 2017*

Using the FAA methodology, demand that approaches the calculated ASV likely will result in airfield delays. Several projects that would increase the capacity at an airport

# Sebastian Municipal Airport Master Plan Update



are eligible for funding from the FAA. According to FAA **Order 5090.3C**, *Field Formulation of the National Plan of Integrated Airport Systems (NPIAS)*, this eligibility is achieved once the airfield has reached 60 percent of its current capacity. This allows improvements to be planned and made before demand levels exceed the capacity of the facility thereby avoiding lengthy delays. Typical trigger points for planning and environmental projects is 60 percent of capacity and 80 percent capacity for design and construction.

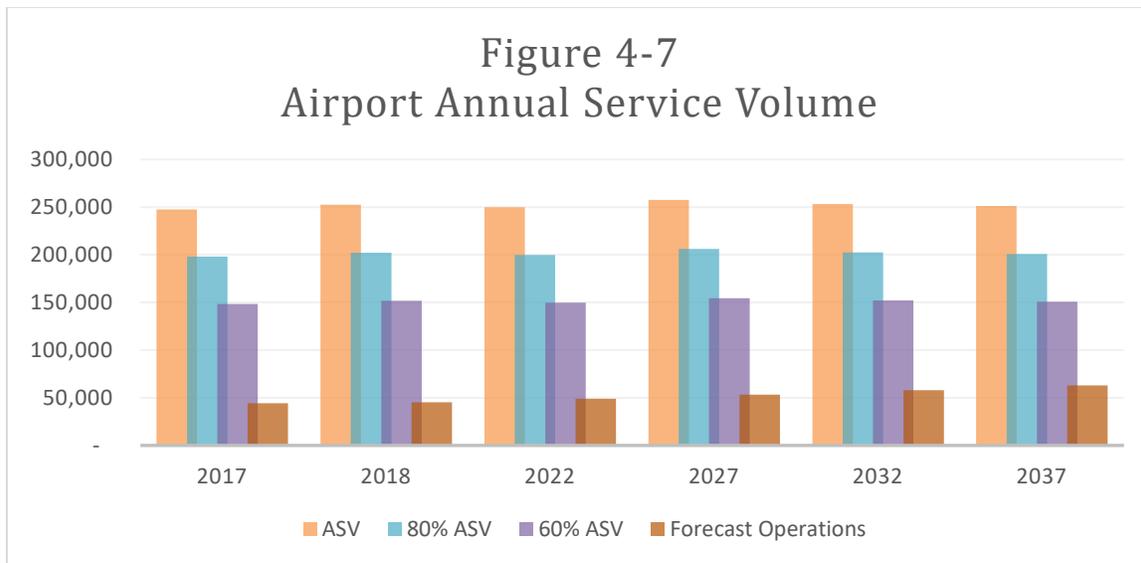
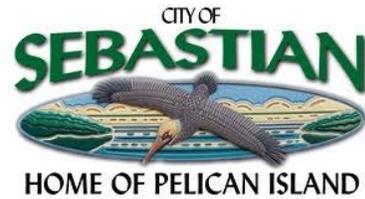
Future capacity levels for the airport were calculated based on the forecast annual operations and the calculated ASV. These levels are depicted in **Table 4-7** and are shown graphically in **Figure 4-7**.

TABLE 4-7 ANNUAL SERVICE VOLUME					
Year	Annual Operations	Annual Service Volume	60% Capacity Level	80% Capacity Level	Current Airport Capacity Level
<b>Base Year</b>					
<b>2017</b>	44,403	247,591	148,555	198,073	18%
<b>Forecast Years</b>					
<b>2018</b>	45,313	252,665	151,599	202,132	18%
<b>2022</b>	48,983	249,748	149,849	199,799	20%
<b>2027</b>	53,316	257,534	154,520	206,027	21%
<b>2032</b>	57,959	253,298	151,979	202,638	23%
<b>2037</b>	62,930	251,108	150,665	200,886	25%

*Sources: Historical Airport Data and TKDA 2017*

Based on capacity levels as presented in **Table 4-7**, the airfield capacity at X26 is not expected to exceed the ASV throughout the twenty-year planning period. Since X26's property boundary is constrained and is sensitive to community goodwill, any additional capacity projects will relate closely to preserving and enhancing existing airfield infrastructure elements. **Chapter 5, Alternatives Analysis**, will outline in more detail projects that are associated with enhancing airside and landside improvements at X26.

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## Annual Aircraft Delay Estimates

The average anticipated delay is based upon a ratio of the forecasted demand to the calculated ASV. This ratio is used as a guide for planning future airfield improvements. The FAA acknowledges in **FAA AC 150/5060-5** that the level of delay that is acceptable to a particular airport may differ from the level deemed acceptable at a similar airport. It is important to note that it is not only the delay time that determines acceptability, but also the frequency of these delays.

Several methods exist for estimating anticipated delay levels. One method involves using a variety of charts in **FAA AC 150/5060-5** to estimate the average delay per aircraft based upon the ratio of annual demand to ASV. This delay per aircraft would then be used to calculate the annual delay for all operations. Another method utilizes software developed by the FAA (*Airport Design Software, Version 4.2d*) to determine the projected delay values. For this study, the anticipated delay, presented in **Table 4-8**, was determined using the FAA software. The increase in anticipated delay is related to the increasing number of operations throughout the planning period.

# Sebastian Municipal Airport Master Plan Update

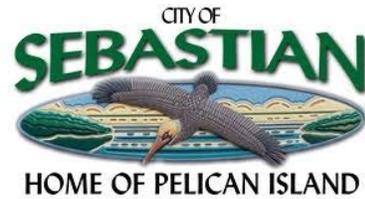


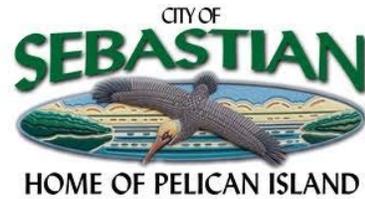
TABLE 4-8 ANNUAL AIRCRAFT DELAY		
Year	Average Delay per Aircraft (Minutes)	Total Annual Delay (Hours)
<b>Base Year</b>		
2017	1.2577	0.0017
<b>Forecast Years</b>		
2018	1.2837	0.0017
2022	1.5312	0.0019
2027	2.3436	0.0026
2032	2.9439	0.0030
2037	3.6880	0.0035

*Sources: Historical Airport Data and TKDA 2017*

As indicated in **Table 4-8**, the average delays per aircraft remain low throughout the planning period. However, the delay projection at X26 considers an average delay based on hours the airport is operationally capable to accommodate aircraft, but may not reflect delay imposed to arriving and departing aircraft during peak periods. Therefore, delay calculations were developed to determine likely peak hour delays for arriving and departing aircraft during VFR and IFR conditions. Peak delay per aircraft operating during these times may be significantly higher. The impact that increasing delay imposes upon the airport is such that constraints, both on the ground and in the air, are compounded with increasing operational activity. Arrival and departure delays can be mitigated by decreasing aircraft runway occupancy time, by constructing additional taxiway exits at critical points along the runway. When aircraft are required to continue taxiing down the runway for the next available taxiway exit, runway occupancy time is increased and thus, hourly throughput capability of the runway is decreased.

**Table 4-9** highlights the anticipated delay which is still marginal. Therefore, capacity improvements related to airspace and airfield capacity demand only is not needed during the planning period based upon anticipated operations.

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**TABLE 4-9  
PEAK HOUR DELAY**

Year	Visual or Instrument Flight Conditions	Arrival Delay in Minutes	Departure Delay in Minutes	Hourly Delay in Minutes
2017	VFR	0.2	0.09	1.257748
2017	IFR	0	0	0
<b>Forecast Demand</b>				
2018	VFR	0.2	0.09	1.283695
2018	IFR	0	0	0
2022	VFR	0.22	0.1	1.531175
2022	IFR	0	0	0
2027	VFR	0.3	0.15	2.343606
2027	IFR	0	0	0
2032	VFR	0.35	0.17	2.943904
2032	IFR	0	0	0
2037	VFR	0.4	0.2	3.688018
2037	IFR	0	0	0

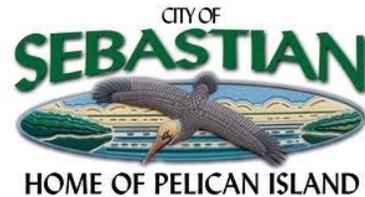
*Sources: Airport historical data and TKDA 2017*

## Summary

In estimating the capacity of the existing X26 operational areas, the primary elements of airfield capacity were examined to determine the airport's ability to accommodate anticipated levels of aviation activity. The results indicate that:

- Projected operations as a percent of total airfield capacity will grow from 18 percent to 25 percent over the planning period, indicating that the airfield has capacity to handle future operations;
- Airspace in the vicinity of the airport does have limitations for additional instrument approach procedures, but likely will accommodate future aviation activity through coordination among local military facility authorities, the FAA, and the surrounding community;
- Based upon wind data obtained from NCDC, the current airfield configuration of 5-23 and 10-28 provides the FAA-required 95 percent wind coverage during 13 knot crosswind conditions; and
- With planned and ongoing improvements to the existing taxiway system constraints and areas of congestion will be mitigated. Additional connectors will

# Sebastian Municipal Airport Master Plan Update



likely be added in the future to support continued airport growth. This is discussed in more detail in the remaining chapters of this master plan update.

## Facility Requirements

This section of the Master Plan Update identifies the airside and landside facility requirements for Merritt Island Airport. Airside facilities include runways, taxiways, navigational aids, airfield lighting, markings, signage, and are related to the arrival, departure, and ground movement of aircraft. Landside facilities provide an interface between the air and ground transportation methods and include general aviation terminal facilities, aircraft hangars, aircraft parking aprons, automobile parking and access as well as various airport support facilities.

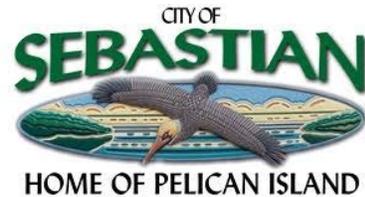
The facility requirements herein were developed in accordance with FAA and FDOT planning guidelines and are a result of on-site inspections and discussions with personnel from the Titusville-Cocoa Airport Authority (TICO Authority) and airport tenants. Whenever possible, the requirements were based upon forecasts of operational and based aircraft activity presented in **Chapter 3, *Forecasts of Aviation Activity***, of this report. Facility surpluses and deficits were identified for the base year 2007, and subsequently for every five years thereafter throughout the 20-year planning period (i.e., 2012, 2017, 2022, and 2027).

Approximately 15 requirements, as established in the Airport Improvement Program (AIP) Handbook, must be met for the Airport District Office (ADO) to even consider a project eligible for AIP funding. In general, a project must pass three basic tests as outlined in Table 3-4 in FAA Order 5100.38D:

- The project advances an AIP Policy contained in 49 CFR §47101;
- There is an actual need for the project within next 5 years including subcomponents as outlined in AC 150/5070-6, Airport Master Plans; and
- The project scope is appropriate as detailed in FAA Order 5100.39

Identification of likely projects including supporting environmental and planning requirements, as well as a full analysis of likely project costs and phasing, FAA and State

# Sebastian Municipal Airport Master Plan Update



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project priority funding criteria, and likely AIP eligibility and funding percentage if eligible is discussed in detail in Chapters 5, *Alternative Evaluation and Preliminary Implementation Plan*, and 8, *Recommended Implementation Plan and Financial Feasibility Analysis*. Projects that do not currently meet the test for FAA AIP eligibility, however, will still be provided along with alternative recommended timing and funding options to provide the sponsor and agencies a map to address future community and

## Airport Development Triggers

Airport development triggers, also known as planning activity levels (PALS), are driven by aircraft demand. When airport demand hits a certain level, typically 60 percent, 80 percent and 90 percent, it will trigger airport planning, infrastructure design and construction efforts, respectively. This allows the Sponsor and the Agencies to determine project funding eligibility, identify and address facilities needed to enhance airport safety, increase capacity, and support local and long-range planning. This Master Plan utilizes two types of development triggers: Activity-Based development triggers and Regulatory-Based development triggers. A detailed analyses of both activity and regulatory based needs are evaluated throughout this chapter.

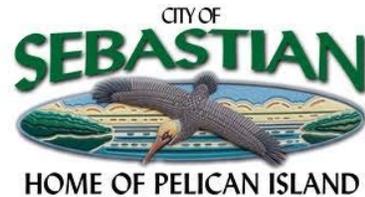
### Activity-Based Development Triggers

Triggers based on airport activity are needed to ensure an airport remains capable of serving the types of aircraft and visitors who currently and will likely operate at the airport through the end of the planning period. Activity based triggers are difficult to gauge since demand fluctuates as a result of outside forces (e.g. fuel prices, available infrastructure, airspace and airport capacity), and there are still no cost effective methods of tracking operations at small, general aviation airports. Therefore, consistent updates to the Master Plan data are essential to justify future airport infrastructure.

### Regulatory-Based Development Triggers

The second type of development triggers are those based on airport standards and recommended guidance established by various regulatory agencies, including FAA and FDOT. Regulatory-Based development triggers identify infrastructure that do not meet current design standards as well as infrastructure needs to comply with impending regulations. These triggers will also identify how and when these criteria need to be met for an airport to remain in compliance with operational and grant assurance requirements. For example, X26 current width of Taxiway A exceeds the taxiway width

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requirements as outlined in FAA AC 150/5300-13A. Therefore, as part of this master plan, reduction of the width of Taxiway A is recommended to allow more area for aircraft apron parking and movement.

## Emerging Trends

As part of the planning process, it is necessary to consider emerging trends in aviation and technology in an effort to capture opportunities for potential development at the airport. This may include changes to existing infrastructure as well as new infrastructure to support these trends as well as economic and operational opportunities.

Trends evaluated throughout this master plan process included: airport sustainability, NextGen technology, technological improvements and demand related to light sport aircraft and unmanned aerial vehicle technology, new federal rules and guidance as well as emergency and community support.

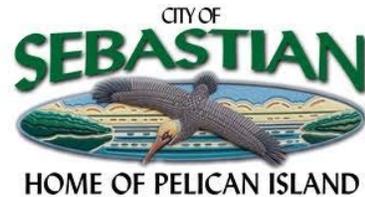
## Airport Sustainability

As noted in Chapters 1 and 2, airport sustainability focuses equally on four areas: community, environmental, financial and operations. Potential development alternatives based upon forecast demand are evaluated as part of Chapters 5 and 6 to determine likely environmental, social, and economic impacts to the airport and surrounding community. A preferred alternative scenario was determined utilizing the essential elements of the “triple bottom line” approach – economic growth, social responsibility, and environmental stewardship.

Because sustainability, airport planning, and design practices are continuously evolving, the planning process must allow airports to capture new trends and initiatives based upon their current and ultimate goals. Each airport must identify its own sustainability priorities in order to establish the groundwork for future planning and implementation. As part of the initial kick-off meeting with Airport Staff and City Administration, sustainability initiatives and goals were identified and are being incorporated throughout the master plan process. Since an environmental study was being conducted in parallel with this master plan update, suggestions and recommendations related to future d

Airports worldwide are at the epicenter of a growing debate regarding airport growth and the environmental consequences of aviation. Due to rising concerns regarding resource

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conservation, environmental protection, and fiscal responsibility. A number of sustainability practices within the aviation industry, supported by government initiatives have already been recommended for incorporation into the master plan process including Solid Waste Management and Recycling, land use, market value and expansion of compatible land use opportunities, environmental mitigation, expanded coordination with local economic development and community organizations, etc.

Sustainable development was first formally defined in 1987 by the Brundtland Commission as: "...development that meets the needs of the present without compromising the ability of future generations to meet their own needs."<sup>2</sup> An airport industry-specific definition was since adopted by Airport Council International-North America, defining sustainability as "...a holistic approach to managing an airport so as to ensure the integrity of the Economic viability, Operational efficiency, Natural resource conservation and Social responsibility (EONS) of the airport."<sup>3</sup>

Airport sustainability according to the Federal Aviation Administration (FAA) "encompasses a wide variety of practices applicable to planning, design, building and operating airport facilities (based upon) three core principles:

- Protecting the environment;
- Maintaining high and stable levels of economic growth; and
- Social progress that recognizes all stakeholders' needs."<sup>4</sup>

As the FAA and FDOT are striving to incorporate sustainability into all projects, a sponsor should determine an appropriate overall sustainability goal(s) and review individual efforts to achieve them. Airports that implement sustainable practices may benefit from reduced resource usage, improved user and tenant satisfaction, a more strategic use of

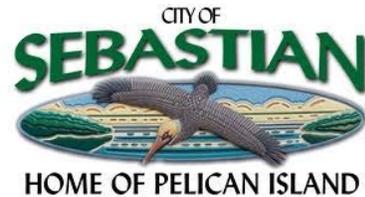
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2 "Report of the World Commission on Environment and Development: Our Common Future" aka "The Brundtland Report", World Commission on Environment and Development, 1987

3 Airport Sustainability: A Holistic Approach to Effective Airport Management. Airport Council International-North America  
<http://www.sustainableaviation.org/pdfs/Sustainability%20White%20Paper.pdf>

4 Federal Aviation Administration, *Interim Guidance for FAA's Sustainable Master Plan Pilot Program*, [http://www.faa.gov/airports/environmental/sustainability/media/interim\\_guidance\\_sustainable\\_master\\_plan\\_pilot.pdf](http://www.faa.gov/airports/environmental/sustainability/media/interim_guidance_sustainable_master_plan_pilot.pdf)

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airport property, and reduced waste generation and increased recycling. As such, these facility requirements and future planning incorporate several sustainability initiatives.

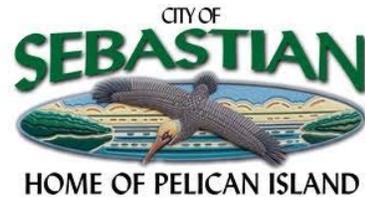
## NextGen

Over the past several decades, the FAA has been working on modernizing the national airspace system to more effectively support the continued growth of aircraft operations. The Next Generation Air Transportation System (NextGen) is a comprehensive suite of state-of-the-art technologies and procedures that enable aircraft to move more directly from Point A to Point B. This allows more efficient route structures allowing for reduced fuel burn, less time in the air per route while also lessening the impact on the overall environment. NextGen relies on satellite rather than ground based navigational systems to provide aircraft navigation. As of 2020, all aircraft must be incorporate the Automatic Dependent Surveillance Broadcast (ADS-B) equipment, which will replace radars as the primary means by which air traffic controllers track and manage aircraft. This satellite-based technology enables more efficient separation of aircraft and provides coverage where radar doesn't exist. Aircraft nationwide are now flying more precise, satellite-based procedures than traditional ground-based procedures, which has allowed airports to provide lower approach minimums to their runways as well as the potential implementation of smaller runway safety areas due to increased navigational precision.

In addition, new separation standards to avoid the hazards of wake turbulence are improving the efficiency of aircraft arrivals and departures, reducing taxi times, and saving fuel. Wake Recategorization (Wake Recat) enables FAA to safely reduce the distance between various aircraft based on wingspan, weight, and stability instead of just mainly on weight.

Other NextGen initiatives include weather, voice systems, information management and data communications. All focused on improving airport efficiency and safety. Thus, all of these changes will have a major impact on airport infrastructure potentially allowing for more areas for revenue development as well as allowing smaller general aviation airports, such as Sebastian, to support diverse general aviation and corporate operations.

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## New Technology

In addition to NextGen, changes in technology is having a massive impact throughout the transportation industry. New and updated aircraft designs and engines are allowing operators to use smaller airports with shorter runways often closer to their destinations saving time and money. Sebastian Airport is also home to several light sport aircraft manufacturers who are expanding aircraft ownership to a whole new group of users. Previously, the cost of owning and operating an aircraft was prohibitive to most of the population. However, continued growth in this sector along with other changes including the sport pilot's license has opened up flying to more individuals.

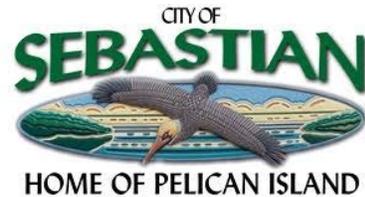
Other technological improvements include the development of unmanned aerial vehicles. Unmanned Aerial Vehicles currently operate under the FAA's small unmanned aircraft rule, Part 107, which has been in place for approximately one year at the time of this writing. It is important to note that unmanned aerial vehicles are not the same as drones, although sometimes used interchangeably. UAS still operate under line of sight requirements and must be under 55 pounds whereas Drones are primarily associated with military unmanned aircraft that are operated outside line of sight and may exceed the 55 pound criteria.

Under the new regulations, UAVs uses have expanded to include:

- Emergency response and recovery efforts
- Scientific research, survey and mapping
- Movie filming
- Real estate marketing
- Infrastructure and utility survey, inspections and monitoring
- Agricultural mapping
- Wildlife tracking, etc.

Growth in this field has expanded exponentially. Since 107 became effective since August 2016, "more than 80,000 individual drones have been registered for commercial and government purposes. And more than 60,000 people have obtained a Remote Pilot Certificate required to operate a drone under Part 107. By 2021 – just four years from

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now—the agency estimates there could be as many as 1.6 million small drones (under 55 lbs.) in commercial operation.”<sup>5</sup>

What does this mean for Sebastian Airport? The airport already supports other new technology operations which may be ripe for use as UAS. Further, the airport has areas portions of the airport which may be suitable for UAS manufacturing, testing and training. The impacts and opportunities related to this new technology as well as others was considered in identifying future airport development.

## New Federal Rules and Guidance

On August 30, 2017, the final rule overhauling airworthiness standards for general aviation airplanes was implemented. This was in response to Congressional mandates directing the FAA to streamline approval of safety advancements for small GA airplanes. The new rule also addresses recommendations from the FAA’s 2013 Part 23 Reorganization Aviation Rulemaking Committee, which suggested a more streamlined approval process for safety equipment on those airplanes. Part 23 revolutionizes standards for airplanes weighing 19,000 pounds or less and with 19 or fewer passenger seats by replacing prescriptive requirements with performance-based standards in addition to consensus-based compliance methods for specific designs and technologies.

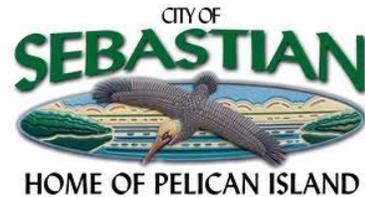
The FAA expects this rule will enable faster installation of innovative, safety-enhancing technologies into small airplanes, while reducing costs for the aviation industry. The new part 23 also promotes regulatory harmonization among the FAA’s foreign partners, including the European Aviation Safety Agency, Transport Canada Civil Aviation, and Brazil’s National Civil Aviation Authority. It is hoped that this “harmonization” will minimize certification costs for airplane and engine manufacturers worldwide.

This change has already benefitted X26 by attracting a small light sport manufacturer and distributor to set up operations at the airport. It is anticipated because of its location between several airports along with available infrastructure and lower costs will allow management to continue to attract and capitalize on these type of

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<sup>5</sup> FAA Small Drone Rule Lets Unmanned Aircraft Soar, FAA News, September 6, 2017, <https://www.faa.gov/news/updates/?newsId=88748>

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opportunities. Further, since the airport supports skydivers from around the world, the airport is known worldwide which has also increased its visibility on the world stage.

These are just some of the emerging aviation trends that will likely impact operations at Sebastian Municipal Airport during the 20-year planning period. This master plan considered the various issues and opportunities as part of the short and long-term airport development. However, the master plan was created in a way to allow the City and Airport management the flexibility to address unforeseen changes and opportunities in the market.

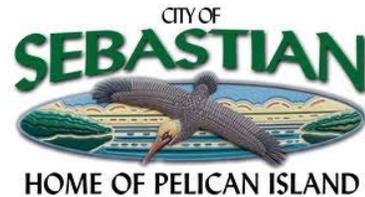
## Airport Role and Service Level

X26 is included in the National Plan of Integrated Airport System (NPIAS), which is published by the U.S. Department of Transportation. In the NPIAS, the FAA establishes the role of those public airports defined as essential to meet the needs of civil aviation and to support the Department of Defense and Postal Service. In the NPIAS, the role for each airport is identified as one of four basic service levels (Primary, Commercial Service, Reliever and General Aviation). These levels describe the type of service that the airport is expected to provide the community during the NPIAS five-year planning period. It also represents the funding categories set up by Congress to assist in airport development.

In 2012, the FAA released General Aviation Airports, A National Assets study which re-categorized general aviation airports throughout the US based upon operations and based aircraft activity. These categories included: National Airports, Regional Airports, Local Airports and Basic Airports. According to the criteria listed in this report, Sebastian Airport is designated as a Local General Aviation Airport. Local airports are defined as:

- 'Closer to metropolitan areas and provide access for the community to the national aviation system
- Support some flying by sophisticated aircraft
- Primarily support piston aircraft operations
- Support business and personal aircraft operations as well as significant flight training, emergency services and small charter operations
- Most operations are within the state or region, and

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- May be important access for aeromedical and emergency services<sup>6</sup>

Based upon forecast demand and the long-term goals of the City and Airport management, the airport will remain a local airport throughout the anticipated planning period.

The Florida Department of Transportation also categorizes airports within their Aviation System Plan as commercial, reliever or general aviation. According to the Florida Aviation System Plan (FASP), X26 is designated as a general aviation airport.

Sebastian Airport, as noted in previous chapters, primarily supports general aviation operations by private and corporate/business users. The Airport is also used regularly for flight training as well as supports significant skydiving activity associated with Skydive Sebastian. Also due to the airport's close proximity to the Indian River Lagoon and the Sebastian Inlet, the airport attracts a number of transient/visiting general aviation aircraft.

Airport management has stated that their focus is on continuing to support general aviation operations, and is continuing to see strong growth in light sport aircraft, skydiving and other recreational activity. The current airfield can and does support some limited air taxi operations as well as very light jets, such as the Phenom 100 or 300. Forecast activity suggests and is supported by the FASP forecasts that the airport will continue to experience significant growth.

## Critical Aircraft

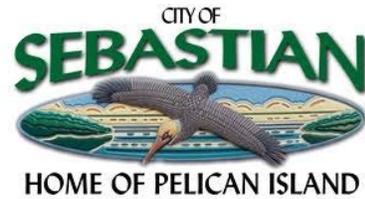
A key element in defining facility needs is establishing development guidelines that are directly associated with the size and type of aircraft activity that the airport currently and will be expected to serve during the planning period. A critical aircraft for facility planning and design purposes.

The critical aircraft may be a single aircraft or a composite of the most demanding characteristics of several aircraft. The critical aircraft (or composite aircraft) performs more than 500 itinerant operations on a particular runway. An itinerant operation is a flight that originates at the facility and arrives at another facility more than 20 nautical

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<sup>6</sup> General Aviation Airports, A National Asset, 2012, Federal Aviation Administration, Appendix A-2, page A28.

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miles way, or those arriving at the facility from an origination point more than 20 nautical miles away.

Often, more than one aircraft will determine different facility features such as an aircraft which has a wide wingspan, but is not very heavy compared to another aircraft which is heavier but does not have as wide of a wingspan. Both use the same runway, however the heavier aircraft will determine runway pavement strength while the aircraft with the wider wingspan will determine lateral separations within the airfield layout.

The existing critical aircraft is the Beech King Air 200D, which is used by both Skydive Sebastian, private users as well as the FBO for charter operations. It is anticipated based upon discussions with users and growth in the market that the future critical aircraft will be the King Air 350i, which provides more passenger and cargo room, has greater fuel range, and is more efficient than the older King Air 200. Critical aircraft design criteria is outlined in **Table 4-10**.

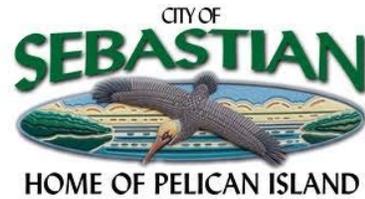
TABLE 4-10 RUNWAY CRITICAL AIRCRAFT		
	Existing	Future
<b>Critical Aircraft</b>	Beech King Air 200D	Beech King Air 350i
<b>Approach Speed</b>	98 knots	120 knots
<b>Approach Category</b>	B	B
<b>Wingspan</b>	54 ft. 6 inches	57 ft. 11 inches
<b>Design Group</b>	II	II
<b>Tail Height</b>	15 ft	14 ft 4 inches
<b>Maximum Takeoff Weight</b>	12,500 lbs	15,000 lbs

*Sources: TKDA Analysis, Airport historical data, FAA AC 150/5300-13A, Beechcraft (Textron)*

## Airport Reference Code

One method for identifying the standard capabilities of an airport is to review its Airport Reference Code (ARC). The ARC is the Runway Design Code (RDC) of the most capable or most demanding runway at an airport. These codes are developed and established based on the Critical Aircraft that will regularly use the runway.

# Sebastian Municipal Airport Master Plan Update



## Runway Design Code

The Runway Design Code (RDC) is a code signifying the design standards to which a runway is to be built. Each runway has its own RDC, which is composed of three elements based on the critical design aircraft and the visibility minimums for the runway:

- The first element of the RDC is the aircraft approach category, which is a grouping of aircraft based on a reference landing speed ( $V_{REF}$ ). The categories of the aircraft approach category can be seen in **Table 4-11**.
- The second element is the airplane design group, which is a classification of aircraft based on wingspan and tail height. The specification of each airplane design group can be seen in **Table 4-12**.
- The third component is the visibility minimums at the airport expressed in RVR values in feet. The RVR values can be seen in **Table 4-13**. The current runway visibility range is 5,000 feet.

TABLE 4-11 AIRCRAFT APPROACH CATEGORY (AAC)	
AAC	Vref/Approach Speed
A	Approach speed less than 91 knots
B	Approach speed 91 knots or more, but less than 121 knots
C	Approach speed 121 knots or more, but less than 141 knots
D	Approach speed 141 knots or more, but less than 166 knots
E	Approach speed 166 knots or more

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

TABLE 4-12 AIRPLANE DESIGN GROUP (ADG)		
Group Number	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' (52m – < 65 m)
VI	66' – < 80' (20 m – < 24.5 m)	214' – < 262' (65 m – < 80 m)

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

# Sebastian Municipal Airport Master Plan Update

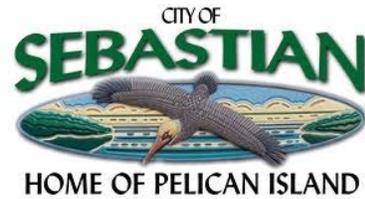


TABLE 4-13 VISIBILITY MINIMUMS	
RVR (ft.*)	Instrument Flight Visibility Category (Statute Miles)
5000	Not lower than 1 mile
4000	Lower than 1 mile but not lower than 3/4 mile
2400	Lower than 3/4 mile but now lower than 1/2 mile
1600	Lower than 1/2 mile but not lower than 1/4 mile
1200	Lower than 1/4 mile
<i>Source: FAA AC 150/5300-13A, Change 1, Airport Design</i>	

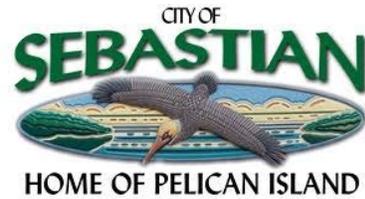
## Approach Reference Code and Departure Reference Code

The Approach Reference Code (APRC) for a runway indicates the current operational capabilities of a runway and associated parallel taxiway for landing operations. The APRC is composed of the same three elements as the RDC; however the RDC indicates the planned development of the runway and has no operational application.

X26 was initially designed as naval flight training facility as a result some of its airfield pavement exceeds current standards. Runway 5-23 was narrowed to a width of 75 feet, and Runway 10-28 also has a width of 75 feet. The taxiway to runway centerline separation between Runway 10-28 and Taxiway B is 240 feet, and the new Taxiway C which will run parallel to Runway 5-23 is designed with a 240 foot centerline to centerline separation.

Since the previously approved Airport Layout Plan (2010), GPS approaches were added to Runway 5-23, and the runway was remarked as a non-precision instrument runway. Based upon the critical aircraft, the Beech 200, the existing APRC for Runway 5-23 is B-II-5000. Recommendations for Runway 10-28 included adding non-precision approaches as well as upgrading the runway from B-I (small)-visual to a B-II with greater than 1 mile visibility. However, at the time of this writing, Runway 10-28 is still marked as a basic runway and supports visual only approaches. However, the runway regularly supports operations by the King Air 100 (B-I), DHC-6-300 Twin Otter (A-II) as well as the Beech King Air 200 (B-II). As a result, the runway should be classified as a B-II small runway based upon the combination of operations regularly using Runway 10-28.

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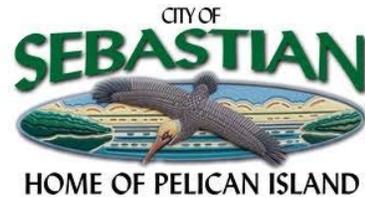


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The Departure Reference Code (DPRC) is similar to the APRC, but indicates the current operational capabilities of a runway and associated parallel taxiway for takeoff operations. The DPRC is also composed of the same three elements as the RDC. Therefore DPRC for Runway 5-23 is B-II-5000 and for 10-28 is B-II (small)-visual.

Both the APRC and DPRC are adequate to support forecast operations. However, the runway pavement strength of Runway 10-28 is unpublished. Thus, it is assumed that the runway pavement supports aircraft weighing 12,500 lbs. or less (small aircraft). Whereas Runway 5-23 has a published single wheel strength of 22,000 lbs. Thus, based upon discussions with City and Airport Management as well as users, the viability of changing Runway 10-28 to a utility runway with no less than 1 mile visibility was considered.

# Sebastian Municipal Airport Master Plan Update



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## Runway System Requirements

The most important piece of infrastructure at an airport is the runway. Runways must be designed to the proper length, width, and strength to safely accommodate the critical aircraft. The RDC of each runway establishes the required separation and safety standards of the runway according to AC 150/5300-13A, *Airport Design*.

According to the 2017 Airport Master Record, Runway 5-23 is 4,023 x 75 feet and has a single-wheel pavement strength of 22,000 lbs. Runway 10-28 is 3,199 x 75 feet, and its pavement strength is unpublished.

## Runway Length Analyses

In determining the recommended runway lengths for X26, the procedure and rationale as outlined in **FAA AC 150/5325-4B and draft 4C**, *Runway Length Requirements for Airport Design*, were used. Several characteristics of the design aircraft were needed to conduct the runway length analysis including MTOW, approach speed, and number of passenger seats along with mean maximum temperature of the hottest month, airport elevation and effective runway gradient (difference between the highest and lowest elevations of the runway centerline divided by the runway length).

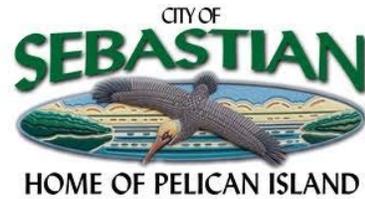
### Runway 5-23

Runway 5-23 is the primary runway at X26, and therefore should be designed to accommodate the most demanding aircraft likely to use the airport. The critical aircraft used for the runway length analysis was the Beech King Air 350i. Since the maximum takeoff weight (MTOW) of this aircraft is 15,000 lbs, runway length guidelines outlined in Chapter 3 of FAA AC 150/5325-4B was applied.

The Beech King Air 350i falls within Table 3-1, Airplanes that make up 75 percent of the fleet. The next step was to apply the mean maximum temperature at Sebastian, which historically is 90.1 degrees Fahrenheit, and airport elevation, 21.5 feet surveyed, to Table Figure 3-1 in AC 150/5325-4B. This resulted in the following runway length:

- At 60 percent load factor, a runway length of 4,550 feet is required (see Figure 4-8). Adjusting this distance for gradient change between the highest and lowest

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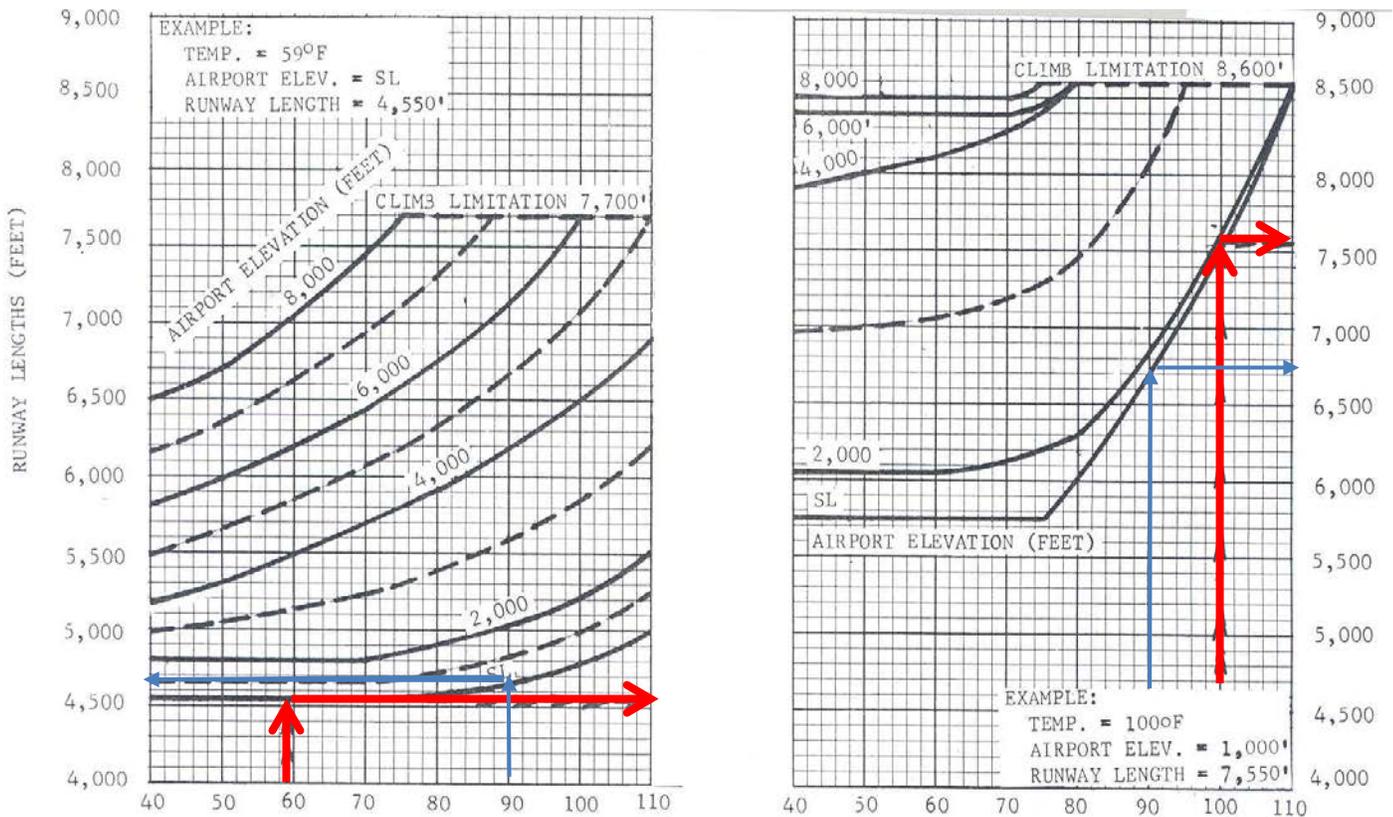


- points on Runway 5-23 results in a recommended runway length of 4,581 feet (3.1 feet x 10 + 4,550 feet).
- At 90 percent load factor, a runway length 6,750 feet was determined (see Figure 4-x). Adjusted for the change in runway grade results in a recommended runway length of 6,781 feet.

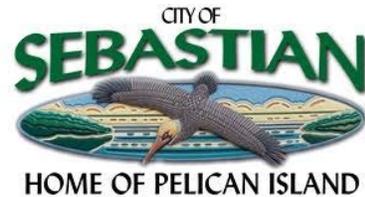
The blue lines represent the estimated runway length requirements based upon airport elevation and mean maximum temperature.

**FIGURE 4-8**  
**75 PERCENT OF FLEET AT 60 OR 90 PERCENT USEFUL LOAD**

Sources: FAA AC 150/5325-4B, Figure 3-1 and TKDA, 2017



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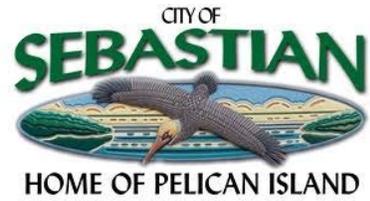
However, it is important to note that this methodology captures the runway length requirements to support turboprop and turbine powered (jet) aircraft with maximum takeoff weights between 12,600 lbs and 60,000 lbs. As a result, the methodology recommended in the Draft AC 150/5325-4C which recommends using the recommended FAR takeoff lengths published by manufacturers of that specific aircraft and adjusting for temperature, airport elevation and runway grade changes was anticipated to provide a more realistic demand for runway length requirements.

According to Beechcraft Textron Aviation, the manufacturer of the Beech King Air 350i, the takeoff length at 59 degrees Fahrenheit, at sea level and over a 50 foot obstacle is 3,300 feet. Adjusting this length for airport elevation, temperature and grade change results in a recommended total length of 3,851 feet. Based upon the existing and forecast fleet mix, a runway length of 3,851 feet is a realistic representation of runway length demand.

## *Runway 10-28*

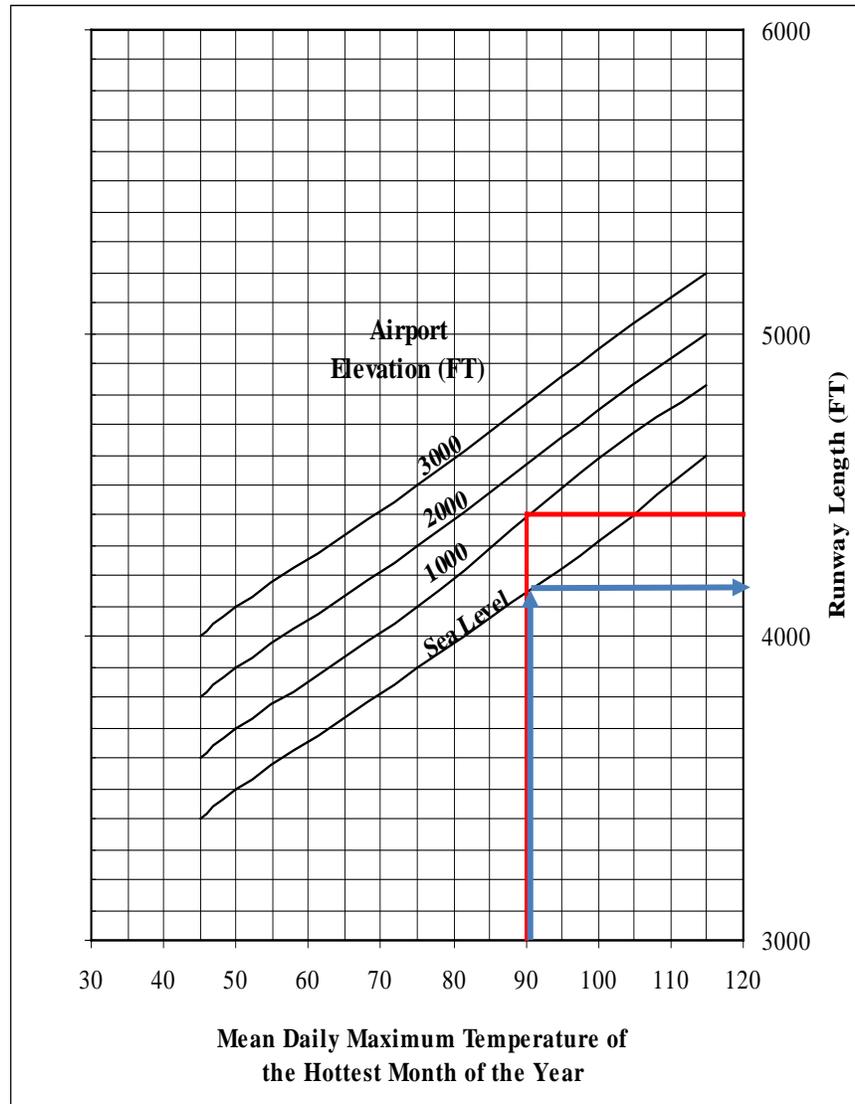
Runway 10-28 appears to be designed to support aircraft with maximum takeoff weights of 12,500 lbs or less. Using the Cessna 208 and DHC6-300 as the critical aircraft for the runway length analysis, guidance outlined in Chapter 2 of AC 150/5325-4B was applied. Since both aircraft are designed to accommodate 10 passengers or more, Figure 2-2, Small Airplanes Having 10 or More Passenger Seats, was used. Applying the airport elevation of 21.5 feet MSL and mean maximum temperature of 90.1 degrees Fahrenheit results in a runway length of 4,175 feet (see **Figure 4-9**). Adjusting this length for change in elevation (2.5 feet) results in a recommended runway length of 4,200 feet. Note the blue line represents the estimated runway length for Runway 10-28 at X26.

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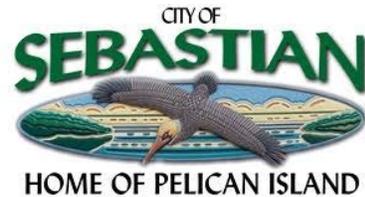
**FIGURE 4-9**  
**SMALL AIRPLANES HAVING 10 OR MORE PASSENGER SEATS**

Source: FAA AC 150/5325-4B, Figure 2-1



However, similar to Runway 5-23, DHC-6-300 and B100 aircraft regularly use Runway 10-28 even though it has a length of 3,199 feet. Therefore, applying the recommended

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methodology outlined in Draft AC 150/5325-4C which recommends adjusting the manufacturer's FAR takeoff length resulted in the following lengths:

- The Twin Otter DHC-6-300 manufacturer FAR balanced field length is 2,700 feet. Adjusting this for airport elevation, temperature and change in runway grade results in a recommended length of 3,151 feet.
- The Cessna 208 manufacturer FAR balanced field length is 2,055 feet. Adjusting this length by airport elevation, temperature, and change in runway grade results in a recommended length of 2,404 feet.

Thus, based upon manufacturer data which provides a more realistic estimate of runway demand, no runway extension is required to support existing and forecast aircraft demand at Sebastian Municipal Airport over the twenty-year planning period.

## Width Requirements

Since Runways 5-23 and 10-28 support B-II operations, a runway width of 75 feet is required based upon FAA AC 150/5300-13A. Both runways meet this design criteria.

## Pavement Strength and Conditions

The runway pavement must be designed and maintained to support regular use of the critical aircraft as well as limited use by larger and heavier aircraft. The published runway pavement strength of Runway 5-23 and Runway 10-28 weights varying from 3,000 to 12,500 lbs. single wheel, information based on the February 2017 - PCN Evaluation Report completed by FDOT.

The Florida Department of Transportation (FDOT) published February 2017 Statewide Airfield Pavement Management Program Update, which provides the pavement condition index (PCI) for each Florida airport inspected. The weighted PCI rating and condition for the runways, taxiways, apron and overall airfield as published in the report are provided in **Table 4-14**.

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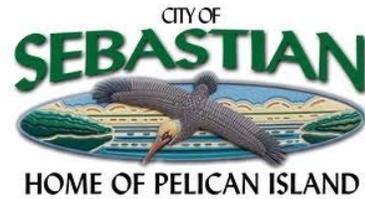


TABLE 4-14 2017 PAVEMENT CONDITIONS REPORT SEBASTIAN MUNICIPAL AIRPORT		
	PCI Index	PCI Condition
Runway 5-23	75	SATISFACTORY
Runway 10-28	80	SATISFACTORY
Taxiways	79	SATISFACTORY
Apron	74	SATISFACTORY
Overall Airfield	81	SATISFACTORY
<i>Source: Summary Report, Statewide Airfield Pavement Management Program Update, Florida Department of Transportation, 2017</i>		

As part of airport development, pavement rehabilitation associated with the existing aprons and taxiways is being considered in the short term. A runway overlay is recommended for the midterm with a potential full rehabilitation set for the long-term.

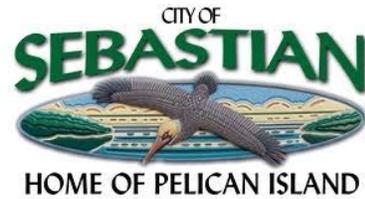
## Part 77 Airport Imaginary Surfaces

The Code of Federal Regulations Title 14, Chapter I, Subchapter E, Part 77 – *Safe, Efficient Use, and Preservation of Navigable Airspace* establishes the imaginary surfaces used to identify airspace around an airport necessary for the safe passage of aircraft. These surfaces are used to identify existing obstacles, and to establish a process to determine whether any new or proposed construction would be a hazard to air navigation.

These surfaces are to be used by the airport sponsor to prevent any possible hazard to the airspace surrounding the airport. Development both on and adjacent to the Airport should be evaluated to determine if negative impacts to airport operations would likely occur and to identify potential mitigation options. Failure to do so can result in the loss of funds from the FAA. There are five imaginary surfaces for any airport:

**Primary Surface:** This surface is centered on the runway centerline with its width determined by the visibility minima of the approaches at an airport. For specially prepared hard surfaces, the primary surface extends 200 feet beyond the runway end, and for turf or other surfaces it ends at the end of the runway. The elevation of the primary surface is the same as the elevation of the nearest point of the runway.

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**Approach Surface:** This surface is centered on the runway centerline and extends outward and upward from the end of the primary surface. The length and widths of the approach surface are determined by the type of approach for that runway end. The slope, or the amount of horizontal distance for every one foot of vertical rise, is also determined by the type of approach to the runway end.

**Transitional Surface:** The transitional surface extend outward and upward at right angles to the runway centerline, and the extended runway centerline at a fixed slope of seven feet horizontal to every one foot vertical from the sides of the primary surface, and approach surfaces.

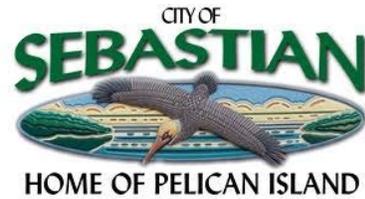
**Horizontal Surface:** This surface is a horizontal plane that is 150 feet above the established airport elevation. This surface is developed by creating swinging arcs of specific radii from the end of the primary surface, and then connecting those arcs by lines tangent to those arcs.

**Conical Surface:** The conical surface extends outward and upward from the periphery of the horizontal surface for a distance of 4,000 feet at a slope of 20 feet horizontal for every one foot vertical.

Several tree obstructions were identified that impact the approach surface to Runway 23, and a three-story home is located within the approach to Runway 5. Other obstructions to the Part 77 surfaces are identified in Table 4-15.

TABLE 4-15 OBSTRUCTIONS TO AIR NAVIGATION					
ID	Description	Elev.	Surface	Latitude	Longitude
A	Lighted Tower	198'	Horizontal	27.837811	-80.487560

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## Approach and Departure Surfaces

Approach and Departure Surfaces (APDS) were designed and implemented to protect the use of the runway in both visual and instrument flight conditions near the airport. Their specifications are listed in Table 3-2 of AC 150/5300/13A Change 2, *Airport Design*, provided in **Table 4-16**. Unlike 14 CFR Part 77 airport imaginary surfaces, these surfaces are clearance surfaces and move with the threshold, not the runway end.

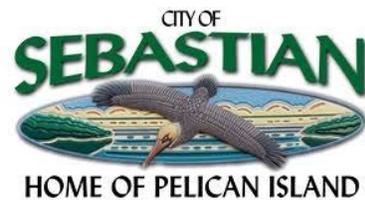
Both runways serve Airplane Approach Category A and B aircraft. Runway 5-23 also supports both day and night instrument operations (Table 4-X, Row 4). Since both Runway 5 and 23 are equipped with non-precision GPS instrument approaches which provide vertical guidance (LP and LNAV), Row 8 of **Table 4-16** also applies. However, Runways 10-28 supports visual and daytime only operations by aircraft with approach speeds greater than 50 knots, thus, Row 2 applies.

The Airport is equipped with NAVAIDs which support non-precision instrument approaches to Runway 5 and 23 so a 40:1 departure surface slope applies as illustrated in **Table 4-16**.

Interviews with the existing tenants and airport users indicated the existing approaches are adequate for their operations at X26; however approaches less than one mile but greater than 3/4 statute mile will be considered. Forecast demand does not anticipate use by aircraft larger than approach category B. The airport is expected to retain the same approach and departure surface requirements for each runway of Row 4 and Row 8, as well as a departure surface for each runway end. Lower approaches would require the protection of Row 6.

TABLE 4-16 APPROACH AND DEPARTURE SURFACE STANDARDS TABLE							
Row	Runway Type	Dimensional Standards Feet (Meters)					Slope/OCS
		A	B	C	D	E	
1	Approach end of runways expected to serve small airplanes with approach speeds less than 50 knots. (Visual runways only, day/night)	0 (0)	120 (37)	300 (91)	500 (152)	2,500 (762)	15:1
2	Approach end of runways expected to serve small airplanes with approach	0 (0)	250 (76)	700 (213)	2,250 (686)	2,750 (838)	20:1

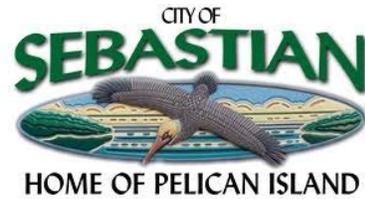
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**TABLE 4-16  
APPROACH AND DEPARTURE SURFACE STANDARDS TABLE**

Row	Runway Type	Dimensional Standards Feet (Meters)					Slope/OCS
		A	B	C	D	E	
	speeds of 50 knots or more. (Visual runways only, day/night)						
3	Approach end of runways expected to serve large airplanes (Visual day/night); or instrument minimums $\geq 1$ statute mile (1.6 km) (day only).	0 (0)	400 (122)	1000 (305)	1,500 (457)	8,500 (2591)	20:1
4	Approach end of runways expected to support instrument night operations, serving approach Category A and B aircraft only. <sup>1</sup>	200 (61)	400 (122)	3,800 (1158)	10,000 <sup>2</sup> (3048)	0 (0)	20:1
5	Approach end of runways expected to support instrument night operations serving greater than approach Category B aircraft. <sup>1</sup>	200 (61)	800 (244)	3,800 (1158)	10,000 <sup>2</sup> (3048)	0 (0)	20:1
6	Approach end of runways expected to accommodate instrument approaches having visibility minimums $\geq 3/4$ but $< 1$ statute mile ( $\geq 1.2$ km but $< 1.6$ km), day or night.	200 (61)	800 (244)	3,800 (1158)	10,000 <sup>2</sup> (3048)	0 (0)	20:1
7	Approach end of runways expected to accommodate instrument approaches having visibility minimums $< 3/4$ statute mile (1.2 km).	200 (61)	800 (244)	3,800 (1158)	10,000 <sup>2</sup> (3048)	0 (0)	34:1
8	Approach end of runways expected to accommodate approaches with vertical guidance (Glide Path Qualification Surface [GQS]).	0 (0)	Runway width + 200 (61)	1520 (463)	10,000 <sup>2</sup> (3048)	0 (0)	30:1
9	Departure runway ends for all instrument operations.	0 <sup>4</sup> (0)	See Figure 2- 8.	40:1			
<b>Notes:</b>	1 "Marking and lighting of obstacle penetrations to this surface or the use of a Visual Guidance Slope Indicator (VGSI) ...may avoid displacing the threshold"						
	2 "10,000 feet (3048 m) is a nominal value for planning purposes. The actual length of these areas is dependent upon the visual descent point position for 20:1 and 34:1, and Decision Altitude (DA) point for the 30:1"						
	4 "Dimension A is measure relative to Takeoff Distance Available (TODA) (to include clearway)"						

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**TABLE 4-16**  
**APPROACH AND DEPARTURE SURFACE STANDARDS TABLE**

Row	Runway Type	Dimensional Standards Feet (Meters)					Slope/OCS
		A	B	C	D	E	
<i>Source: Federal Aviation Administration Advisory Circular 150/5300-13A Change 1, Table 3-2, FAA Approach/Departures Standards Table, 2/26/2014</i>							

## Declared Distances

If the surfaces are not clear of obstructions and those obstructions cannot be removed, landing and takeoff thresholds may be displaced by implementing declared distance criteria to avoid the obstruction(s). Declared distances typically include different landing and takeoff thresholds due to an obstruction to air navigation (i.e. tower, building, or highway) within the approach or departure surface. Currently, there are no displaced thresholds at X26.

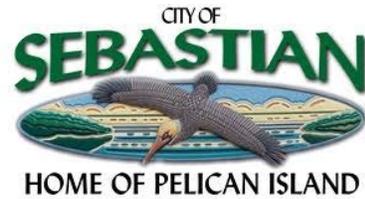
The airport does not completely own the RPZ property prior to the Runway 5, 23 and 28 ends, which is recommended. Following the publication of the 2012 Interim Guidance on Land Uses Within a Runway Protection Zone, if the visibility minima were to decrease, a change in classification to other-than-utility, a change to the runway threshold, or any other adjustments to the existing layout would occur that would move or alter the size of the RPZ or introduce additional incompatible land uses, then one option may include implementation of declared distance criteria.

**Table 4-17** lists the current available distances allowed on Runway 15-33 and 10-28.

**TABLE 4-17**  
**EXISTING AND FUTURE DECLARED DISTANCE LENGTHS**

	Runway 5		Runway 23	
	Existing	Future	Existing	Future
<b>Takeoff Runway Available</b>	4,023 ft.	TBD	4,023 ft.	TBD
<b>Takeoff Distance Available</b>	4,023 ft.	TBD	4,023 ft.	TBD
<b>Accelerate Stop Distance Available</b>	4,023 ft.	TBD	4,023 ft.	TBD
<b>Landing Distance Available</b>	4,023 ft.	TBD	4,023 ft.	TBD
	Runway 10		Runway 28	
	Existing	Future	Existing	Future
<b>Takeoff Runway Available</b>	3,199 ft.	TBD	3,199 ft.	TBD

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<b>Takeoff Distance Available</b>	3,199 ft.	TBD	3,199 ft.	TBD
<b>Accelerate Stop Distance Available</b>	3,199 ft.	TBD	3,199 ft.	TBD
<b>Landing Distance Available</b>	3,199 ft.	TBD	3,199 ft.	TBD
<i>Sources: TKDA, 2017</i>				

## Runway Safety Dimensional Requirements

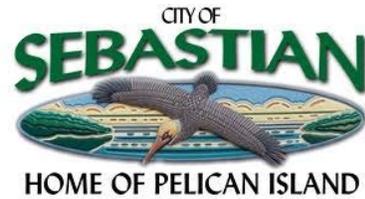
Runway safety dimensions are areas on each runway’s ends and sides designed to protect aircraft landing, departing, and operating on the runway. These areas consist of the Runway Safety Area (RSA), Runway Object Free Area (ROFA), and the Runway Protection Zone (RPZ).

### Runway Safety Area (RSA)

The RSA is intended to enhance the safety of aircraft that overshoot, underrun, or veer off the runway while also providing greater accessibility to firefighting and rescue equipment during these incidents. The distance necessary beyond the runway end is determined to contain 90 percent of overrun incidents.

The RSA is centered on the runway centerline and according to the FAA must be: (1) cleared and graded and have no potentially hazardous ruts, humps, depressions, or other surface variations; (2) drained by grading or storm sewers; (3) capable, under dry conditions, of supporting snow removal and aircraft rescue and firefighting equipment, and the occasional passage of aircraft without causing damage to the aircraft; and (4) free of objects, except for objects that need to be within the RSA because of their function. Unlike other airport standards, RSA standards cannot be modified. **Table 4-18** illustrates the RSA information for X26.

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**TABLE 4-18  
RUNWAY SAFETY AREA DIMENSIONS**

Runway 5-23			
	Existing Condition	FAA B-II Standard	Future Condition
Width	150'	150'	Same
Length Beyond Departure End	300'	300'	Same
Length Prior to Threshold	300'	300'	Same
Runway 10-28			
	Existing Condition	FAA B-II Small Standard	Future Condition
Width	150'	150'	Same
Length Beyond Departure End	300'	300'	Same
Length Prior to Threshold	300'	300'	Same

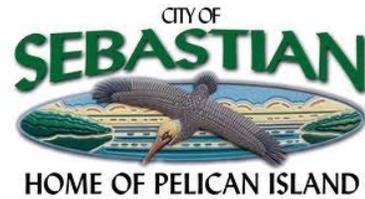
*Source: AC 150/5300-13A, Airport Design and TKDA, 2017*

B-II RSA requirements will remain protected so the operational capability, the APRC and DPRC, can remain B-II-5000. This can be maintained at little to no additional cost. The RSAs at X26 are clear of all objects other than those necessary for their purpose.

## Runway Object Free Area (ROFA)

The Runway Object Free Area is another clearing surface which considers all objects protruding above the nearest point of the RSA to be obstructions. This includes terrain within a distance from the edge of the RSA equal to one-half the most demanding wingspan of the RDC of the runway. Objects necessary for the air navigation or ground maneuvering of aircraft, except where precluded by other clearing standards, are

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allowed within the ROFA, as well as taxiing aircraft and holding aircraft. Objects not necessary for the air navigation or aircraft ground maneuvering purposes should not be placed in the ROFA. ROFA existing conditions, standards, and ultimate configurations are shown in **Table 4-19**.

TABLE 4-19 RUNWAY OBJECT FREE AREA DIMENSIONS			
Runway 5-23			
	Existing Condition	FAA B-II Standard	Future Condition
Width	500'	500'	Same
Length (Beyond Runway End)	300'	300'	Same
Length Prior to Threshold	300'	300'	Same
Runway 10-28			
	Existing Condition	FAA B-II Small Standard	Future Condition
Width	500'	500'	Same
Length (Beyond Runway End)	300'	300'	Same
Length Prior to Threshold	300'	300'	Same

*Source: AC 150/5300-13A, Airport Design and TKDA, 2017*

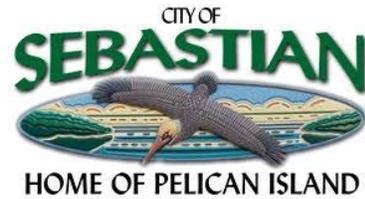
B-II ROFA standards will remain protected so the operational capability, the APRC and DPRC, can remain B-II-5000. The ROFAs at X26 are clear of protruding objects above the edge of the RSA.

## Obstacle Free Zone (OFZ)

The Obstacle Free Zone is a safety area that is not only a design surface, but an operational surface as well. It is a defined volume of airspace centered above the runway centerline, above a surface whose elevation at any point is that of the nearest point on the runway centerline.

Typical design standards require objects, except for frangible NAVAIDs, be cleared from this surface, and while operations are being conducted, aircraft also may not be within this surface. The OFZ is made up of the Runway OFZ, and when applicable the Precision Obstacle Free Zone (POFZ), the inner-approach OFZ, and the inner-transitional OFZ. The

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OFZ is unique in its shape being dependent on the approach minimums for the runway end and the aircraft on approach. For each operation, the OFZ may be different. Best practice is to use the most demanding OFZ when designing safety areas. OFZ criteria are shown in **Table 4-20**.

TABLE 4-20 OBSTACLE FREE ZONE DIMENSIONS		
Operator	Width	Length beyond Runway End
Small aircraft and visibility < 3/4 mile	300	200
Small aircraft with approach speeds > 50 knots	250	200
Small aircraft with approach speeds < 50 knots	120	200
Operations by Large aircraft	400	200

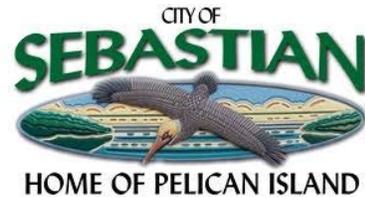
*Source: Advisory Circular 150/5300-13A, Change 1, Airport Design*

X26 supports regular operations (500 annual operations) of both large aircraft with MTOW greater than 12,500 lbs. as well as small aircraft with approach speeds greater than 50 knots. Therefore, Runway 5-23 has an object free zone criteria of 200 x 400 feet, and Runway 10-28 has an OFZ of 200 x 250 feet.

## Runway Protection Zone (RPZ)

The RPZ is a safety area designed to protect people and property on the ground. According to AC 150/5300-13A, *Airport Design*, the RPZ is trapezoidal in shape, is centered on the extended runway centerline, and it begins 200 feet from the runway threshold. There are two RPZs for each runway, a departure RPZ and an approach RPZ; however the more stringent of the two is used unless they begin at different locations such as a relocated departure RPZ if the Takeoff Run Available (TORA) and the runway end are not the same. The dimensions of the RPZ are determined by the critical aircraft and the approach minimums for the approach RPZ and the critical aircraft and departure procedures for the departure RPZ.

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On September 27, 2012, the FAA released **Interim Guidance on Land Uses Within a Runway Protection Zone**. This document, to be included in the yet to be released **Land Use Compatibility AC**, provides more clarity on what land uses are specifically prohibited within an RPZ and specifies what changes at the airport will require further review of an RPZ. The following changes will require FAA Regional and ADO staff to consult with the National Airport Planning and Environmental Division, APP-400 (who will then coordinate with the Airport Engineering Division, AAS-100):

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

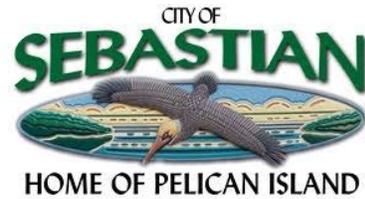
Before the consultation with APP-400, an alternatives analysis must be performed in coordination with FAA Regional and ADO staff to document the full range of alternatives that could avoid introducing a land issue within the RPZ, minimize the impact of the land use in the RPZ, or mitigate risk to people and property on the ground.

Existing land uses within an RPZ are to be mitigated as practical. For now, the FAA has taken the stance of mitigate when possible. Otherwise if no change occurs to the dimensions or location of the RPZ, then an RPZ analysis does not need to be performed.

Land uses within an RPZ that are either prohibited or require coordination with the FAA include:

- Buildings and structures (examples include but are not limited to: residences, schools, churches, hospitals or other medical care facilities, commercial/industrial buildings, etc.)
- Recreational land use (examples include but are not limited to: golf courses, sports fields, amusement parks, other places of public assembly, etc.)
- Transportation facilities (examples include but are not limited to: rail facilities – light or heavy, passenger or freight; public roads/highways; vehicular parking facilities)
- Fuel storage facilities (above or below ground)
- Hazardous material storage (above or below ground)

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- Wastewater treatment facilities
- Above-ground utility infrastructure (i.e. electrical substations) including any type of solar panel installations.

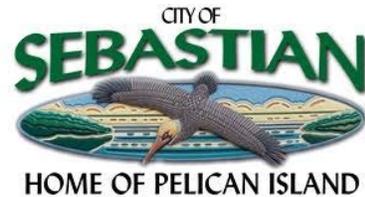
There are two possible RPZ incompatible uses at X26 listed in **Table 4-21**.

TABLE 4-21 RPZ INCOMPATIBILITIES	
Runway	Incompatible Uses
10	Airport Road West
10	Roseland Road

*Source: TKDA 2017*

Standards for RPZ dimensions have changed since the previous ALP to include a difference between small and large aircraft users of the airport. Small aircraft, those 12,500 pounds or less, now have slightly reduced standards for safety dimensions. The RPZ dimensions can be seen in **Table 4-22**.

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**TABLE 4-22  
RUNWAY PROTECTION ZONE DIMENSIONS**

	Runway 5			Runway 23		
	Existing	Standard	Future	Existing	Standard	Future
<b>Approach Visibility Minima</b>	1-mile	1-mile	TBD	1-mile	1-mile	TBD
<b>Length (ft.)</b>	1000 ft.	1000 ft.	TBD	1000 ft.	1000 ft.	TBD
<b>Inner Width (ft.)</b>	500 ft.	500 ft.	TBD	500 ft.	500 ft.	TBD
<b>Outer Width (ft.)</b>	700 ft.	700 ft.	TBD	700 ft.	700 ft.	TBD
<b>Acreage</b>	13.770	13.770	TBD	13.770	13.770	TBD
	Runway 10			Runway 28		
	Existing	Standard	Future	Existing	Standard	Future
<b>Approach Visibility Minima</b>	Visual	Visual	Visual	Visual	Visual	Visual
<b>Length (ft.)</b>	1000 ft.	1000 ft.	1000 ft.	1000 ft.	1000 ft.	1000 ft.
<b>Inner Width (ft.)</b>	250 ft.	250 ft.	250 ft.	250 ft.	250 ft.	250 ft.
<b>Outer Width (ft.)</b>	450 ft.	450 ft.	450 ft.	450 ft.	450 ft.	450 ft.
<b>Acreage</b>	8.035	8.035	8.035	8.035	8.035	8.035

*Source: AC 150/5300-13A, Airport Design and TKDA, 2017*

If the status of any of the RPZs changes as previously mentioned, then incompatibilities will need to be rectified or an alternatives analysis performed documenting why the incompatibilities cannot be fixed. Despite some of the incompatibilities being “grandfathered-in,” the airport should still actively attempt to clear the RPZ from the incompatibilities for the safety of the people and persons on the ground.

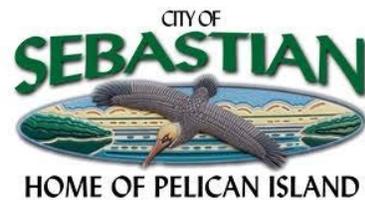
## Runway System Requirements Summary

The following tables summarize the runway requirements for X26.

**TABLE 4-23  
RUNWAY 5-23 DATA TABLE**

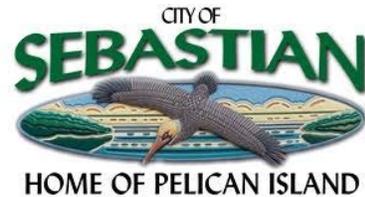
	Existing		Standard		Future	
	5	23	5	23	5	23
<b>Aircraft Service</b>	Utility		N/A		Utility	
<b>Runway Design Code</b>	B-II		N/A		Same	
<b>Approach Reference Code</b>	B-II-5000		N/A		TBD	
<b>Departure Reference Code</b>	B-II-5000		N/A		TBD	

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<b>Pavement Strength (lbs.)</b>	22,000		N/A		Same	
<b>Pavement Material</b>	Asphalt		N/A		Same	
<b>Surface Treatment</b>	None		N/A		Same	
<b>Effective Gradient</b>	0.07%		±2.00		Same	
<b>Wind Coverage at 13 knots</b>	95%		95%		Same	
<b>Runway Length</b>	4,023'		N/A		TBD	
<b>Runway Width</b>	75'		75'		Same	
<b>Displaced Threshold Elevation</b>	N/A		N/A		TBD	
<b>Runway Lighting Type</b>	LIRL		LIRL		Same	
<b>Runway Marking Type</b>	NPI		NPI		Same	
<b>Part 77 Approach Category</b>	B(NP)	B(NP)	N/A	N/A	TBD	TBD
<b>Approach Type</b>	Non-Precision	Non-Precision	N/A	N/A	Same	Same
<b>Visibility Minimums</b>	1-Mile	1-Mile	N/A	N/A	TBD	TBD
<b>Type of Aeronautical Survey Required</b>	Non-Vertically Guided		Non-Vertically Guided		Vertically Guided	
<b>Runway Departure Surface</b>	Yes	Yes	Yes	Yes	TBD	TBD
<b>Threshold Siting Surface</b>	Row 4, 8	Row 4, 8	N/A	N/A	TBD	TBD
<b>Visual and Instrument NAVAIDs</b>	PAPI-2, Beacon, AWOS-3, ADS-B Antenna		N/A		PAPI-2, REILs, Beacon, AWOS-3, ADS-B Antenna	
<b>Touchdown Zone Elevation</b>	18.4'	21.5'	N/A	N/A	18.4'	21.5'
<b>Vertical Datum</b>	NAD88		NAD88		Same	
<b>Horizontal Datum</b>	NAD83		NAD83		Same	
<i>Source: Federal Aviation Administration Advisory Circular 150/5300-13A Change 1</i>						

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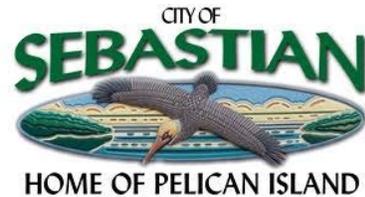


**TABLE 4-24  
RUNWAY 10-28 DATA TABLE**

Runway 10-28					
	Existing		Standard	Future	
Aircraft Service	Utility		N/A	Utility	
Runway Design Code	B-II Small		B-II Small	B-II Small	
Approach Reference Code	B-II-Visual		NA	B-II-Visual	
Departure Reference Code	B-II-Visual		NA	B-II-Visual	
Pavement Strength (1,000lbs)	Unpublished		12.5	12.5	
Pavement Material	Asphalt		NA	Asphalt	
Surface Treatment	None		NA	None	
Effective Gradient	0.00%		NA	0.00%	
Wind Coverage at 10.5 knots/13 knots	90%/91%		95%	90%/91%	
Runway Length	3,199'		NA	3,199'	
Runway Width	75'		75'	75'	
Displaced Threshold Elevation	NA		NA	NA	
Runway Lighting Type	None (Reflectors)		NA	Same	
Runway Marking Type	Basic		NA	Same	
Part 77 Approach Category	A(Vis)	A(Vis)	NA	A(Vis)	A(Vis)
Approach Type	Visual	Visual	NA	Same	Same
Visibility Minimums	>1 mile	>1 mile	NA	Same	Same
Type of Aeronautical Survey Required	Non-Vertically Guided		NA	Non-Vertically Guided	
Runway Departure Surface	None		NA	None	
Threshold Siting Surface	Row 2		NA	Row 2	
Visual and Instrument NAVAIDs	PAPI-2, Beacon, AWOS-3, ADS-B Antenna		NA	PAPI-2, Beacon, AWOS-3, ADS-B Antenna	
Touchdown Zone Elevation	18.3'	20.8'	NA	18.3'	20.8'
Vertical Datum	NAD88		NAD88	NAD88	
Horizontal Datum	NAD83		NAD83	NAD83	

*Source: Federal Aviation Administration Advisory Circular 150/5300-13A Change 1*

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## Taxiway System Requirement

A safe and efficient taxiway system is designed to provide safe and efficient aircraft movement to and from the runways to landside facilities. The previous ALP was developed when taxiway design was based on Airport Design Group (ADG) only, which itself is based on the wingspan and tail height of an aircraft. However, within an ADG, there can be vastly different types of undercarriage in the aircraft. The FAA, according to AC 150/5300-13A, has introduced Taxiway Design Groups (TDG). These TDGs are based on the Main Gear Width (MGW) and the Cockpit to Main Gear Distance (CMG) of the taxiway critical aircraft (which may be different than the runway critical aircraft). There are seven TDGs, and the representative critical aircraft for taxiways at X26, the Beechcraft King Air 200D and 350i, both fall within the TDG 2 category.

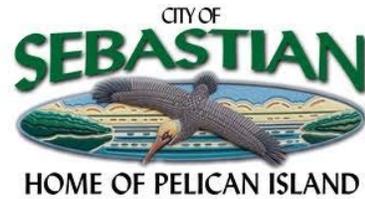
TDG 2 taxiways and taxilanes have a maximum width of 35 feet. Since Sebastian Municipal Airport was originally designed as a Naval aircraft training facility, much of the airfield was designed to support military operations. Also, some of the existing taxiways, including Taxiway A, was designed and initially used as a runway. Currently Taxiway A runs from North to South on the edge of the general aviation apron, and it connects the northwest development to Runway 10 as well as Runway 5. Taxiway B is 35 feet wide and runs parallel on the north side of Runway 10-28.

New taxiways are being designed and constructed during the time of this writing. Taxiways C, D, and E are all designed to accommodate taxiway group 2 aircraft. However, taxilanes supporting the T-hangars on the west side of the airfield are only 15 feet wide. This may be due to the size of the aircraft. However, even TDG group 1A aircraft require a taxilane width of no less than 25 feet. Thus, as part of proposed development, improvements to the existing taxiway system as well as new taxiways and taxilanes will be identified.

FAA has begun to enforce the right aircraft right size approach in designing and constructing infrastructure at airports. All future taxiways and taxilanes will be funded only to the maximum width of the critical aircraft's TDG at the time of development.

Taxiway and taxilane clearance requirements are still associated with the ADG of the critical aircraft as it is determined by wingspan. Due to the desire to maintain the operational capability of the runway as B-II, the taxiway/taxilane separations will be

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based on ADG II standards. **Table 4-25** lists the safety areas for taxiways and taxilanes based upon this criteria.

TABLE 4-25 TAXIWAY AND TAXILANE SAFETY AREAS		
Item	IA/B	II
Taxiway Protection		
<b>Taxiway/Taxilane Safety Area</b>	49'	79'
<b>Taxiway OFA</b>	89'	131'
<b>Taxilane OFA</b>	79'	115'
Taxiway Separation		
<b>Taxiway Centerline to Parallel Taxiway/Taxilane Centerline</b>	70'	105'
<b>Taxiway Centerline to Fixed or Moving Object</b>	44.5'	65.5'
<b>Taxilane Centerline to Parallel Taxilane Centerline</b>	64'	97'
<b>Taxilane Centerline to Fixed or Movable Object</b>	39.5'	57.5'
Wingtip Clearance		
<b>Taxiway Wingtip Clearance</b>	20'	26'
<b>Taxilane Wingtip Clearance</b>	15'	18'

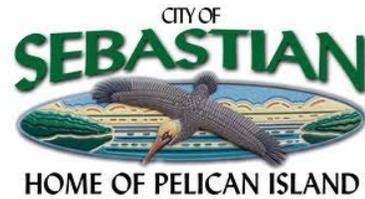
*Source: FAA AC 150/5300-13A Change 1*

Current taxiway and taxilane data for ACQ is listed in **Table 4-26** and **Table 4-27**.

TABLE 4-26 TAXIWAY/TAXILANE CRITICAL AIRCRAFT		
	Existing	Future
<b>Aircraft</b>	Beech King Air 200D	Beech King Air 350i
<b>Cockpit to Main Gear</b>	14.92 (14'11")	16.25 (16' 3")
<b>Main Gear Width</b>	17.17 (17'2")	17.17 (17' 2")
<b>Design Group</b>	1A	2

*Sources: Beechcraft Textron Aviation Aircraft Data, 2017 and FAA AC 150/5300-13A Change 1*

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**TABLE 4-27  
TAXIWAY AND TAXILANE DESIGN CRITERIA**

	Existing	Future
Taxiway Design Group	1A	Same
Taxiway Width	25'	35'
Taxiway Safety Area Width	49'	79'
Taxiway Object Free Area Width	89'	131'
Taxiway Edge Safety Margin	5'	7.5'
Taxiway Shoulder Width	10'	15'
Taxilane Design Group	1A	1/2
Taxilane Width	15'/35'	25'/35'
Taxilane Object Free Area Width	79'	79'/115'
Taxilane Safety Area Width	49'	49'/79'

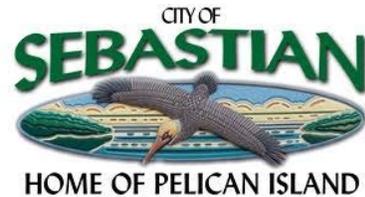
*Source: FAA AC 150/5300-13A, Airport Design*

## Taxiway A and B

There are currently no airfield signs at X26. As noted, Taxiway A was a former runway and runs on the east side of the west airport apron. From initial measurements, it appears that portions of Taxiway A may be wider than the required width of 35 feet. Narrowing the Taxiway to the correct width will likely open up apron space for aircraft movement to and from various aircraft facilities as well as provide area for aircraft apron parking. Taxiway A is not equipped with any lighting, and will likely need to be remarked to clearly identify the taxiway movement area and allowable apron parking positions.

Taxiway B is located on the north side of Runway 10-28, and provide full parallel access to the runway. Taxiway B provides access to the west side of the airport as well as the north side of the airfield and infield areas. The taxiway is in satisfactory condition, and the taxiway is not equipped with lights. Since Sebastian Airport is primarily used during daylight hours, the existing taxiways are equipped with reflectors only rather than taxiway lights.

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Taxiway B currently is used as the primary taxiway to access facilities around the airfield property. The taxiway is currently 35 feet in width and is designed to support B-II aircraft.

To maintain APRC and DPRC B-II design standards, the recommended safety areas for Taxiway A are based on an ADG II aircraft which includes a safety area width of 79 feet and an object free area width of 131 feet. Both the current TSA and TOFA are clear of objects. The current runway centerline to Taxiway B centerline separation is 240 feet satisfying the standard for B-II operations with approach visibility minima not lower than greater than 1 statute mile.

## New Taxiways C, D and E

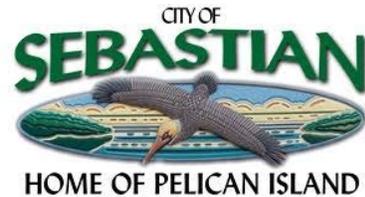
In 2016, the City and Airport management worked with Infrastructure Engineering Consultants to design several new taxiways for the airport which would improve aircraft and airport vehicle movements as well as improve safety and access to planned development. All taxiways were designed to accommodate TDG Group 2 aircraft. Taxiway C was designed as a full parallel taxiway to Runway 5-23. This runway is equipped with four connector taxiways as well as an aircraft runup area. Construction of Taxiway A will also allow for access to the Northeast quadrant of the airport, which will allow for aviation development within the northeast portion of the airfield.

Taxiway D was designed to provide access to Runway 5-22 and the new corporate area development, aprons and the terminal apron. The Taxiway was designed to not provide direct access to Runway 5-23, thus eliminating any unforeseen runway incursions.

Taxiway E provides access to and from the terminal area apron and taxilane and the Runway 28 threshold. This runway is planned to be located on the south side of Runway 28 to allow direct access to the terminal area. The taxiway will be located 240 feet from the runway centerline.

All taxiways including connector taxiways are designed to accommodate Taxiway Design Group 2 aircraft represented by the existing critical aircraft, King Air B-200D, and the future critical aircraft the King Air 350i. Thus, all parallel taxiways and access taxiways to existing and proposed facilities should be designed to a 35 foot standard. In addition, all

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taxiways are not equipped with any type of lighting but are rather equipped with taxiway reflectors.

## Taxilanes

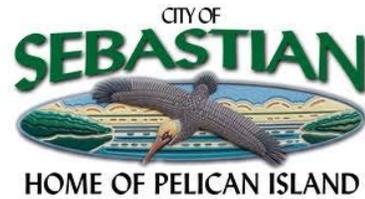
The pavement leading to and in between hangars are important to ensuring the safe passage of aircraft to the taxiway system, and subsequently the national airspace system. The taxilanes include the taxilanes leading to the hangars and the taxilanes between those hangars. The pavement conditions vary amongst the taxilanes from fair to satisfactory condition.

Taxilanes must allow the safe passage of aircraft between hangars and to other facilities. Taxilanes which provide access to and from the T-hangars on the west side of the airport appear to be only 15 feet wide. Thus, it is recommended that all taxilanes be designed to support at least TDG Category 1A and 1B aircraft requiring a width of 25 feet. Although the T-hangar is currently full, the size of the taxilanes limit its use by slightly larger aircraft. Therefore, proposed development will be designed to satisfy the taxilane object free area separation of 79 for ADG I aircraft, and 115 feet for ADG II aircraft.

## PARACHUTE LANDING AREAS/DROP ZONES

A major tenant of Sebastian Municipal Airport is Skydive Sebastian. Skydive Sebastian leasehold is located within the northwest quadrant of the airport property. The parachute landing area (PLA) drop zone is designated in the infield north of Taxiway B. A Swoop Pond was recently installed near the closed runway on the northeast side of the airport. Skydive Sebastian has several buildings including a tiki bar, hangar, as well as a building providing bathroom facilities. Skydive Sebastian attracts jumpers from all over the world and holds special events at the Airport throughout the year. Skydive Sebastian also has an above ground Jet A fuel tank used for their operations only, and the airport has provided as part of their leasehold property that may be used for camping. Skydive Sebastian is looking to expand their facilities. Therefore, as part of proposed development, the Master Plan team considered planned Skydive Sebastian's plans to allow for compatible development.

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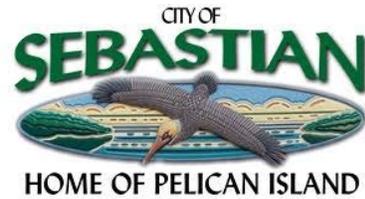
Sebastian Skydive provides a variety of opportunities including student training, tandem jumps as well as jumps designed for experience skydivers.

**FIGURE 4-10  
AIRPORT DROP ZONE**



Although the airport is listed as a drop zone according to the United States Parachutists Association, there is not a specified landing area currently marked on the airfield. According to DOT/FAA/AR-11/30, *Development of Criteria for Parachute Landing Areas on Airports*, May 2012, provides recommendations for development of on-airport parachute landing areas (PLAs) to be incorporated into FAA AC 150/5300-13A. The PLA's must be hazard free. The size of the PLA is dependent upon the parachutists experience and type of activity. Three PLAs are recommended:

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**TABLE 4-28  
PARACHUTE LANDING AREA REQUIREMENTS**

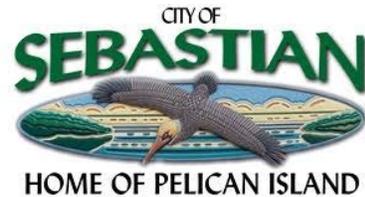
Parachute Activity	Minimum PLA Size Using Ram-Air Canopies (sq. ft.)	Minimum PLA Size Using Round Canopies (sq. ft.)	Minimum Radial Distance From Hazards (ft)	Experience Level
Student/training	338,000	3,041,900	40	Least experienced parachutists
Tandem	84,500	N/A	40	B- and C-licensed parachutists and tandem operations
All other activity	5,000	338,000	40	Most Experienced Parachutists

Examples of Minimum PLAs include:

- Student/training PLAs and requires  $(100 \text{ m radius from hazards})^2 \times \pi \approx 338,000$  SF:
  - 582 x 582 foot square
  - 656 ft diameter circle
  - 700 x 483 ft rectangle or
  - Any other shape with an area equaling 338,000 square feet
- Tandem PLAs and requires  $(50 \text{ meter radius from hazards})^2 \times \pi \approx 84,500$  SF
  - 292- by 292-ft square
  - 328-ft-diameter circle
  - 340- by 250-ft rectangle
  - Any other shape with an area equaling 84,500 sq. ft
- All Other Activity PLAs and requires  $((12\text{-m radius from hazards})^2 \times \pi \approx 5000 \text{ sq. ft.})$ .
  - 70- by 70-ft square
  - 80-ft-diameter circle
  - 85- by 60-ft rectangle
  - Any other shape with an area equaling 5000 sq. ft.

The edge of the PLA must be located at a minimum of 40 feet from any hazard. PLAs should not be located within a runway safety area or object free areas.

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## Recommended PLA Markings

On-airport PLAs perimeter boundaries should be marked to distinguish the PLA from the surrounding areas, and allow the parachutist to discern the landing area from the air.

Sample type of markings include:

- Dashed line, a minimum of 3 inches wide in white or orange chalk, paint, or engineering tape
- Traffic-style cones
- Flags
- Streamers or
- Landscaping

It is also recommended to use different types of markers when designating areas within the PLA and the perimeter of the PLA.

## Approach and Navigational AIDS

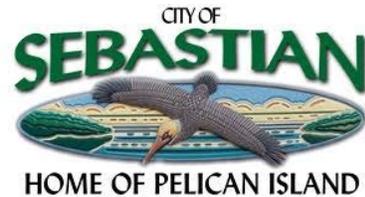
### Instrument Approach Facilities

X26 does not currently utilize on-airport instrument approach facilities. Instead, there are designated GPS approaches to Runway 5 and 23, which do not require on-site equipment. No plans are currently in place to reduce the minimums at X26 to less than 3/4 statute mile. However, the feasibility of lowering the visibility minimums to less than 1 mile but more than 3/4 statute mile will be evaluated as part of the airfield alternatives analysis. Although not required, approach facilities are recommended for airports with less than one mile approaches. In July 2008, Sebastian Airport became the first airport in the United States to have an operational ADS-B tower.

### Visual Landing Aids

X26 also uses a number of visual landing aids, such as those listed in **Chapter 2, Existing Airport Inventory**. Sebastian is equipped with two beacons: the first is located at the top of the arrival and departure building and the backup beacon is located in the parking lot near the electrical vault. The Airport is also equipped with a lighted wind cone and segmented circle, and the runup area near the Runway 5 threshold is equipped with a magnetic wind rose. All runways are equipped with PAPI-2s, but only Runway 5-23 is equipped with any runway edge lighting. As part of the analysis related to the viability

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of lowering the approach to Runway 5 or 23, runway end identification lights (REILs) would also be considered.

## Weather Reporting

As previously mentioned in **Chapter 2, Existing Airport Inventory**, the current Super Automated Weather Observing System (AWOS) is being replaced with an AWOS-3, which will allow better coverage. In addition the new AWOS-3 will be equipped with dual coverage allowing users to hear both weather as well as airport traffic communications within the airport airspace. The new AWOS-3 is being located within the infield area between future Taxiway C and Runway 10-28 within the southwest quadrant of the airport property. This location provides unobstructed coverage, which should provide accurate weather and wind data.

## Airfield Signage and Pavement Markings

### Airfield Signage

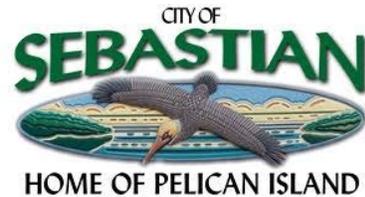
X26 is not currently equipped with any airfield signage for the runway or taxiways. It is suggested the airport install taxiway and runway signs. FAA Advisory Circular 150/5345-44K, *Specification for Runway and Taxiway Signs* details signage requirements at airports.

### Pavement Markings

Runway 5-23 is marked as a non-precision instrument approach since both Runway 5 and 23 are equipped with RNAV GPS approaches. Non-precision markings are the standard for runways with instrument approach minima greater than or equal to one mile as well as for approach minima greater than or equal to 3/4 mile.

Runway 10-28 is still marked as a Basic runway since it continues to only support visual approaches with runway visibility greater than 1 mile, and is limited to daytime use only. Based upon the most recent inspection, the runway markings on both 5-23 and 10-28 are in fair to good condition.

# Sebastian Municipal Airport Master Plan Update



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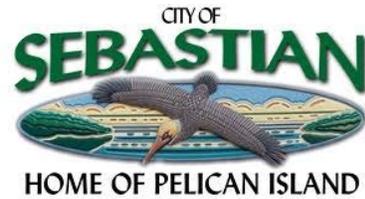
## Aircraft Aprons and Tie-Downs

The Airport has several aprons around the airport which provide aircraft parking and movement areas to adjacent facilities. The terminal area apron provides approximately 7 to 10 tie-down spaces. There is also aircraft parking on the apron south of the T-hangar facilities and on the northwest apron adjacent to Pilot's Paradise facilities. In all, there are approximately 25 tie-downs for general aviation aircraft.

However, according to leasehold data, the northwest apron is part of the Pilot's Paradise lease and they obtain revenue from tie-down parking. Still, based upon on-site inspections, the area is not well marked which causes some adjacent tenants to be blocked from their facilities. Thus as part of the Apron redevelopment and rehabilitation, remarking Taxiway A along with adding movement area and parking markings to more efficiently use the existing apron facilities was considered as part of the alternatives analysis.

Airport tie-down demand consists of both based aircraft and transient aircraft demand. Aircraft parking requirements were based upon the length and wingspan of the typical aircraft fleet at X26 as well as a 10 and 20 foot buffer around the aircraft. The proposed parking criteria for the typical aircraft using the airport are outlined in **Table 4-29**.

# Sebastian Municipal Airport Master Plan Update



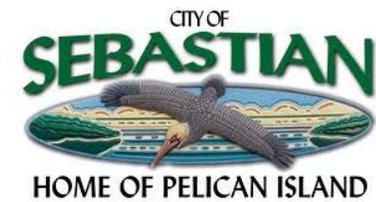
**TABLE 4-29  
AIRCRAFT PARKING SPACE REQUIREMENTS**

Make/Model*	Length (INCHES)	Wing Span (INCHES)	Required Parking Area <sup>1</sup>
			(Square Yards)
<b>Beech 200D</b>	526	654	266
<b>DH6-300</b>	621	780	374
<b>King Air 350i</b>	560	695	301
<b>Piper Cherokee</b>	279.5	360	78
<b>Velocity TXL</b>	240	372	69
<b>Velocity XL</b>	240	372	69
<b>Velocity XL-5</b>	240	372	69
<b>Velocity SE</b>	228	352	62
<b>Velocity V-Twin</b>	240	418	78
<b>Cessna 208 Caravan</b>	451	625	218
<b>Embraer Phenom 300</b>	506	638	249
<b>Helicopter Parking Areas</b>	40 x 40 ft		178

*Sources: Aircraft manufacturer data, AC 150/5300-13a and TKDA 2017*

Using this data along with forecast transient peak hour demand along with anticipated based aircraft parking demand, a low and high apron and aircraft parking demand forecast was development to assist Airport management. If shade and other hangars are not provided to satisfy demand, then increase apron parking demand was anticipated. Table 4-x highlight the anticipated low and high apron parking demand forecasts.

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**TABLE 4-30  
FORECAST APRON PARKING DEMAND**

Year	Based Aircraft				Transient Aircraft			Apron Parking Demand (SY)	Parking Demand (SY)
	SEP/MEP	Turbine/Rotor	Other*	Apron Parking Demand (SY)	SEP/MEP	Turbine/Rotor	Other		
Low Forecasts of Demand									
2017	5	0	0	400	2	0	0	355	755
2018	5	0	0	390	1	1	0	452	842
2022	5	0	0	390	1	1	0	452	842
2027	6	0	1	593	1	1	0	452	1,045
2032	6	0	0	468	1	1	0	452	920
2037	6	0	1	537	1	1	0	452	989
High Forecasts of Demand									
2017	18	0	0	1,414	2	0	0	355	1,769
2018	22	0	3	1,923	2	0	0	357	2,280
2022	23	0	3	2,001	2	0	0	370	2,371
2027	24	0	4	2,148	2	1	0	388	2,536
2032	32	0	4	2,772	2	1	0	409	3,181
2037	32	0	13	3,393	2	1	0	431	3,824

*Sources: TKDA 2017*

# Sebastian Municipal Airport Master Plan Update



## Aircraft Hangars

As part of the inventory process, it was determined that there was a need for additional hangar facilities at the Airport including small shade through conventional hangar facilities. In preparation of continued growth and demand, Airport management’s goal is to provide for an on-site corporate industrial park using the 150 acres gained by closing Runway 13/31. Management would also like to attract additional aviation services and construct additional T-hangars and/or ‘condo’ hangars.

Using a breakdown of aircraft storage demand from historical data as well as other nearby and similar airports, the following percentages were applied to traffic forecast to determine the likely need as illustrated in **Table 4-31**.

TABLE 4-31 BREAKDOWN OF HANGAR DEMAND						
Aircraft Type	Conventional	Corporate	T-Hangar	Shade	Apron	Total
Single Engine	10%	5%	45%	30%	10%	100%
Multi-Engine Piston	25%	15%	30%	20%	10%	100%
Turbo-Prop	50%	50%	0%	0%	0%	100%
Jet/VLJ	50%	50%	0%	0%	0%	100%
Helicopter (Rotor)	50%	20%	10%	10%	10%	100%
Experimental	50%	50%	0%	0%	0%	100%
Light Sport	0%	35%	55%	5%	5%	100%
Other	0%	50%	50%	0%	0%	100%
*Note: Conventional Hangars typically accommodate 4 aircraft						
<i>Corporate Hangars typically can accommodate 2 aircraft</i>						
<i>Sources: TKDA 2017</i>						

# Sebastian Municipal Airport Master Plan Update



Based upon this demand estimate and forecast activity levels, forecast hangar demand was identified as illustrated in **Table 4-32**.

TABLE 4-32 FORECAST HANGAR DEMAND						
	Conventional	Corporate	T-Hangar	Shade	Total	Apron Tie-Downs
<b>Actual</b>	<b>6</b>	<b>0</b>	<b>40</b>	<b>0</b>		<b>15</b>
2017	2	4	27	13	46	9
Surplus/(Deficit)	4	(4)	13	(13)		6
2018	3	5	29	22	59	7
Surplus/(Deficit)	3	(5)	11	(22)		8
2022	4	5	33	23	65	7
Surplus/(Deficit)	2	(5)	7	(23)		8
2027	4	6	36	23	69	9
Surplus/(Deficit)	2	(6)	4	(23)		6
2032	1	8	38	32	79	8
Surplus/(Deficit)	5	(8)	2	(32)		7
2037	2	8	36	40	86	9
Surplus/(Deficit)	4	(8)	4	(40)		6

*Sources: Airport historical records and TKDA, 2017*

## Aircraft Fuel Storage

Both the City of Sebastian and Pilot’s Paradise sell 100LL fuel. Pilot’s Paradise provides full service at their location on the west side of the airfield, and the City provides self-service facilities adjacent to the Airport Terminal building. Pilot’s Paradise is equipped with one 10,000 gallon tank as well as a 1200 gallon fuel truck. Sebastian Skydive also has their own personal tank, 10,000 gallons, which contains Jet A, but they use it only for fueling their own aircraft. The City is also equipped with one 10,000 gallon fuel tank that provides 100LL as well as a fuel truck and self fueling equipment.

Using the fleet mix forecast of operations in addition to historical fuel demand, the following forecasts of fuel demand were developed. It is recommended that the City of

# Sebastian Municipal Airport Master Plan Update



Sebastian obtain either an additional 10,000 gallon fuel tank to support Jet A operations or obtain a dual use tank in order to provide Jet A, MoGas, or biofuel, whichever demand warrants.

The forecast of anticipated fuel demand for key forecast years is provided in **Table 4-33**.

TABLE 4-33 FORECAST FUEL – 14 DAY PEAK DEMAND				
Year	Avgas Sold (Gal per Ops)	Peak Month Ops	Peak Month Fuel	14 Day Peak Fuel
2017	1.25	3,788.79	4,735.99	2,431.14
2018	1.24	3,861.24	4,773.00	2,450.14
2022	1.18	4,147.53	4,903.11	2,516.93
2027	1.12	4,475.60	5,003.88	2,568.66
2032	1.06	4,817.69	5,094.08	2,614.96
2037	1.00	5,173.85	5,173.85	2,655.91
Year	Jet A (Gal per Ops)	Peak Month Ops	Peak Month Fuel	14 Day Fuel
2017	43.00	300	12,908.95	6,626.59
2018	43.53	313	13,604.92	6,983.86
2022	45.73	367	16,787.84	8,617.76
2027	48.63	441	21,460.22	11,016.25
2032	51.72	530	27,396.25	14,063.41
2037	55.00	635	34,938.14	17,934.91

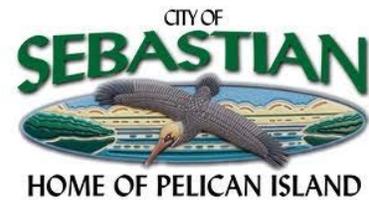
Sources: Airport and tenant historical fuel records, operational data and TKDA forecast of demand, 2017

## Arrival/Departure Building

The general aviation terminal building at Sebastian was completed and dedicated in October 2006. This building is located on the east side of the airport’s 620 acre property and is accessed from Main Street to Airport Drive. The 10,000 square foot general aviation terminal building houses several tenants as well as the airport administration offices. Adjacent to the terminal apron facilities is a self-serve station that provides 100LL fuel only.

According to **Chapter 3, *Forecasts of Aviation Activity***, the anticipated peak hour passengers likely to use the GA terminal building ranged between 6 and 7 passengers.

# Sebastian Municipal Airport Master Plan Update



Since two wings of the terminal building are currently rented to tenants and one wing is used by the Airport administration, the following estimate of Terminal Area demand was determined as illustrated in **Table 4-34**.

## Automobile Parking

Peak hour parking demand was based upon peak hour itinerant and local passenger demand and tenant parking demands. The airport has approximately 135 parking spaces scattered around the airport which includes parking adjacent to the Arrival and Departure building, new corporate hangars, and parking facilities located off Airport Drive West. Applying spacing recommendations provided in the City of Sebastian Ordinance Sec. Sec. 54-3-10.6., *Design and specifications for parking areas*, paragraph h, and Transportation Research Board publication, *Measuring Airport Landside Capacity, guidance*, a 40 square yard area was used to determine parking space and parking movement lane needs.

Peak hour parking demand was established by determining itinerant and local aircraft parking needs based upon the type of operation (i.e. air taxi, personal use and skydiving). Using historical and forecast data outlined in Chapter 3, the following passenger estimates were used to determine peak demand based upon forecast peak hourly operations shown in **Table 3-17**.

# Sebastian Municipal Airport Master Plan Update

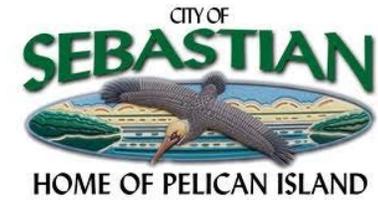
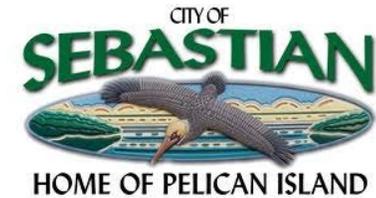


TABLE 4-34  
TERMINAL AREA DEMAND

Year	Air Taxi	Itinerant GA	Skydiving	Local GA	Total Peak Hour Passengers	Terminal Tenants (SF)	Airport Offices (SF)	Passenger Demand (SF)	Total Demand	Est. Terminal Area	Surplus/(Deficit)
2017	2	4	12	0	6	5000	2000	903	7,903	10000	2,097
2018	2	4	12	0	6	5000	2000	909	7,909	10000	2,091
2022	2	4	15	0	6	5000	2000	935	7,935	10000	2,065
2027	2	4	15	1	6	5000	2000	969	7,969	10000	2,031
2032	3	4	18	1	7	5000	2000	1,008	8,008	10000	1,992
2037	3	4	21	1	7	5000	2000	1,050	8,050	10000	1,950

Sources: Airport historical data, peak hour demand, and TKDA, 2017

# Sebastian Municipal Airport Master Plan Update



**TABLE 4-35  
ESTIMATED PEAK HOUR PASSENGER DEMAND**

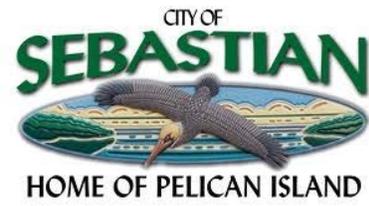
Year	Air Taxi		Itinerant GA		Skydiving Local		Local GA		Total Passengers
	Avg Enplanements	Total Passengers per 50% peak hour operations	Avg Enplanements	Total Passengers per 50% peak hour operations	Avg Enplanements	Total Passengers per 50% peak hour operations	Avg Enplanements	Total Passengers per 50% peak hour operations	
2017	2	2	1.5	5	6	12	1	0	19
2018	2	2	1.5	5	6	12	1	0	19
2022	2	2	1.5	5	6	15	1	0	22
2027	2	2	1.5	5	6	15	1	1	23
2032	3	3	1.5	5	6	18	1	1	27
2037	3	3	1.5	5	6	21	1	1	30

Sources: Airport historical records and TKDA 2017

Discussions with tenants and on-site inventory showed that during peak hours, on-airport tenant surface parking demand was approximately 55 spaces. As the airport attracts more tenants, this number is anticipated to grow. However, to establish a baseline for likely tenant parking demand, a correlation of 2.90 tenant spaces per peak hour passenger parking demand was applied.

The City of Sebastian Code Ordinance also has requirements for handicap parking spaces as illustrated in **Table 4-36**.

# Sebastian Municipal Airport Master Plan Update

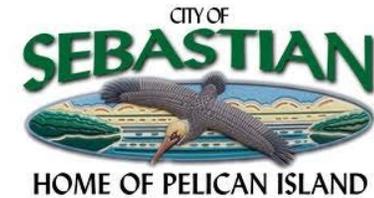


**TABLE 4-36**  
**HANDICAP PARKING SPACE ORDINANCE REQUIREMENTS**

Total Spaces Required	Required Number of Handicap Spaces
1—25	1
26—50	2
51—75	3
76—100	4
101—150	5
151—200	6
201—300	7
301-400	8

On-site inventory identified approximately 135 total parking spaces (5,400 square yards) of which at least five are designated as handicapped. Applying forecast demand to existing facilities, parking surplus and deficits were determined as illustrated in **Table 4-37**.

# Sebastian Municipal Airport Master Plan Update



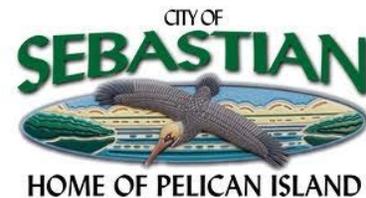
**TABLE 4-37  
AUTOMOBILE PARKING DEMAND**

Fiscal Year	Peak Tenant Demand	Peak Hour Passenger Demand	Peak Hour Parking Space Demand	Parking Spaces Available	Surplus (Deficit)	Handicap Spaces Needed	Handicap Spaces Available	Surplus (Deficit)	Peak Hour Parking Area Demand	Parking Area Available (SY)	Surplus/(Deficit) (SY)
2017	55	19	74	135	61	3	5	2	2,960	5,400	2,440
2018	55	19	74	135	61	3	5	2	2,960	5,400	2,440
2022	64	22	86	135	49	4	5	1	3,440	5,400	1,960
2027	67	23	90	135	45	4	5	1	3,600	5,400	1,800
2032	78	27	105	135	30	5	5	0	4,200	5,400	1,200
2037	87	30	117	135	18	5	5	0	4,680	5,400	720

Sources: Peak Hour Demand, Historical airport data, aviation activity forecast and TKDA 2017

Although surplus parking may be identified, the location and condition of the parking may not support forecast demand. Therefore, both surface access and automobile parking needs were further evaluated as part of the airport development analyses.

# Sebastian Municipal Airport Master Plan Update



## Stormwater Drainage

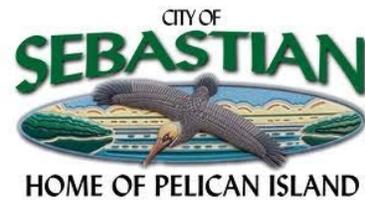
Stormwater drainage at X26 is provided via a series of on-site manmade and natural ditches, swales and retention basins which are located on the airport golf course. Drainage facilities are used to divert runoff from the paved airport operating areas well as the skydiving jump zone. Based upon Indian River County FEMA Flood Insurance Rate Information, updated December 4, 2012, airfield stormwater runoff drains from the north and west toward retention areas to the south and east of the airport property. During heavy rain events, standing water can be found in the infield area of the airport due to the type of airport soils. However, most of this water dissipates between 24 and 48 hours of such an event. The current drainage system adequately supports current operations and infrastructure at the airport. Further, there is some available capacity to support additional demand.

Still, future improvements including increased impervious surfaces such as runways, taxiways, apron, buildings, etc. will require additional treatment areas. As part of any future development, evaluation of stormwater discharge and containment should be evaluated to limit any potential impacts to environmentally sensitive habitat on and adjacent to the airport property. Stormwater drainage improvements to accommodate potential airport development is provided in **Chapters 5, *Airport Alternatives and Recommended Development***, and **8, *Airport Implementation Plan***, of this report.

## Land Use and Potential Acquisition

Current airport property encompasses 620 acres of which approximately 1/3 is used by the Sebastian Municipal 18-hole golf course. In addition to the golf course, portions of the current airport property was designated as conservation to support Scrub Jay, Gopher Tortoise and other habitats. According to federal funding grants, conservation is not an acceptable on-airport land use. Therefore, in conjunction with this master plan update, an airport environmental study is being performed. This study along with the property encumbrance report and Exhibit 'A' Property Map identifies the 88 acres of airport property that were identified for conservation but now may be used for aviation project construction. In addition, with the closure of former runway 13-31 on the north side of the airfield, this opened up along with other areas within the existing property approximately 100 acres for industrial development and an additional 70 acres for corporate park development

# Sebastian Municipal Airport Master Plan Update



Airfield improvements which may shift required safety areas may require additional property acquisition either via fee simple or via an easement agreement. Land necessary to support planned airport development, to maintain compliance with FAA directives, and support compatible contiguous land use were identified in Chapters 5 and 6 of this report. Recommendations related to land acquisition or sale to support long-term airport development including likely funding sources is provided in detail in Chapter 8, Airport Implementation Plan, of this report.

## Summary

This chapter has discussed the needs of the airport, and the wants that may not be justified, but should be protected for when they become justified. The following tables summarize the facility requirements at X26.

TABLE 4-38 AIRSIDE FACILITY NEEDS		
Facility	Deficiency	Action
<b>Jump/Drop Zone</b>	Unmarked Drop Zone	Provide some marking to designate drop zone
<b>Navigational Aids</b>	None	Recommend adding REILs to Runways 5 and 23
<b>Visual Aids</b>	No signage	Consider adding signage
<b>Airspace (Part 77)</b>	Primary surface obstructions	Clear hazards or perform 7460
<b>Airspace (APDS)</b>	Approach and Departure surface obstructions	Clear obstructions

*Source: FAA AC 150/5300-13A, Airport Design; TKDA 2017*

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**TABLE 4-39  
AIRSIDE FACILITY FUTURE NEEDS**

Facility	Future Condition	Action
<b>Runway</b>	Maintenance and runway rehabilitation	Monitor aircraft operations from critical aircraft
<b>Taxiway</b>	Full-parallel	Extend when justified
<b>Taxiway Lighting</b>	MITLs	Add MITLs instead of reflective markers to Taxiway C and D to support airfield development
<b>Approaches</b>	Evaluate viability $3/4 \leq X < 1$ Mile	Evaluate and Ensure other requirements can be met (RPZ, clearance, etc.)
<b>Aeronautical Survey Required</b>	Vertically Guided	Approaches are < 1 Mile
<b>Source: FAA AC 150/5300-13A, Airport Design; TKDA 2017</b>		

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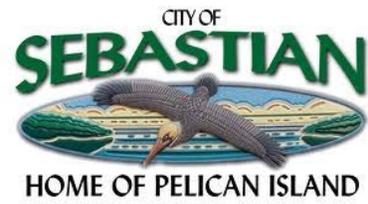
**TABLE 4-40  
LANDSIDE FACILITY NEEDS**

Facility	Deficiency	Action
<b>Hangars</b>	Need 8 new hangar units	Construct 8-10 unit T-hangar
<b>Apron</b>	Tie-down in TOFA	Reconfigure apron, apron expansion
<b>Parking</b>	Five spaces needed	Add more parking; parking for skydivers and spectators
<b>Security</b>	Easy access to hangars	Relocate fenceline in conjunction with proposed airport development. Keep access gate closed or monitor. Add additional security cameras to Hangar C.
<b>RPZ</b>	Incompatible Uses	Perform further RPZ analysis
<b>Land Acquisition</b>	Acquire easement to property located within existing runway protection zones	Acquire land to obtain control of these safety area

*Source: FAA AC 150/5300-13A, Airport Design; TKDA 2016*

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