Chapter Three
FACILITY REQUIREMENTS

To properly plan for the future of Corpus Christi International Airport (CCIA), it is necessary to translate forecast aviation demand into the specific types and quantities of facilities that can adequately serve the identified demand. This chapter uses the results of the forecasts presented in Chapter Two, as well as established planning criteria, to determine the airside (i.e., runways, taxiways, navigational aids, marking, and lighting) and landside (i.e., hangars, aircraft parking apron, and automobile parking) facility requirements.

The objective of this effort is to identify the adequacy of existing airport facilities and outline what new facilities may be needed, and when they may be needed, to accommodate forecast demands. Facility requirements will be established in this chapter, and alternatives for providing these facilities will be evaluated in the next chapter.

PLANNING HORIZONS

An updated set of aviation demand forecasts for CCIA has been established; a summary of the primary forecasting elements was presented on Exhibit 2N. These activity forecasts include commercial passenger enplanements, annual operations, based aircraft, fleet mix, and air cargo. With this information, specific components of the airfield and landside system can be evaluated to determine their capacity to accommodate future demand.

Cost-effective, efficient, and orderly development of an airport should rely more on actual demand than on a time-based forecast figure. In order to develop a master plan that is demand-based, rather than time-based, a series of planning horizon milestones has been established that considers the reasonable range of aviation demand projections. The planning horizons presented in **Table 3A** are segmented as the short term (approximately years 1-5), the intermediate term (approximately years 6-10), and the long term (generally, years 11-20 and possibly beyond).

TABLE 3A | Planning Horizon Activity Levels – Corpus Christi International Airport

	Base Year	PLANNING HORIZON		
		Short Term	Intermediate Term	Long Term
Demand Indicators				
Enplaned Passengers	348,702	417,500	465,500	540,000
Total Air Cargo (tons)	573	720	6,040	7,941
Dedicated Carrier	489	613	5,682	7,766
Airline Belly Freight	84	107	142	175
Total Based Aircraft	45	49	52	61
Annualized Aircraft Operations				
Passenger Airline	10,916	11,000	11,240	11,720
Air Cargo	525	525	525	525
General Aviation	14,012	17,250	18,800	23,200
Other Air Taxi	4,388	4,640	4,905	5,475
Military	39,616	46,175	46,175	46,175
Total Annual Operations	**69,457**	**75,590**	**81,645**	**87,095**

It is important to consider that actual activity at the airport may be higher or lower than what the annualized forecast portrays. By planning according to activity milestones, the resultant plan can accommodate unexpected shifts or changes in the area's aviation demand. It is important for the plan to accommodate these changes so airport officials can respond to unexpected changes in a timely fashion.

The most important reason for utilizing milestones is that doing so allows airport management flexibility to make decisions and develop facilities according to needs generated by actual demand levels. The demand-based schedule provides flexibility in development, as development schedules can be slowed or expedited according to demand at any given time over the planning period. The resultant plan provides airport officials with a financially responsible and needs-based program.

AIRFIELD CAPACITY

Airfield capacity is measured in a variety of ways. **Hourly capacity** measures the maximum number of aircraft operations that can take place in an hour. **Annual service volume (ASV)** is an annual level of service that may be used to define airfield capacity needs. **Aircraft delay** is the total delay incurred by aircraft using the airfield during a given timeframe. Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5060-5, *Airport Capacity and Delay*, provides a methodology for examining the operational capacity of an airfield for planning purposes. This analysis considers specific factors about the airfield, which are depicted on **Exhibit 3A**. The following describes the input factors as they relate to CCIA.

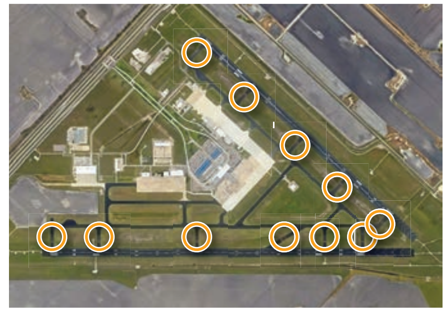
- **Runway Configuration |** CCIA has two runways: primary Runway 13-31 and secondary/crosswind Runway 18-36. Each runway is served by a full-length parallel taxiway. Runways 13 and 36 are equipped with an instrument landing system (ILS) with minimums down to 200 feet and ½ mile. Runways 18 and 31 also have global positioning system (GPS)-based area navigation (RNAV), localizer performance with vertical guidance (LPV), and required navigation performance (RNP) instrument approaches, all with not lower than ½-mile visibility minimums.

AIRFIELD LAYOUT

Runway Configuration

Runway Use

Number of Exits

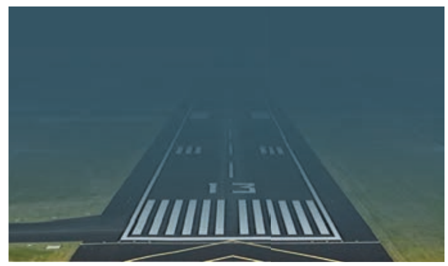


WEATHER CONDITIONS

VMC (VFR) Visual Meteorological Conditions

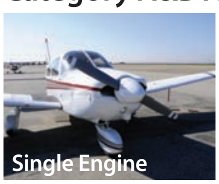
IMC (IFR) Instrument Meteorological Conditions

PVC Poor Visual Conditions

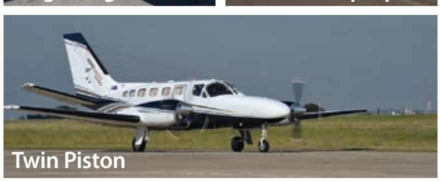


AIRCRAFT MIX

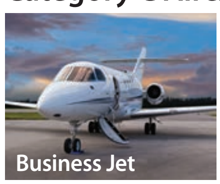
Category A&B Aircraft

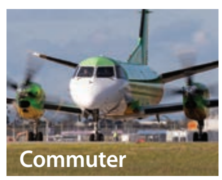

Single Engine


Small Turboprop

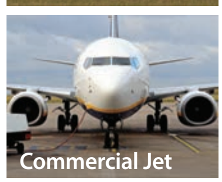

Twin Piston

Category C Aircraft


Business Jet


Commuter


Regional Jet


Commercial Jet

Category D Aircraft


Wide Body Jets

OPERATIONS

Arrivals

Departures

Touch-and-Go

Total Operations

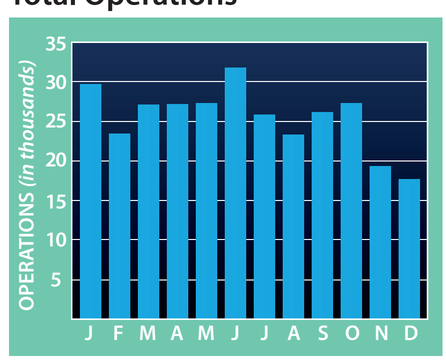


Exhibit 3A
AIRFIELD CAPACITY FACTORS

- **Runway Use |** Runway usage is affected by several factors. Operational safety is the highest priority, so the runway's ability to accommodate a variety of aircraft is the foremost consideration. For example, at 6,080 feet in length, Runway 18-36 may not be fully capable of accommodating the full range of large jet aircraft that operate at CCIA, especially during hot weather conditions in which jet engines are less efficient. Wind direction is another operational factor for runway selection. The location of the runway in proximity to users and the ability to use runways simultaneously can also factor into runway use. During active periods when delay can be a factor, air traffic control will operate runway combinations that can safely provide adequate capacity to minimize delays.

  Runway 13 is the most frequently used runway for both takeoff and landing operations; just under 60 percent of departure operations and just over 60 percent of arrival operations use Runway 13. Runway 18 is the next utilized runway (18 percent for both departure and arrival operations). Runway 36 is preferred over Runway 31 for landing; however, the opposite is true for departures.

- **Exit Taxiways |** Based on the aircraft mix using CCIA, taxiways located between 3,500 and 6,500 feet from the landing threshold count in the exit rating for the airfield. Runways 13 and 31 have three runway exits within the range for an exit rating of 3. Runways 18 and 36 have exit ratings of 2.

- **Weather Conditions |** Visual meteorological conditions (VMC) are defined as conditions in which cloud ceilings are 1,000 feet or above and/or visibility is at least three statute miles. Instrument meteorological conditions (IMC) occur when cloud ceilings are between 500 and 1,000 feet and visibility is between one and three statute miles. Poor visibility conditions (PVC) apply for minimums below 500 feet and one mile.

  Weather data indicate that CCIA is in VMC approximately 94 percent of the year, IMC approximately five percent of the year, and PVC one percent of the year.

- **Aircraft Mix |** Most aircraft operations at CRP fell within Category C at 84.7 percent in 2023. These operations should increase to 87 percent by the long term with the inclusion of slightly higher Category D aircraft, which are represented by cargo operations and the Boeing 757.

- **Percent Arrivals |** Arrival percentages generally follow the typical 50- to 50-percent split.

- **Touch-and-Go Activity |** Percentages of touch-and-go activity are generally low, except during peak military training periods.

- **Operational Levels |** Operational planning horizons were outlined in the previous section of this chapter. It should be noted that the peak hourly data presented include a high level of military training, typically late at night. These operations are generally sporadic and should not be used to define hourly capacity for this analysis. As such, a review of typical peaks within the day, including all forms of activity, was used, which reduced the figure to under 50 operations per hour.

HOURLY RUNWAY CAPACITY

Based on the input factors, current and future hourly capacities for the various operational scenarios at CCIA were determined. The base year and high-range hourly capacities are depicted in **Table 3B**. The base year weighted hourly capacity was 82 operations. This capacity is expected to decline slightly to 79 operations by the long-term planning horizon, as the mix of larger commercial and business jet aircraft at CCIA is expected to increase over time.

TABLE 3B | Airfield Demand/Capacity Summary – Corpus Christi International Airport

	PLANNING HORIZON	
	Base Year-2023	**Long Term**
Operational Demand		
Annual	69,457	87,095
Design Hour	44	50
Capacity		
Annual Service Volume	129,000	137,000
Weighted Hourly Capacity	82	79
Demand/Capacity Ratio	53.7%	63.6%
Delay		
Per Operation (minutes)	0.4	0.5
Total Annual (hours)	463	726

ANNUAL SERVICE VOLUME

The weighted hourly capacity is utilized to determine the annual service volume in the following equation:

Annual Service Volume (ASV) = C x D x H

C = weighted hourly capacity
D = ratio of annual demand to the average daily demand during the peak month
H = ratio of average daily demand to the design hour demand during the peak month

The ratio of annual demand to average daily demand (D) at CCIA was determined to remain relatively constant, increasing slightly in the future (between 268 and 294). The ratio of average daily demand to average peak hour demand (H) was determined to be 5.89 in 2023. This ratio will also remain relatively constant over the forecast period.

The base year ASV was determined to be 129,000 operations. Changes in the demand ratios result in a slight increase in ASV to 137,000 for the long term. Annual operations for the long-term planning horizon are 87,095, which would be 63.6 percent of CCIA's calculated ASV.

AIRCRAFT DELAY

As the number of annual aircraft operations approaches the airfield's capacity, increasing amounts of delay to aircraft operations begin to occur. Delays occur to arriving and departing aircraft in all weather conditions. Arriving aircraft delays result in aircraft holding outside the airport traffic area. Departing aircraft delays result in aircraft holding at the runway end until released by air traffic control.

Table 3B summarizes the aircraft delay analysis conducted for CCIA. The delay per operation represents an average delay per aircraft. It should be noted that delays of five to 10 times the average could be experienced by individual aircraft during peak periods. In the base year of 2023, it was estimated to be 463 hours. Generally, as an airport's operations increase toward the annual service volume, delays increase exponentially. Analysis of delay factors for the long-term planning horizon indicates that annual delay can be expected to nearly double, reaching 726 total hours by the long term; however, it should be noted that total annual delays are not considered significant below 20,000 total hours.

CAPACITY ANALYSIS CONCLUSIONS

FAA Order 5090.3C, *Field Formulation of the National Plan of Integrated Airport Systems (NPIAS)*, indicates that improvements for airfield capacity purposes should begin to be considered once operations reach 60 to 75 percent of the annual service volume. Because this range could be reached at CCIA by the long term, planning for some improvements is generally warranted. Given the relatively low delay hours forecast, these improvements could be achieved with operational modifications or taxiway improvements. No major improvements, such as an additional runway, should be warranted.

AIRFIELD REQUIREMENTS

As indicated earlier, airport facilities include both airfield and landside components. Airfield facilities include those facilities that are related to the arrival, departure, and ground movement of aircraft. The FAA has established various dimensional design standards related to the airfield to ensure the safe operations of aircraft. **Exhibit 3B** presents these dimensional standards.

The FAA design standards impact the design of each airfield component analyzed. The following airfield components are analyzed in detail for compliance to FAA design standards:

- Runway configuration
- Runway design standards
- Runways
- Taxiways
- Navigational and weather aids

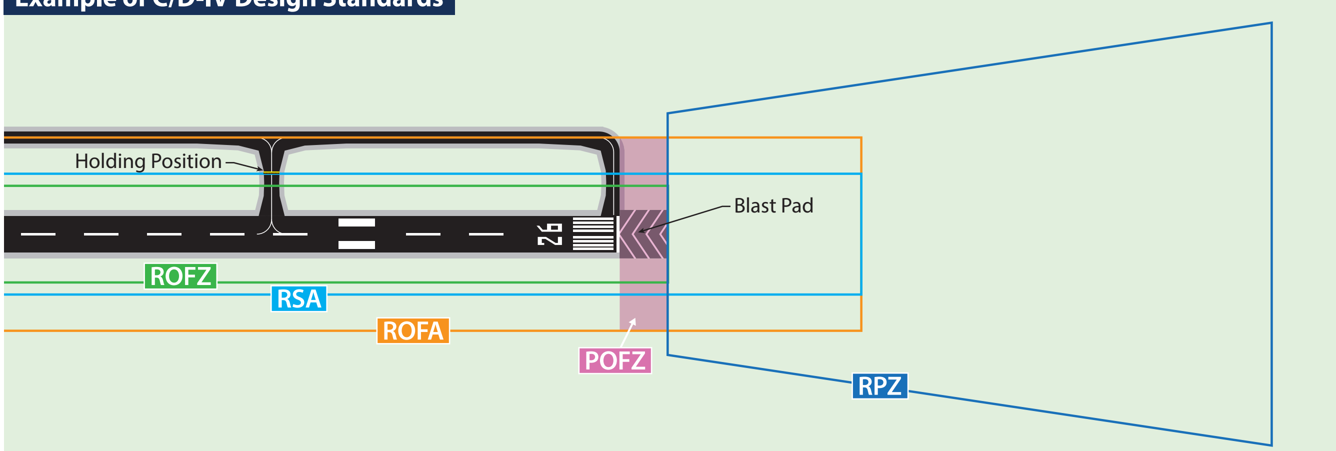
RUNWAY CONFIGURATION

CCIA's airfield system has two runways. Primary Runway 13-31 is oriented northwest to southeast, while crosswind/secondary Runway 18-36 is oriented north to south. Both runways can (and do) support all aircraft operations, including commercial operations; however, Runway 13-31 is primarily used due to its longer length and slightly better wind coverage. As for singular runway ends, Runway 31 is preferred/used significantly more than any other; Runway 31 is used for approximately 60 percent of both arrivals and departures, based on automatic dependent surveillance-broadcast (ADS-B) data

	Runways 13-31 and 18-36 EXISTING	Runways 13-31 and 18-36 ULTIMATE
Runway Design Code (RDC)	C/D-III-2400	C/D-IV-2400
Visibility Minimums (in miles)	1/2-mile	1/2-mile
Existing Runway Dimensions	7,510 x 150 (13-31) | 6,080 x 150 (18-36)	7,510 x 150 (13-31) | 6,080 x 150 (18-36)
RUNWAY DESIGN STANDARDS		
Runway Width	100 (150' for >150k lb. aircraft)	**150**
Runway Shoulder Width	20	**25**
Blast Pad Length/Width	200 x 140	**200 x 200**
RUNWAY PROTECTION STANDARDS		
Runway Safety Area (RSA)		
Width	500	500
Length Beyond Departure End	1,000	1,000
Length Prior to Threshold	600	600
Runway Object Free Area (ROFA)		
Width	800	800
Length Beyond Departure End	1,000	1,000
Length Prior to Threshold	600	600
Runway Obstacle Free Zone (ROFZ)		
Width	400	400
Length Beyond Runway End	200	200
Precision Obstacle Free Zone (POFZ)		
Width	800	800
Length Beyond Runway End	200	200
Approach Runway Protection Zone		
Length	2,500	2,500
Inner Width	1,000	1,000
Outer Width	1,750	1,750
Departure Runway Protection Zone		
Length	1,700	1,700
Inner Width	500	500
Outer Width	1,010	1,010
RUNWAY SEPARATION STANDARDS		
Runway Centerline to:		
Holding Position	250	250
Parallel Taxiway	400	400

Note: All dimensions in feet unless otherwise noted
Source: *FAA AC 150/5300-13B, Airport Design*

Example of C/D-IV Design Standards



provided by the FAA. Runway 18 is the next most utilized end; Runway 18 is used for roughly 15 percent of both arrivals and departures. As such, south flow (operations moving from north to south) occurs approximately 75 percent of the year and dominates traffic flow. Runway 31 has more departure use (13 percent) than Runway 36 (10.5 percent), while Runway 36 (13.5 percent) is used more for landing than Runway 31 (6.7 percent).

A crosswind runway configuration is common at commercial service airports across the country. A crosswind configuration is generally required to meet local wind conditions, as detailed below. For the operational safety and efficiency of an airport, it is desirable for the primary runway to be oriented as closely as possible to the direction of the prevailing wind. This reduces the impact of wind components perpendicular to the direction of travel of an aircraft that is landing or taking off.

FAA AC 150/5300-13A, *Airport Design*, recommends that a crosswind runway be made available when the primary runway orientation provides for less than 95 percent wind coverage for specific crosswind components. The 95 percent wind coverage is computed on the basis of not exceeding a 10.5-knot (12 miles per hour [mph]) component for runway design code (RDC) A-I and B-I; a 13-knot (15 mph) component for RDC A-II and B-II; a 16-knot (18 mph) component for RDC A-III, B-III, C-I through C-III, and D-I through D-III; and a 20-knot component for aircraft with larger wingspans.

Weather data specific to CCIA were obtained from the National Oceanic Atmospheric Administration (NOAA) National Climatic Data Center. These data were collected from the CCIA weather reporting station over a continuous period from January 2014 through December 2024. A total of 124,661 observations of wind direction and intensity were made, as well as other weather observations. Of the total number of observations, 15,845 were made in instrument flight rules (IFR) conditions. IFR conditions exist when visibility is below three miles or cloud ceilings are below 1,000 feet.

Exhibit 3C presents an all-weather wind rose and an IFR wind rose. A wind rose is a graphic tool that provides a succinct view of how wind speed and direction are historically distributed at a particular location. The tables above the wind roses indicate the percent of wind coverage for each runway at specific wind intensities, or crosswind components.

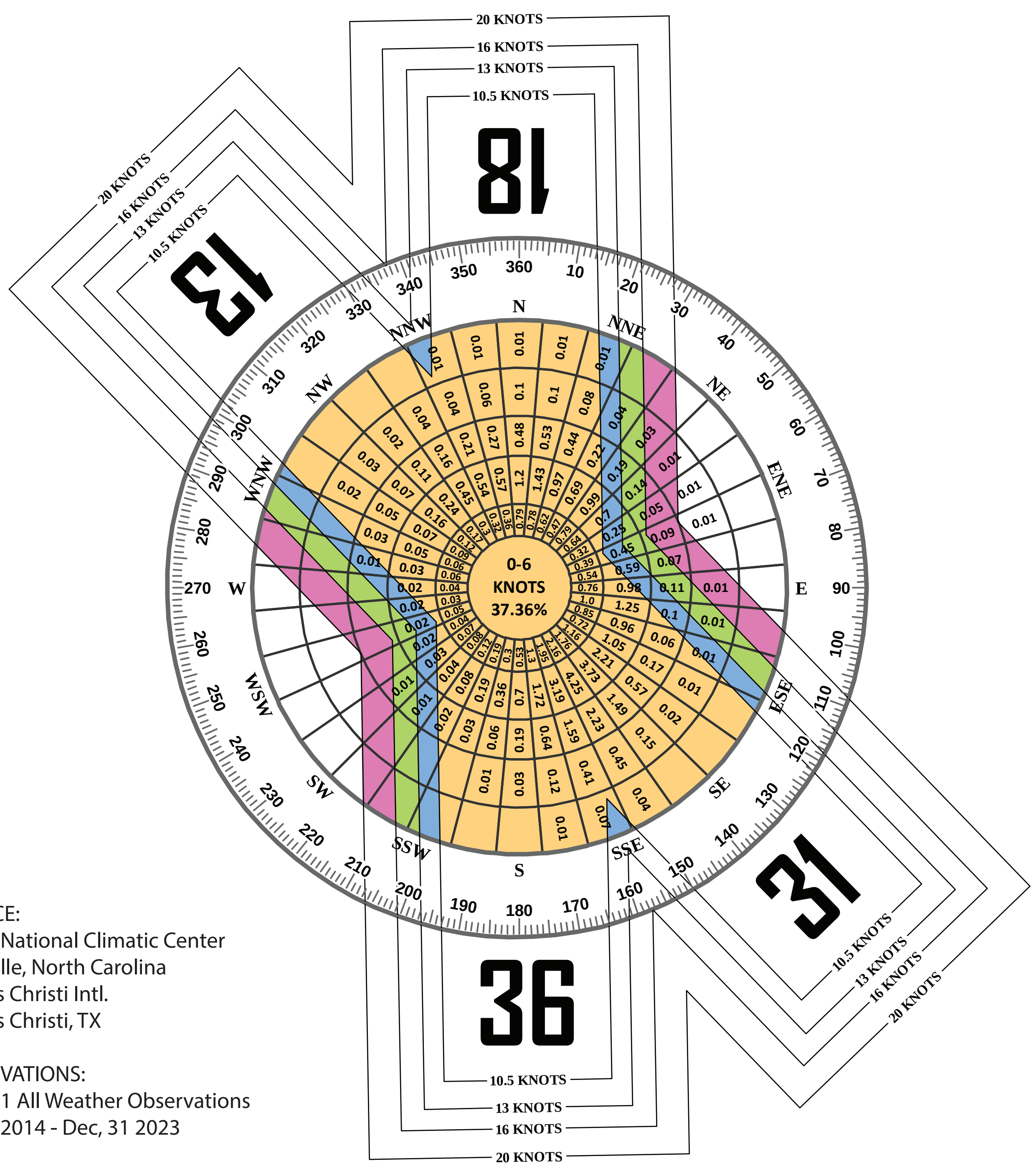
As shown on the exhibit, neither runway can provide sufficient wind coverage at 13 knots or below; therefore, a crosswind runway is justified by FAA standards. Together, both runways provide a combined 97.05 percent coverage for 10.5 knots and greater for all remaining crosswind components; however, it is important to note that neither runway meets FAA design standards for 95 percent coverage for 10.5- or 13-knot components. This generally means both runways are necessary, making both eligible and justified for future federal grant-in-aid funding participation.

RUNWAY DESIGN STANDARDS

The FAA has established design standards to protect aircraft operational areas and keep them free from obstructions that could affect their safe operation. These standards include the runway safety area (RSA), runway object free area (ROFA), runway obstacle free zone (ROFZ), and runway protection zone (RPZ).

ALL WEATHER WIND COVERAGE

Runways	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 13-31	89.31%	94.37%	98.03%	99.55%
Runway 18-36	88.33%	94.67%	98.79%	99.76%
All Runways	97.05%	98.95%	99.73%	99.95%

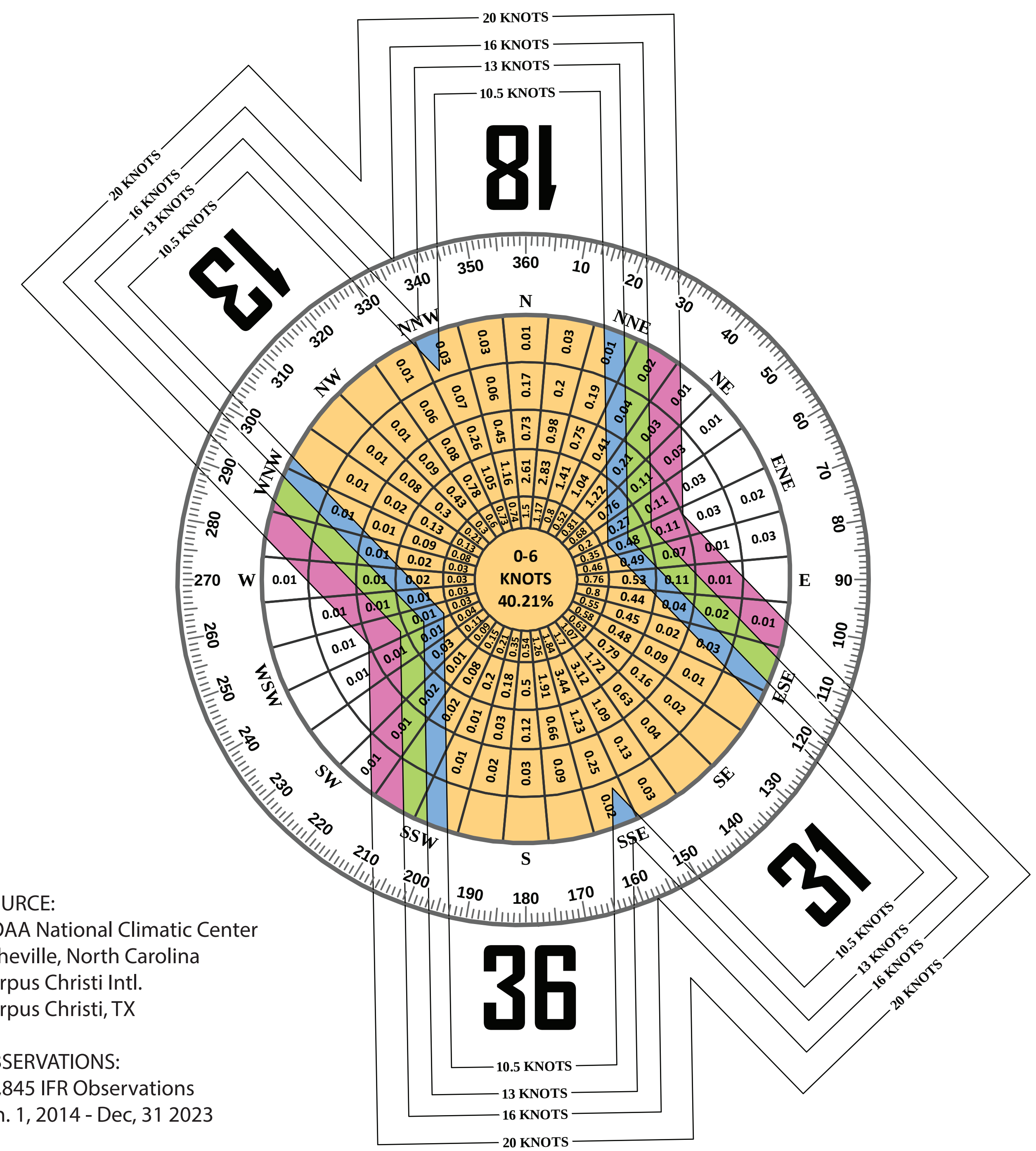


SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
Corpus Christi Intl.
Corpus Christi, TX

OBSERVATIONS:
124,661 All Weather Observations
Jan. 1, 2014 - Dec, 31 2023

IFR WIND COVERAGE

Runways	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 13-31	85.82%	92.16%	96.89%	99.18%
Runway 18-36	92.74%	96.54%	98.89%	99.61%
All Runways	96.87%	98.67%	99.48%	99.82%



SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
Corpus Christi Intl.
Corpus Christi, TX

OBSERVATIONS:
15,845 IFR Observations
Jan. 1, 2014 - Dec, 31 2023

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The entire RSA, ROFA, and ROFZ must be under the direct ownership of the airport sponsor to ensure these areas remain free of obstacles and can be readily accessed by maintenance and emergency personnel. The RPZ for each runway end should also be under airport ownership. An alternative to outright ownership of the RPZ is purchasing avigation easements (acquiring control of designated airspace within the RPZ) or having sufficient land use control measures in place that ensure the RPZ remains free of incompatible development. Dimensional standards for the various safety areas associated with the runways are a function of the types of aircraft expected to use the runways, as well as the instrument approach capability. The various airport safety areas are graphically depicted on **Exhibit 3D**.

Analysis in the previous chapter determined that both runways at CCIA are currently justified under FAA operational criteria as aircraft approach category (AAC) C/D and airplane design group (ADG) III (i.e., C/D-III). All runway ends offer instrument approach capability with lower than ¾-mile visibility minimums; thus, both runways have runway design code C/D-III-2400 under existing conditions. The future RDC for both runways, as projected in the previous chapter, includes the potential upgauging of cargo aircraft to the Boeing 757 model, which is a C-IV aircraft; therefore, for this study, the ultimate RDC for both runways will be C/D-IV-2400. The taxiway design group (TDG) for the Boeing 737 models is currently TDG 3 and would increase to TDG 4 for the Boeing 757.

Previous Airfield Conditions and Improvements

Prior to the examination of airfield design standards, reviewing previous work efforts at CCIA offered perspective. In 2011, the consultant preparing the master plan was contracted to complete a taxiway utilization study with the intent of studying and identifying alternatives for improving what is now deemed an "airfield geometry problem." At the time of the study, the primary airfield geometry concern was the southern convergence of the two runways. The runways did not touch, but their close proximity required the parallel taxiway(s) and runway entrance taxiway(s) serving each of the two southern ends to have a non-standard layout. The non-standard layout was considered a precipitator for pilot confusion, which resulted in several runway incursion events. Runway incursions are serious and require mitigation whenever possible. The recommendations of the study included many proposed improvements, the majority of which focused on shifting both runways north and modifying several taxiways serving both runways and the commercial terminal apron. **Exhibit 3E** graphically presents the "before" and "after" airfield layouts; the "after" airfield layout is the result of the airfield geometry study and subsequently implemented capital projects.

As shown on the exhibit, airside pavements on August 28, 2011, differed greatly from those of December 18, 2023. Both runways were shifted to the north to decouple the runway ends. This allowed for the "Y" intersection of parallel Taxiways A and B to be decoupled, as well, so the resultant configuration provides a 90-degree taxiway connector from the parallel taxiways to both Runway 31 and Runway 36. Many of the other taxiways were moved and/or modified to meet updated FAA standards. Examples include removal of high-speed exits (Taxiways B2, B3, B4, A2, and A3 on the "before" side of the exhibit) and removal of direct-access taxiways linking aircraft parking areas directly to a runway (Taxiways B3, B4, A2, and A3).

Runway Safety Area (RSA)

The RSA is defined in FAA AC 150/5300-13A, *Airport Design*, as a "surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of undershoot, overshoot, or excursion from the runway." The RSA is centered on the runway and dimensioned in accordance with the approach speed of the critical design aircraft that uses the runway. The FAA requires the RSA to be cleared and graded, drained by grading or storm sewers, capable of accommodating the design aircraft and fire and rescue vehicles, and free of obstacles that are not fixed by navigational purpose, such as runway edge lights or approach lights. The existing and ultimate RSA for CCIA extends 1,000 feet beyond each runway end, 600 feet prior to landing on approach, and is 500 feet wide.

All RSA conditions for both runways meet current and future FAA design parameters. It should be noted that the RSAs beyond the south ends of both runways overlap slightly at the southeastern corner of the Runway 31 end. The FAA would prefer the RSAs for two runways to not overlap, if possible; however, it is not a requirement to separate them. The current overlap is minimal and should not pose safety or operational risks, as both areas should be free of obstructions. The possibility of two aircraft using both runways simultaneously interacting in the southern RSA overlap is highly unlikely. As a result, modifications to improve the overlap are not deemed warranted at this time.

Runway Object Free Area (ROFA)

The ROFA is "a two-dimensional ground area surrounding runways, taxiways, and taxilanes, which is clear of objects except for objects whose location is fixed by function (i.e., airfield lighting)." The ROFA does not have to be graded and level like the RSA; instead, the primary requirement for the ROFA is that no object in the ROFA penetrates the lateral elevation of the RSA. The ROFA is centered on the runway, extending out in accordance with the critical design aircraft that utilizes the runway. The ROFAs for both runways are 800 feet wide and extend 1,000 feet beyond each threshold. All ROFAs are properly maintained on the airfield.

Runway Obstacle Free Zone (ROFZ)

The ROFZ is an imaginary volume of airspace that precludes object penetrations, including taxiing and parked aircraft. The only allowance for ROFZ obstructions is navigational aids mounted on frangible bases that are fixed in their locations by function, such as airfield signs. The ROFZ is established to ensure the safety of aircraft operations. If the ROFZ is obstructed, the airport's approaches could be removed, or its approach minimums could be increased. The ROFZ for each runway meets current design standards.

Precision Obstacle Free Zone (POFZ)

A precision obstacle free zone (POFZ) is defined for runway ends that are served by a vertically guided approach and have lower than ¾-mile visibility minimums. The POFZ is 800 feet wide, centered on the runway, and extends 200 feet beyond the runway threshold. All four runway ends at CCIA qualify for this standard to be in effect when the following conditions are met:

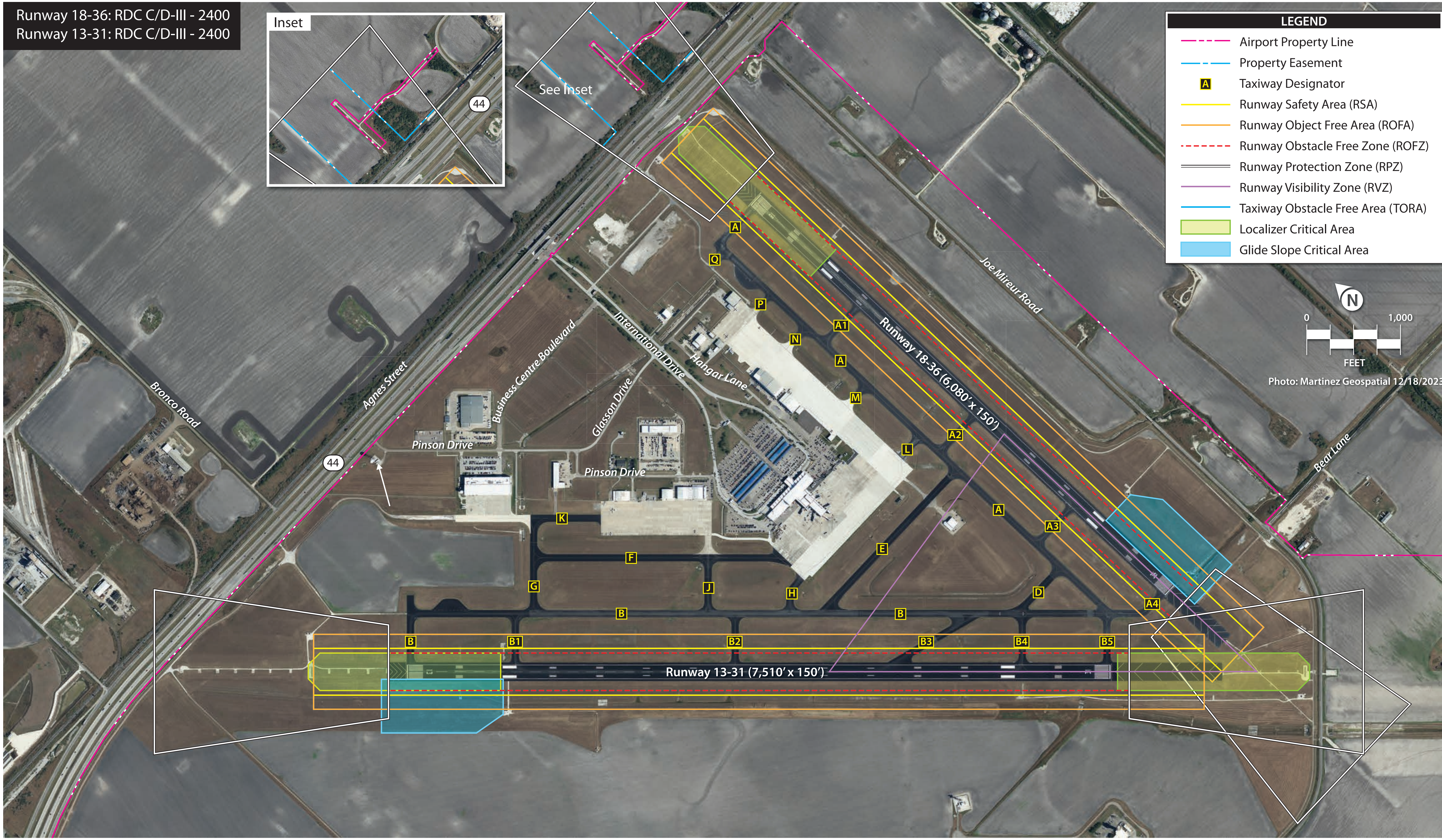


Exhibit 3D
EXISTING SAFETY AREAS

AUGUST 28, 2011

DECEMBER 18, 2023

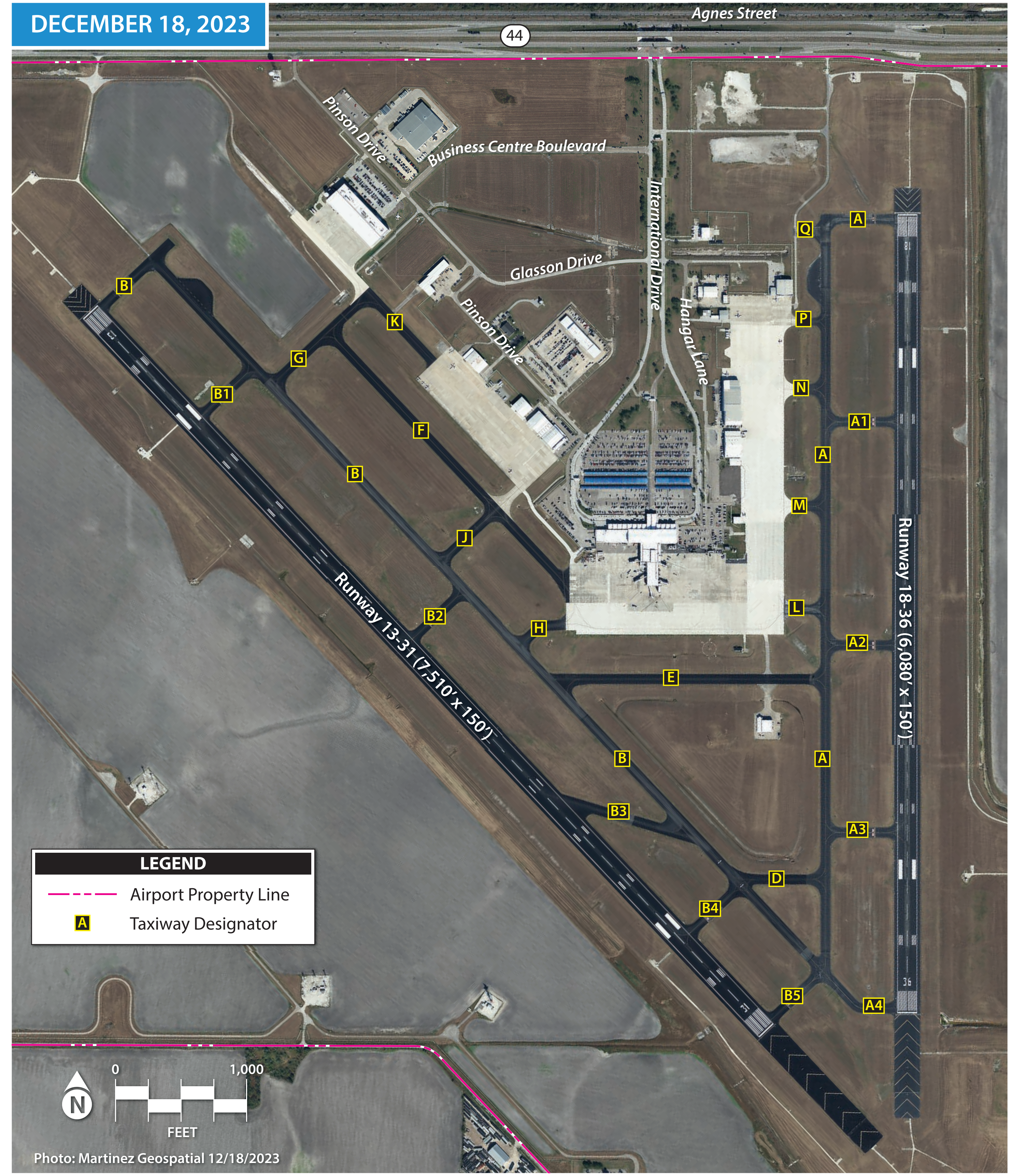


Exhibit 3E
AIRFIELD COMPARISON

a) The runway supports a vertically guided approach.
b) The reported ceiling is below 250 feet and/or visibility is under ¾-mile.
c) An aircraft is on final approach within two miles of the runway threshold.

When the POFZ is in effect, a wing of an aircraft holding on a taxiway may penetrate the POFZ; however, neither the fuselage nor the tail may infringe on the POFZ. All runway ends are served with lower than ¾-mile visibility minimum approaches with vertical guidance (glideslope and GPS LPV). All POFZ areas are clear and should be maintained throughout the planning period.

Runway Protection Zone (RPZ)

An RPZ is a trapezoidal area centered on the extended runway centerline beginning 200 feet from the end of a runway. This safety area is established to protect the end of the runway from airspace penetrations and incompatible land uses. The RPZ dimensions are based on the established RDC and the approach visibility minimums serving the runway. While the RPZ is intended to be clear of incompatible objects or land uses, some uses are permitted with conditions and other land uses are prohibited. According to AC 150/5300-13B, the following land uses are permissible within the RPZ:

- Farming that meets the minimum buffer requirements
- Irrigation channels, as long as they do not attract birds
- Airport service roads, as long as they are not public roads and are directly controlled by the airport operator
- Underground facilities, as long as they meet other design criteria, such as RSA requirements, as applicable
- Unstaffed navigational aids (NAVAIDs) and facilities required for airport equipment that are fixed by function in regard to the RPZ
- Aboveground fuel tanks associated with backup generators for unstaffed NAVAIDs

In September 2022, the FAA published AC 150/5190-4B, *Airport Land Use Compatibility Planning*, which states that airport owner control over RPZs is preferred. Airport owner control over RPZs may be achieved through one of the following methods:

- Ownership of the RPZ property in fee simple
- Possessing sufficient interest in the RPZ property through easements, deed restrictions, etc.
- Possessing sufficient land use control authority to regulate land use in the jurisdiction that contains the RPZ
- Possessing and exercising the power of eminent domain over the property
- Possessing and exercising permitting authority over proponents of development within the RPZ (e.g., where the sponsor is a state)

AC 150/5190-4B further states that "control is preferably exercised through acquisition of sufficient property interest and includes clearing RPZ areas (and keeping them clear) of objects and activities that would impact the safety of people and property on the ground." The FAA recognizes that land ownership, environmental, geographical, and other considerations can complicate land use compatibility within RPZs. Regardless, airport sponsors must comply with FAA grant assurances, including (but not limited to) Grant Assurance 21, *Compatible Land Use*. Sponsors are expected to take appropriate measures to "protect against, remove, or mitigate land uses that introduce incompatible development within RPZs." For a proposed project that would shift an RPZ into an area with existing incompatible land uses, such as a runway extension or the construction of a new runway, the sponsor is expected to have or secure sufficient control of the RPZ, ideally through fee simple ownership. Where existing incompatible land uses are present, the FAA expects sponsors to "seek all possible opportunities to eliminate, reduce, or mitigate existing incompatible land uses" through acquisition, land exchanges, right-of-first refusal to purchase, agreements with property owners regarding land uses, easements, or other such measures. These efforts should be revisited during master plan or airport layout plan (ALP) updates, and periodically thereafter, and documented to demonstrate compliance with FAA grant assurances. If a new or proposed incompatible land use impacts an RPZ, the FAA expects the airport to take the above actions to control the property within the RPZ and adopt a strong public stance opposing the incompatible land use.

For new incompatible land uses that result from a sponsor-proposed action (e.g., an airfield project such as a runway extension, a change in the critical aircraft that increases the RPZ dimension, or lower minimums that increase the RPZ dimension), the airport sponsor is expected to conduct an alternatives evaluation. The intent of the alternatives evaluation is to "proactively identify a full range of alternatives and prepare a sufficient evaluation to be able to draw a conclusion about what is 'appropriate and reasonable.'" For incompatible development off-airport, the sponsor should coordinate with the FAA Airports District Office (ADO) as soon as the sponsor learns of the development, and the alternatives evaluation should be conducted within 30 days of the sponsor's first awareness of the development within the RPZ. The following items are typically necessary in an alternatives evaluation:

- Sponsor's statement of the purpose and need of the proposed action (airport project, land use change, or development).
- Identification of any other interested parties and proponents.
- Identification of any federal, state, and/or local transportation agencies involved.
- Analysis of sponsor control of the land within the RPZ.
- Summary of all alternatives considered, including:
    - Alternatives that preclude introducing the incompatible land use within the RPZ (e.g., zoning action, purchase, and design alternatives, such as implementation of declared distances, displaced thresholds, runway shift or shortening, raising minimums, etc.)
    - Alternatives that minimize the impact of the land use in the RPZ (e.g., rerouting a new roadway through less of the RPZ, etc.)
    - Alternatives that mitigate risk to people and property on the ground (e.g., tunnelling, depressing, and/or protecting a roadway through the RPZ, implementing operational measures to mitigate any risks, etc.).

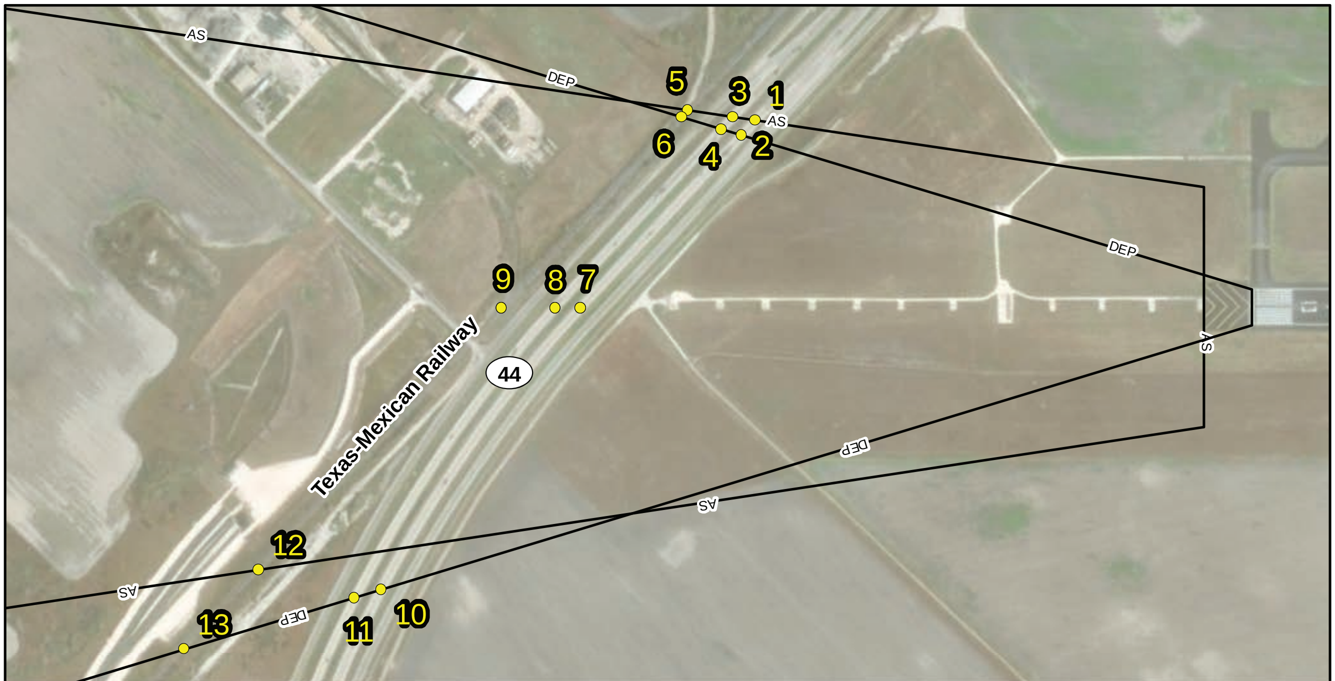
- Narrative discussion and exhibits or figures depicting the alternative.
- Rough order of magnitude cost estimates associated with each alternative, regardless of potential funding sources.
- Practicability assessment based on the feasibility of the alternative in terms of cost, constructability, operational impacts, and other factors.

Once the alternatives evaluation has been submitted to the ADO, the FAA will determine whether the sponsor has made an adequate effort to pursue and fully consider appropriate and reasonable alternatives. The FAA will not approve or disapprove the airport sponsor's preferred alternative. The FAA will only evaluate whether an acceptable level of alternatives analysis has been completed before the sponsor makes the decision to allow or disallow the proposed land use within the RPZ.

In summary, the RPZ guidance published in September 2022 shifts the responsibility of protecting the RPZ to the airport sponsor. The airport sponsor is expected to take action to control the RPZ or demonstrate that appropriate actions have been taken. It is ultimately up to the airport sponsor to permit or disallow existing or new incompatible land uses within an RPZ, with the understanding that the sponsor still has grant assurance obligations, and the FAA retains the authority to review and approve or disapprove portions of the ALP that would adversely impact the safety of people and property within the RPZ.

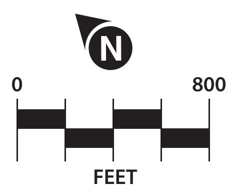
RPZs include both approach and departure RPZs. The approach RPZ is a function of the aircraft approach category (AAC), and approach visibility minimums associated with the approach runway end. The departure RPZ is a function of the AAC, and departure procedures associated with the runway. For a particular runway end, the more stringent RPZ requirements (usually associated with the approach RPZ) will govern the property interests and clearing requirements the airport sponsor should pursue.

None of the runways at CCIA have displaced thresholds, so the approach and departure RPZs on each runway occur in the same location 200 feet from the end of each runway. For planning purposes, the approach RPZ was used to create the most restrictive condition. All four RPZs are shown on **Exhibit 3D**. Both RPZs on the south ends of the runway are fully contained on existing airport property; however, the RPZs to the north extend beyond airport property bounds. A small portion of the northeastern corner of land in the Runway 13 RPZ is not owned by CCIA. This area is mostly owned by the railroad and would likely never be developed for incompatible land uses. A much larger area in the Runway 18 RPZ is not owned. Some of the property is owned to maintain the approach lighting system. Another portion to the sides of the RPZ are owned in easement. Future considerations should include the acquisition of all RPZ land outside current bounds, either in fee or easement, to ensure local control of land uses. The obstruction analysis of Runways 13 and 18 provided on **Exhibit 3F** (front and reverse sides) illustrates that the current Highway 44 and railroad should not be considered hazard-to-flight obstructions. Only a 1.38-foot obstruction to the 50:1 approach surface (Number 7 on the approach surface to Runway 18) on the outer eastern edge of the primary surface is indicated as a concern; however, this "obstruction" is likely not a flight hazard. All other obstacles appear to be clear, based on the survey information obtained for use in this study.



ID	Feature	Ground Elevation (ft. msl.)	Adjustment Height (ft.)	Top Elevation (ft. msl.)	Obstruction Value*	
					50:1 Part 77 Approach (ILS)	40:1 Departure Section 1
1	State Hwy 44	45.20	17.00	62.20	-21.26	N/A
2	State Hwy 44	45.20	17.00	62.20	N/A	-37.04
3	State Hwy 44	45.09	17.00	62.09	-23.24	N/A
4	State Hwy 44	45.01	17.00	62.01	N/A	-39.3
5	TM Railroad	43.00	23.00	66.00	-23.04	N/A
6	TM Railroad	43.35	23.00	66.35	N/A	-39.09
7	State Hwy 44	44.84	17.00	61.84	-36.19	-54.18
8	State Hwy 44	44.84	17.00	61.84	-38.29	-56.8
9	TM Railroad	44.13	23.00	67.13	-37.47	-57.1
10	State Hwy 44	44.08	17.00	61.08	N/A	-75.7
11	State Hwy 44	44.62	17.00	61.62	N/A	-77.93
12	TM Railroad	43.50	23.00	66.50	-58.38	N/A
13	TM Railroad	43.32	23.00	66.32	N/A	-90.96

*Negative Clearance Value indicates point is clear of surface.



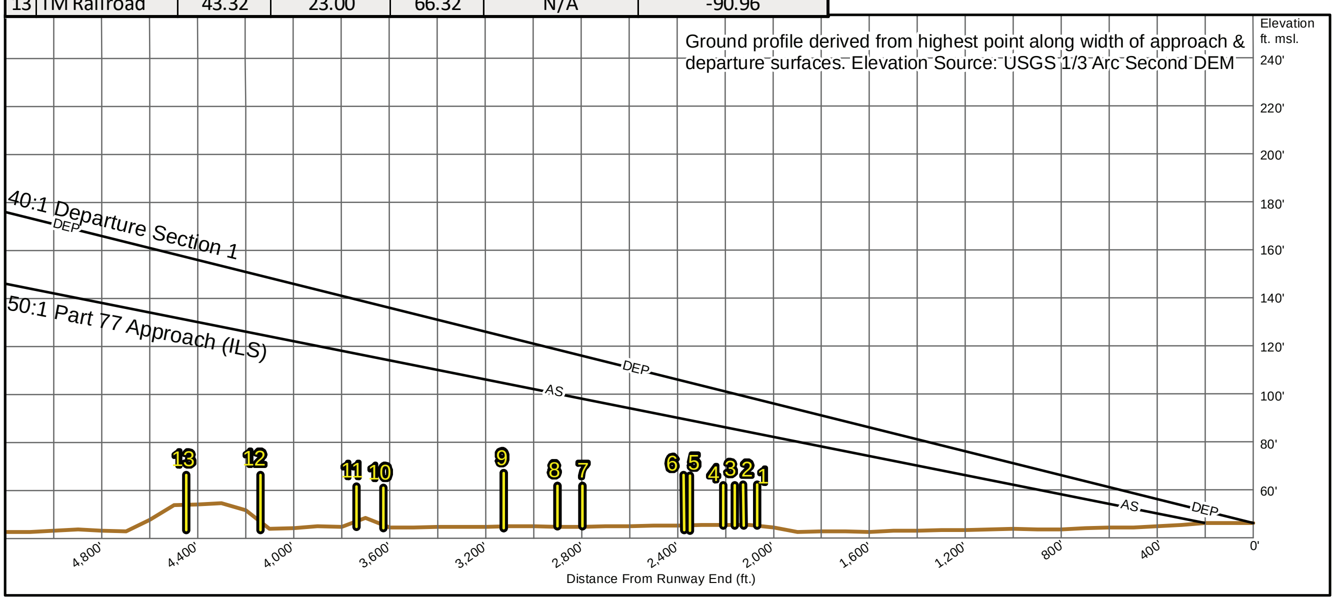
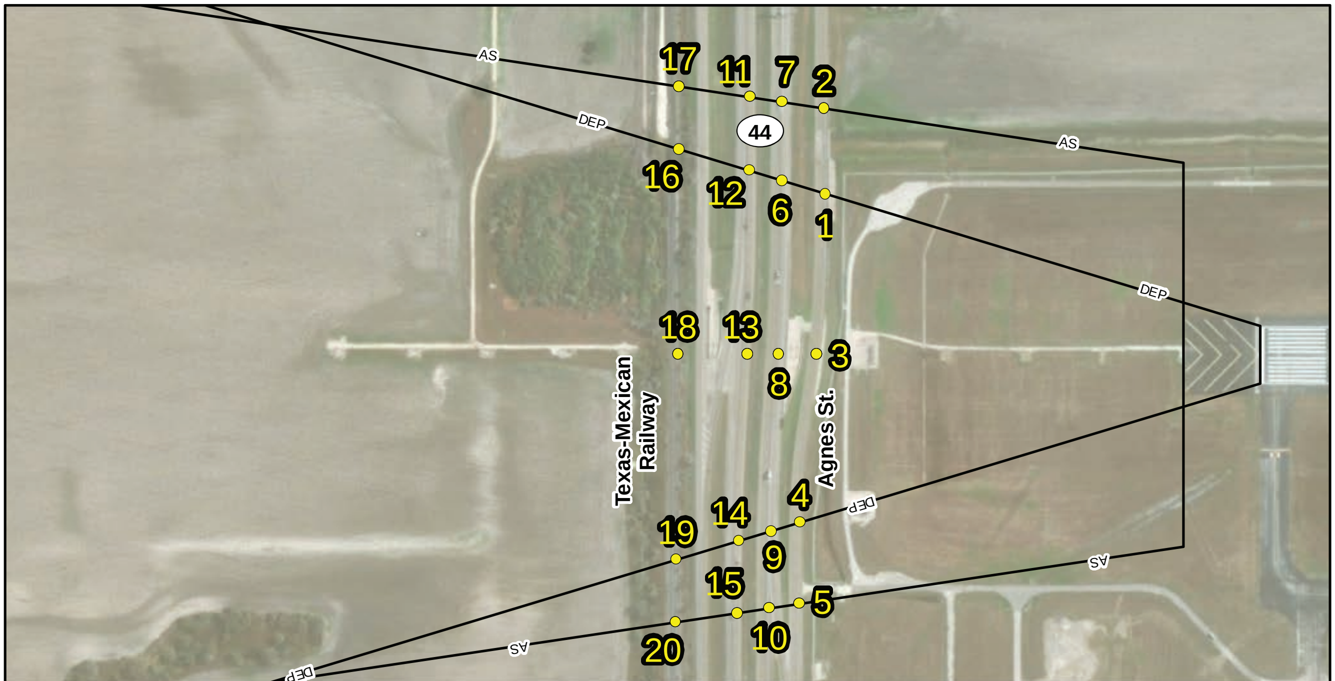


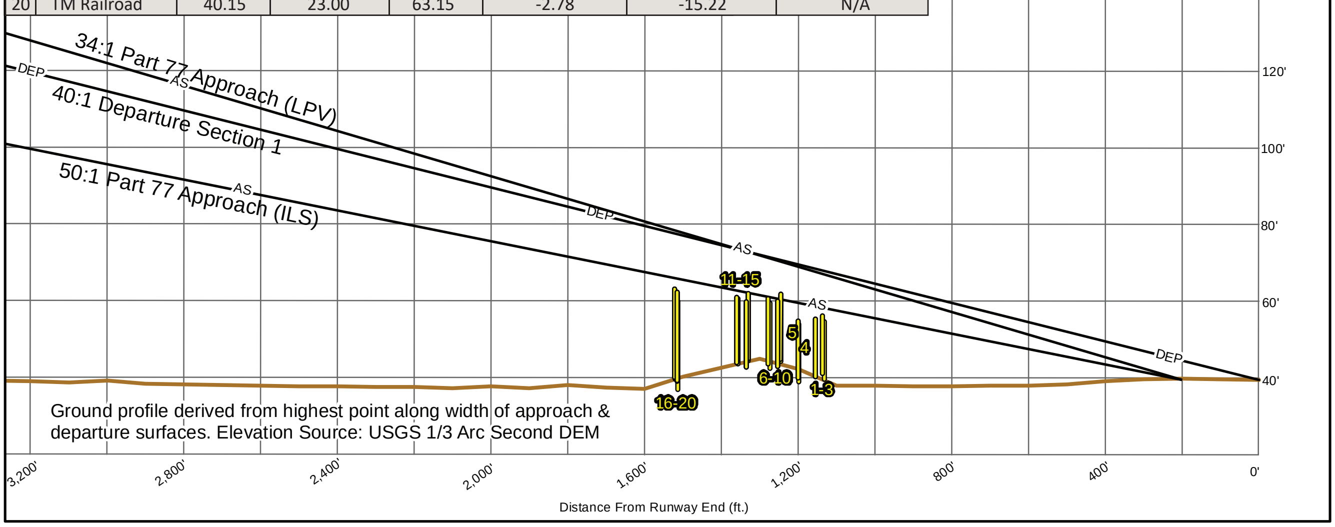
Exhibit 3F
RUNWAY 13 ANALYSIS



ID	Feature	Ground Elevation (ft. msl.)	Adjustment Height (ft.)	Top Elevation (ft. msl.)	Obstruction Value* 50:1 Part 77 Approach (ILS)	34:1 Part 77 Approach (LPV)	40:1 Departure Section 1
1	Agnes St.	39.63	15.00	54.63	N/A	N/A	-13.60
2	Agnes St.	41.18	15.00	56.18	-2.04	-10.86	N/A
3	Agnes St.	40.34	15.00	55.34	-3.28	-12.25	-13.04
4	Agnes St.	38.98	15.00	53.98	N/A	N/A	-15.46
5	Agnes St.	39.88	15.00	54.88	-4.63	-14.04	N/A
6	State Hwy 44	44.22	17.00	61.22	N/A	N/A	-9.41
7	State Hwy 44	44.80	17.00	61.80	1.38	-8.46	N/A
8	State Hwy 44	42.98	17.00	59.98	-0.58	-10.49	-10.85
9	State Hwy 44	42.53	17.00	59.53	N/A	N/A	-11.80
10	State Hwy 44	43.55	17.00	60.55	-0.50	-10.65	N/A
11	State Hwy 44	44.90	17.00	61.90	-0.20	-10.83	N/A
12	State Hwy 44	44.48	17.00	61.48	N/A	N/A	-11.28
13	State Hwy 44	42.84	17.00	59.84	-2.37	-13.06	-13.05
14	State Hwy 44	43.62	17.00	60.62	N/A	N/A	-12.80
15	State Hwy 44	44.03	17.00	61.03	-1.69	-12.61	N/A
16	TM Railroad	36.98	23.00	59.98	N/A	N/A	-17.36
17	TM Railroad	39.15	23.00	62.15	-3.65	-16.03	N/A
18	TM Railroad	39.30	23.00	62.30	-3.51	-15.89	-15.08
19	TM Railroad	39.57	23.00	62.57	N/A	N/A	-14.93
20	TM Railroad	40.15	23.00	63.15	-2.78	-15.22	N/A

*Negative Clearance Value indicates point is clear of surface

N
0 500
FEET



Ground profile derived from highest point along width of approach & departure surfaces. Elevation Source: USGS 1/3 Arc Second DEM

Exhibit 3F (continued)
RUNWAY 18 ANALYSIS

Runway/Taxiway Separation

The design standards for the separation between runways and parallel taxiways are a function of the critical design aircraft and the instrument approach visibility minimum. The runway-to-taxiway separation standard for RDC D-IV runways is 400 feet (centerline to centerline). Parallel Taxiways A and B exceed this standard.

Hold Line Separation

Hold lines are markings on taxiways that lead to runways. When instructed, pilots must stop short of the hold line. The hold line for each runway is 250 feet from the runway centerline.

According to FAA AC 150/5300-13B, *Airport Design*, Change 1, the hold line location must be increased based on an airport's elevation and the RDC of the runway. For RDC C/D/E-III, -IV, and -V, the hold line position should be increased by one foot for every 100 feet above sea level. The elevation of CCIA is less than 100 feet above mean sea level (MSL), so the hold lines for are set at the standard 250-foot dimension.

Aircraft Parking Area Separation

For both runways, aircraft parking areas should be at least 500 feet from the runway centerline. For both runways all aircraft parking areas meet this standard.

RUNWAYS

The adequacy of the existing runway system at CCIA has been analyzed from several perspectives, including runway orientation and adherence to safety area standards. From this information, requirements for runway improvements were determined for CCIA. This section presents runway elements, including length, width, and strength.

Runway Length

The determination of runway length requirements for an airport is based on five primary factors:

1. Mean maximum temperature of the hottest month
2. Airport elevation
3. Runway gradient
4. Critical aircraft type expected to use the runway
5. Stage length of the longest nonstop destination (specific to larger aircraft)

Aircraft performance declines as elevation, temperature, and runway gradient factors increase. For CCIA, the mean maximum daily temperature of the hottest month is 95 degrees Fahrenheit (°F), which occurs in July. The airport elevation is 46 feet above MSL. The gradient of the runways conforms to FAA design standards for 0.6 percent greatest gradient.

Runway length needs for commercial aircraft must factor in the conditions described above, as well as the loads carried by aircraft. An aircraft's load includes its payload of passengers and/or cargo, plus the amount of fuel it has on board. For departures, the amount of fuel varies depending on the length of nonstop flight (or trip length). Current commercial airline jet operations from CCIA are destined for either Dallas Fort Worth International Airport (DFW) or William P. Hobby Airport ("Houston Hobby"/HOU). Both airports fall within 1,000 miles of CCIA and are considered short haul routes. Future routes could include more distant locales (such as Denver, Las Vegas, Nashville, etc.) and more moderate/medium haul routes between 1,000 and 1,500 miles from CCIA.

FAA AC 150/5325-4C, *Runway Length Recommendations for Airport Design*, indicates that individual aircraft planning manuals should be consulted when analyzing runway length for aircraft over 12,500 pounds. The aircraft planning manuals for the most common commercial aircraft that currently (or could potentially) use Corpus Christi International Airport were consulted to determine minimum runway length needs. The runway length needs were determined for travel distances of up to 1,500 miles, which includes most current or potential domestic destinations, as well as many potential international destinations in Mexico. The analysis assumed a full passenger load and adequate fuel (including reserve) to reach the destination. In some cases, airlines will ferry fuel due to availability/pricing; however, fuel ferrying is not considered in the analysis. **Exhibit 3G** presents the runway length requirements for the most common commercial aircraft currently or potentially using CCIA.

Exhibit 3H presents the runway lengths of the most common general aviation turbine aircraft that use the airport, with takeoff length on the front side and landing on the reverse side of the exhibit. The exhibit provides a detailed runway length analysis for several of the most common turbine aircraft in the national fleet. These data were obtained from Ultranav software, which computes operational parameters for specific aircraft based on flight manual data. The analysis includes the maximum takeoff weight (MTOW) allowable and the percent useful load from 60 percent to 100 percent. Also presented is the runway length required for landing under three operational categories: Title 14 Code of Federal Regulations (CFR) Part 25, CFR Part 135, and CFR Part 91k. CFR Part 25 operations are those conducted by individuals or companies that own their aircraft. CFR Part 135 applies to all for-hire charter operations, including most fractional ownership operations. CFR Part 91k includes operations in fractional ownership that utilize their own aircraft under the direction of pilots specifically assigned to said aircraft. Part 91k and Part 135 rules regarding landing operations require an operator to land at their destination airport within 60 percent of the effective runway length. An additional rule requires specific operators (generally, fractional ownership and similar), to land within 80 percent of the effective runway length if the operator has an approved destination airport analysis in the aircraft's program operating manual. The landing length analysis conducted accounts for both scenarios.

Primary Runway 13-31 Length

Runway 13-31 is the airport's longest runway, at 7,510 feet long. This length is sufficient to meet the needs of current and commercial service aircraft operating domestically or to neighboring international destinations. The length should also be sufficient for most future commercial aircraft, including the potential shift of cargo operations to a Boeing 757 freighter. The Boeing 737-900 model could be weight-restricted on longer potential routes, if used, as the need for this aircraft at 80 percent payload is 8,000 feet, which increases to 8,800 feet at 90 percent useful loads.

COMMERCIAL SERVICE AIRCRAFT RUNWAY LENGTH ANALYSIS

AIRCRAFT	MTOW	Runway Length (ft.) Needed At % Payload				
		60%	70%	80%	90%	100%
B727-200	172,000	5,100	5,900	6,500	8,000	8,800
B737-200	115,500	4,500	5,300	6,200	7,200	9,100
B737-300	135,000	4,700	5,200	6,000	7,000	9,000
B737-400	150,000	5,100	5,500	6,800	8,000	10,300
B737-500	133,500	4,400	5,200	5,800	7,000	8,600
B737-600	144,500	4,200	5,000	5,800	6,600	7,200
B737-700	**154,500**	**4,900**	**5,600**	**6,400**	**7,800**	**10,000**
B737-800	**174,200**	**5,100**	**5,900**	**6,300**	**7,000**	**8,100**
B737-900	**174,200**	**6,000**	**6,800**	**8,000**	**8,800**	**9,800**
B757-200	**240,000**	**4,800**	**5,200**	**5,900**	**6,300**	**7,800**
B757-300	**255,000**	**4,900**	**5,500**	**6,300**	**7,000**	**8,000**
B767-200	315,000	4,300	4,800	5,400	5,800	6,300
B767-300	350,000	7,200	7,500	7,800	8,300	9,200
B777-200	508,000	4,800	5,300	6,000	6,400	7,000
A319	145,505	3,800	4,200	4,300	4,600	4,800
A320	157,630	4,000	4,300	5,000	5,300	5,900
CRJ-200	53,000	4,400	4,800	5,200	5,900	6,200
CRJ-700	75,000	4,300	4,500	4,800	5,300	5,700
CRJ-900	82,500	4,800	5,300	5,700	6,200	6,800
ERJ-135 LR	44,092	4,400	4,800	5,400	5,700	6,600
ERJ-140 KL	46,517	4,400	4,700	5,100	5,500	6,000
EMB 145 LR	48,502	4,600	4,900	6,200	6,600	7,800
EMB 170	79,344	3,400	3,900	4,400	4,800	5,100
EMB 190	110,892	4,600	4,800	5,000	5,500	7,200

(green) Less than primary runway length
(red) Greater than the available runway lengths at CRP
Boldface: Indicates current critical design aircraft
MTOW: Maximum Takeoff Weigth

Calculation Assumptions:
46' MSL field elevation
0.6% runway grade
35° mean max temp of hottest month

Source: Ultranav software, Coffman Associates analysis

GENERAL AVIATION AIRCRAFT RUNWAY LENGTH ANALYSIS: TAKEOFF

AIRCRAFT	MTOW	Runway Length (ft.) Needed At % Useful Load				
		60%	70%	80%	90%	100%
King Air C90GTi[1]	10,100	2,553	2,736	2,933	3,129	3,326
King Air C90B[1]	10,100	2,583	2,775	2,977	3,189	3,409
Citation Ultra	16,300	2,739	2,958	3,199	3,452	3,731
Citation V (Model 560)	15,900	2,748	2,988	3,245	3,514	3,795
Citation CJ3	13,870	2,837	3,028	3,248	3,484	3,735
Citation Encore Plus	16,830	2,999	3,298	3,614	3,958	4,333
Citation II (550)	13,300	3,027	3,323	3,633	3,958	4,297
Citation (525A) CJ2	12,375	3,108	3,348	3,603	3,865	4,136
Citation 560 XLS	20,200	3,262	3,509	3,760	4,046	4,332
King Air 200 GT[1]	12,500	3,326	3,427	3,531	3,639	3,752
King Air 350	15,000	3,349	3,486	3,640	3,882	4,187
Citation Bravo	14,800	3,366	3,616	3,888	4,207	4,557
Citation Sovereign	30,300	3,368	3,403	3,515	3,740	3,992
Lear 40XR	21,000	3,890	4,128	4,447	4,785	5,125
Lear 45XR	21,500	3,997	4,286	4,641	5,006	5,437
Falcon 900EX[A]	49,200	4,030	4,530	5,170	5,820	6,410
Gulfstream 350	70,900	4,046	4,403	4,786	5,202	5,651
Gulfstream 280	39,600	4,054	4,455	4,917	5,415	5,954
Hawker 4000	39,500	4,156	4,504	4,877	5,263	5,733
Gulfstream V	90,500	4,167	4,670	5,330	6,126	6,997
Gulfstream III	69,700	4,196	4,639	5,097	5,570	6,055
Global 5000	92,500	4,207	4,671	5,158	5,666	6,196
Gulfstream 300	72,000	4,214	4,601	4,900	5,381	5,873
Hawker 750	27,000	4,238	4,445	4,809	5,238	5,671
Challenger 300	38,850	4,252	4,653	5,071	5,504	5,955
Falcon 7X	70,000	4,266	4,712	5,195	5,721	6,298
Citation III	21,500	4,268	4,672	5,105	5,568	Climb Limited
Hawker 800XP	28,000	4,299	4,727	5,158	5,669	Climb Limited
Falcon 50 EX	41,000	4,317	4,767	5,244	5,748	6,215
Gulfstream IV/SP	74,600	4,321	4,757	5,218	5,704	6,226
Hawker 900 XP	28,000	4,335	4,462	4,787	5,214	5,669
Gulfstream 450	74,600	4,343	4,769	5,236	5,743	6,305
Citation X	35,700	4,381	4,760	5,215	5,694	6,181
Westwind I[C]	22,850	4,381	4,849	5,370	Climb Limited	Climb Limited
Citation VII	23,000	4,473	4,780	5,106	5,465	5,864
Gulfstream 550	91,000	4,489	5,109	5,751	6,407	7,142
Falcon 2000[B]	35,800	4,616	5,002	5,407	5,860	6,597
Challenger 604/605	48,200	4,705	5,187	5,728	6,303	6,889
Gulfstream 100	24,650	4,726	5,234	5,787	6,336	6,879
Gulfstream 650	99,600	4,740	5,230	5,748	6,365	7,033
Westwind II	23,500	4,744	5,214	5,701	6,206	Climb Limited
Canadair 601-3A/R (Challenger 601)	45,100	4,790	5,320	5,920	6,570	7,300
Lear 55	21,500	4,825	5,324	5,951	6,777	7,904
Gulfstream 150	26,100	4,827	5,078	5,284	5,716	6,271
CRJ-200	53,000	4,886	5,429	6,022	6,697	7,465
Lear 60	23,500	4,914	5,380	5,935	6,431	6,993
Sabreliner 65	24,000	4,951	5,573	6,351	7,204	8,036
Hawker 1000	31,000	5,120	5,720	6,330	Climb Limited	Climb Limited
Embraer 135	49,604	5,181	5,778	6,245	6,547	7,234
Gulfstream 200	35,450	5,246	5,878	6,572	8,118	Brake Limited
Gulfstream II/IISP	65,500	5,255	5,643	6,064	6,518	7,005
Lear 35A	19,600	5,258	5,928	6,598	7,279	Climb Limited
Israel IAI/Gulfstream 100	24,650	5,482	6,004	6,569	Climb Limited	Climb Limited

Less than primary runway length
Greater than the available runway lengths at CRP
Climb Limited: Aircraft unable to maintain minimum climb gradient
Brake Limited: Brake energy limit exceeded
MTOW: Maximum Takeoff Weigth

Calculation Assumptions:
46' MSL field elevation
0.6% runway grade
35° mean max temp of hottest month

[1] No Runway Slope Option Available
[A] Calculator MTOW 49000
[B] Calculator MTOW 36500
[C] Calculator MTOW 23500

Exhibit 3H
RUNWAY LENGTH ANALYSIS

Source: Ultranav software, Coffman Associates analysis

GENERAL AVIATION AIRCRAFT RUNWAY LENGTH ANALYSIS: LANDING

AIRCRAFT	MLW	Dry Runway Condition			Wet Runway Condition		
		Part 25	80% Rule	60% Rule	Part 25	80% Rule	60% Rule
King Air 200 GT[1]	12,500	1,194	1,493	1,990	No Data	No Data	No Data
King Air C90B[1]	9,600	1,234	1,543	2,057	No Data	No Data	No Data
King Air C90GTi[1]	9,600	1,374	1,718	2,290	No Data	No Data	No Data
Gulfstream 150	21,700	2,321	2,901	3,868	3,280	4,100	5,467
Citation II (550)	12,700	2,376	2,970	3,960	5,741	7,176	9,568
Westwind II[1]	19,000	2,400	3,000	4,000	2,760	3,450	4,600
Westwind I[1]	19,000	2,480	3,100	4,133	2,860	3,575	4,767
Challenger 300[1]	33,750	2,609	3,261	4,348	5,000	6,250	8,333
Hawker 750	23,350	2,656	3,320	4,427	4,021	5,026	6,702
Hawker 800XP	23,350	2,656	3,320	4,427	4,021	5,026	6,702
Hawker 900 XP	23,350	2,656	3,320	4,427	3,905	4,881	6,508
Global 5000[1]	78,600	2,674	3,343	4,457	3,075	3,844	5,125
Embraer 135[1]	40,785	2,684	3,355	4,473	3,077	3,846	5,128
Gulfstream 550	75,300	2,775	3,469	4,625	4,931	6,164	8,218
Challenger 604/605[1]	38,000	2,784	3,480	4,640	4,306	5,383	7,177
Gulfstream V[1]	75,300	2,787	3,484	4,645	3,205	4,006	5,342
King Air 350	15,000	2,806	3,508	4,677	3,227	4,034	5,378
Lear 40XR	19,200	2,817	3,521	4,695	3,549	4,436	5,915
Lear 45XR	19,200	2,817	3,521	4,695	3,549	4,436	5,915
Citation Sovereign	27,100	2,818	3,523	4,697	3,536	4,420	5,893
Hawker 1000	25,000	2,865	3,581	4,775	3,899	4,874	6,498
Israel IAI/Gulfstream 100	20,700	2,884	3,605	4,807	3,316	4,145	5,527
CRJ-200	47,000	2,908	3,635	4,847	5,573	6,966	9,288
Gulfstream 280	32,700	2,914	3,643	4,857	3,351	4,189	5,585
Falcon 7X	62,400	2,922	3,653	4,870	3,360	4,200	5,600
Falcon 50 EX[1]	35,715	2,928	3,660	4,880	3,367	4,209	5,612
Citation CJ3	12,750	2,959	3,699	4,932	4,038	5,048	6,730
Citation Encore Plus	15,200	2,971	3,714	4,952	4,498	5,623	7,497
Citation Ultra	15,200	3,006	3,758	5,010	4,415	5,519	7,358
Citation V (Model 560)	15,200	3,023	3,779	5,038	4,447	5,559	7,412
Gulfstream 100	20,700	3,081	3,851	5,135	5,884	7,355	9,807
Citation VII	20,000	3,095	3,869	5,158	4,165	5,206	6,942
Falcon 2000[1]	33,000	3,127	3,909	5,212	3,596	4,495	5,993
Citation (525A) CJ2	11,500	3,143	3,929	5,238	4,573	5,716	7,622
Gulfstream II/IISP[1]	58,500	3,167	3,959	5,278	6,070	7,588	10,117
Hawker 4000	33,500	3,177	3,971	5,295	3,654	4,568	6,090
Gulfstream III[1]	58,500	3,180	3,975	5,300	6,095	7,619	10,158
Gulfstream 300[1]	66,000	3,182	3,978	5,303	6,100	7,625	10,167
Gulfstream IV/SP[1]	66,000	3,182	3,978	5,303	6,100	7,625	10,167
Lear 35A	15,300	3,240	4,050	5,400	4,537	5,671	7,562
Gulfstream 350[1]	66,000	3,261	4,076	5,435	3,751	4,689	6,252
Gulfstream 450	66,000	3,261	4,076	5,435	5,509	6,886	9,182
Canadair 601-3A/R (Challenger 601)[1]	36,000	3,323	4,154	5,538	3,987	4,984	6,645
Sabreliner 65	21,755	3,326	4,158	5,543	4,482	5,603	7,470
Lear 55	18,000	3,330	4,163	5,550	5,328	6,660	8,880
Citation 560 XLS	18,700	3,382	4,228	5,637	5,323	6,654	8,872
Gulfstream 200	30,000	3,487	4,359	5,812	4,011	5,014	6,685
Citation Bravo	13,500	3,490	4,363	5,817	5,471	6,839	9,118
Lear 60	19,500	3,590	4,488	5,983	4,822	6,028	8,037
Falcon 900EX[1]	44,500	3,671	4,589	6,118	4,221	5,276	7,035
Citation X	31,800	3,708	4,635	6,180	5,237	6,546	8,728
Gulfstream 650	83,500	3,785	4,731	6,308	4,966	6,208	8,277
Citation III	19,000	4,112	5,140	6,853	5,937	7,421	9,895

Less than primary runway length
Greater than the available runway lengths at CRP
Climb Limited: Aircraft unable to maintain minimum climb gradient
Brake Limited: Brake energy limit exceeded
MTOW: Maximum Takeoff Weigth

Calculation Assumptions:
46' MSL field elevation
0.6% runway grade
35° mean max temp of hottest month

[1] No Runway Slope Option Available

Exhibit 3H (continued)
RUNWAY LENGTH ANALYSIS

Source: Ultranav software, Coffman Associates analysis

General aviation aircraft are similarly accommodated by the existing length of Runway 13-31, as detailed on **Exhibit 3H**. For takeoff, all aircraft can generally operate on this runway, with a few exceptions at heavy loads. Some aircraft are climb-limited due to high temperatures and could be restricted, regardless of runway length. Landing length also appears adequate for all those aircraft models listed; the existing runway length is generally adequate for general aviation turbine aircraft.

Based on the potential for future commercial aircraft upgauging, consideration in the next chapter should be for a longer runway length of up to 8,800 feet to account for ultimate aircraft needs. It should be noted that this length is not yet justified or eligible for federal funding, but planning should consider options for providing the length in the event these aircraft needs arise.

Secondary/Crosswind Runway 18-36 Length

Based on prevailing winds, Runway 18-36 should be designed to meet the needs of general aviation aircraft up to ARC C-II and provide a safe alternative for air carrier and business jet aircraft operations during times when the primary runway is not available is essential. It is not uncommon for the primary runway to be closed due to normal maintenance, runway rehabilitation, snow removal, and extreme wind conditions. Ideally, the crosswind runway serving commercial and business jet activity would be the same length as the primary runway. At a minimum, the commercial crosswind runway should be capable of accommodating the vast majority of operations; therefore, a length that is approximately 90 percent of the primary runway length should be considered.

Based on ADS-B data provided by the FAA, Runway 13 is the preferred takeoff runway and is used for 58.3 percent of all operations, while Runway 18 is the secondarily preferred takeoff runway and is used for 16.4 percent of all takeoff operations; however, Runway 36 is preferred almost exactly twice as much as Runway 31 for arrival operations. As a result of both prevailing winds and operational flow, Runway 18-36 should be considered a secondary runway, as well as a crosswind runway. As such, the runway should be fully functional to meet most of the needs of primary operational uses.

The existing Runway 18-36 length of 6,080 feet is adequate to accommodate all commercial aircraft on short haul flights. The primary concern for the future would be upgauging to Boeing 757 and larger 737 models as the critical aircraft. Consideration in the next chapter should be given to extending the runway to better serve as a secondary runway, going forward; however, an extension is not justified at this time and would require specific use analysis to justify longer runway length.

Runway Width

The width of the runway is a function of the ADG for each runway. Both runways at CCIA are currently designed to RDC C/D-III standards and are 150 feet wide. Most aircraft within the C/D-III category require only a 100-foot runway; however, the design standard increases to 150 feet wide for the same design for aircraft with maximum takeoff weights of 150,000 or more pounds. The Boeing 737-800/900/Max aircraft all meet this excess and justify the runway's current width. The movement of CCIA's future critical aircraft to RDC C/D-IV would also justify the runway's 150-foot width. As such, the existing and long-term plan for runway width should be to maintain its current width at 150 feet.

Runway Strength

An important feature of airfield pavement is its ability to withstand repeated use by aircraft. At CCIA, pavement must be able to support multiple operations of large commercial and military aircraft daily.

The current strength rating for both runways is 150,000 pounds (lbs.) single wheel loading (S), 170,000 lbs. dual wheel loading (D), and 245,000 lbs. dual tandem wheel loading (DT). The pavement strength for all runways is mostly adequate. Consideration should be given to the next pavement projects for both runways to meet Boeing Max conditions, and ultimately the Boeing 757 weight of up to 273,000 pounds double dual wheel loading (DDT).

TAXIWAYS

The design standards associated with taxiways are determined by the TDG or ADG of the critical design aircraft. As determined previously, the applicable ADG for Runways 13-31 and 18-36 is III now and IV in the future. **Table 3C** presents the various taxiway design standards related to ADG III and ADG IV.

TABLE 3C | Taxiway Dimensions and Standards – Corpus Christi International Airport

STANDARDS BASED ON WINGSPAN	ADG III	ADG IV	
Taxiway Protection			
Taxiway Safety Area (TSA) Width	118	171	
Taxiway Object Free Area (TOFA) Width	186	259	
Taxilane Object Free Area Width	162	225	
Taxiway Separation			
Taxiway Centerline to:			
Fixed or Movable Object	93	129.5	
Parallel Taxiway/Taxilane	152	215	
Taxilane Centerline to:			
Fixed or Movable Object	81	112.5	
Parallel Taxilane	140	198	
Wingtip Clearance			
Taxiway Wingtip Clearance	34	44	
Taxilane Wingtip Clearance	23	27	
STANDARDS BASED ON TDG	**TDG 2**	**TDG 3/4**	**TDG 5**
Taxiway Width Standard	35	50	75
Taxiway Edge Safety Margin	7.5	10	15
Taxiway Shoulder Width	10	20	25

ADG = airplane design group
TDG = taxiway design group

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

The table also shows the taxiway design standards related to TDG. The TDG standards are based on the main gear width (MGW) and the cockpit to main gear (CMG) distance of the critical design aircraft expected to use those taxiways. Different taxiway and taxilane pavements can and should be designed to the most appropriate TDG design standards, based on usage. **Table 3D** presents the TDG for several commercial service aircraft. The minimum taxiway design for Runways 13-31 and 18-36 should be TDG 3 to meet the needs of the critical design aircraft, the Boeing 737. As such, the taxiways associated with these two runways and/or those commonly utilized by TDG 5 aircraft should be 50 feet wide. The standard for the upgauged Boeing 757, if such a change occurs, would be TDG 4, which also specifies a 50-foot width.

TABLE 3D | Aircraft by Associated TDG

Aircraft	TDG	RDC
Airbus A300/310	5	C-IV
Airbus A319/320	3	C-III
Boeing 717	3	C-III
Boeing 727	5	C-III
Boeing 737-700	3	C-III
Boeing 737-800/900	3	C/D-III
Boeing 747-4	5	D-V
Boeing 747-8	5	D-VI
Boeing 757 Series	4	C-IV
Boeing 767-800	5	C-IV
Boeing 777-300	6	D-V
Boeing 787-800	5	C-IV
Bombardier CRJ All Series	3	C-III
Embraer ERJ 175/195	3	C-III
MD-83/88	4	D-III

TDG = taxiway design group
RDC = runway design code

Source: FAA Data and Aircraft Certification Manuals

The taxiways that comprise the current taxiway system at CCIA are all 75 feet wide. The current taxiway widths are sufficient to meet TDG design criteria for the existing and planned aircraft.

Taxiway Design Considerations

FAA AC 150/5300-13A, *Airport Design*, provides guidance on recommended taxiway and taxilane layouts to enhance safety by avoiding runway incursions. A runway incursion is defined as "any occurrence at an airport involving the incorrect presence of an aircraft, vehicle, or person on the protected area of a surface designated for the landing and takeoff of aircraft."

The taxiway system at the Corpus Christi International Airport generally provides for the efficient movement of aircraft; however, the recently published AC 150/5300-13A, *Airport Design*, provides updated recommendations for taxiway design. The following is a list of the taxiway design guidelines and the basic rationale behind each recommendation.

1. **Taxi Method**: Taxiways are designed for "cockpit over centerline" taxiing with pavement that is sufficiently wide to allow a certain amount of wander. On turns, sufficient pavement should be provided to maintain the edge safety margin from the landing gear. When constructing new taxiways, upgrading existing intersections should be undertaken to eliminate "judgmental oversteering," which occurs when a pilot must intentionally steer the cockpit outside the marked centerline to ensure the aircraft remains on the taxiway pavement.

2. **Steering Angle**: Taxiways should be designed so the nose gear steering angle is no more than 50 degrees, which is the generally accepted value to prevent excessive tire scrubbing.

3. **Three-Node Concept**: To maintain pilot situational awareness, taxiway intersections should provide a pilot with a maximum of three choices of travel. Ideally, these are right- and left-angle turns and a continuation straight ahead.

4. **Intersection Angles**: Design turns to be 90 degrees wherever possible. For acute-angle intersections, standard angles of 30, 45, 60, 120, 135, and 150 degrees are preferred.

5. **Runway Incursions**: Design taxiways to reduce the probability of runway incursions.
   - *Increase Pilot Situational Awareness*: A pilot who knows where they are on the airport is less likely to enter a runway improperly. Complexity leads to confusion. Keep taxiways systems simple using the three-node concept.
   - *Avoid Wide Expanses of Pavement*: Wide pavements require placement of signs far from a pilot's eye. This is especially critical at runway entrance points. Where a wide expanse of pavement is necessary, avoid direct access to a runway.
   - *Limit Runway Crossings*: The taxiway layout can reduce the opportunity for human error. The benefits are twofold: through a reduction in the number of occurrences and a reduction in air traffic controller workload.
   - *Avoid High-Energy Intersections*: These are intersections in the middle thirds of runways. By limiting runway crossings to the first and last thirds of a runway, the portion of the runway where a pilot can least maneuver to avoid a collision is kept clear.
   - *Increase Visibility*: Right-angle intersections between both taxiways and runways provide the best visibility. Acute-angle runway exits provide for greater efficiency in runway usage but should not be used as runway entrance or crossing points. A right-angle turn at the end of a parallel taxiway is a clear indication of approaching a runway.
   - *Avoid Dual-Purpose Pavements*: Runways used as taxiways and taxiways used as runways can lead to confusion. A runway should always be clearly identified as a runway and only a runway.
   - *Indirect Access*: Taxiways should not be designed to lead directly from an apron to a runway. Such configurations can lead to confusion where a pilot typically expects to encounter a parallel taxiway.
   - *Hot Spots*: Confusing intersections near runways are more likely to contribute to runway incursions. These intersections must be redesigned when the associated runway is subject to reconstruction or rehabilitation. Other hot spots should be corrected as soon as practicable.

6. **Runway/Taxiway Intersections**:
   - *Right Angle*: Right-angle intersections are the standard for all runway/taxiway intersections, except where there is a need for a high-speed exit. Right-angle taxiways provide the best visual perspective to a pilot approaching an intersection with the runway to observe aircraft in both the left and right directions. They also provide optimal orientation of the runway holding position signs for visibility to pilots.

- *Acute Angle*: Acute angles should not be larger than 45 degrees from the runway centerline. A 30-degree taxiway layout should be reserved for high-speed exits. The use of multiple intersecting taxiways with acute angles creates pilot confusion and improper positioning of taxiway signage.
- *Large Expanses of Pavement*: Taxiways must never coincide with the intersection of two runways. Taxiway configurations with multiple taxiway and runway intersections in a single area create large expanses of pavement, making it difficult to provide proper signage, marking, and lighting.

7. **Taxiway/Runway/Apron Incursion Prevention**: Apron locations that allow direct access to a runway should be avoided. Increase pilot situational awareness by designing taxiways in a manner that forces pilots to consciously make turns. Taxiways that originate from aprons and form straight lines across runways at mid-span should be avoided.

8. **Wide Throat Taxiways**: Wide throat taxiway entrances should be avoided. Such large expanses of pavement may cause pilot confusion and make lighting and marking more difficult.

9. **Direct Access from Apron to a Runway**: Avoid taxiway connectors that cross over a parallel taxiway and directly onto a runway. Consider a staggered taxiway layout that forces pilots to make a conscious decision to turn.

10. **Apron to Parallel Taxiway End**: Avoid direct connection from an apron to a parallel taxiway at the end of a runway.

FAA AC 150/5300-13A, *Airport Design*, states: "Existing taxiway geometry should be improved whenever feasible, with emphasis on designated 'hot spots.'" To the extent practicable, the removal of existing pavement may be necessary to correct confusing layouts.

As previously discussed, the taxiway utilization study conducted in 2011, and subsequent improvements made based on the findings of the study, resulted in the current airfield system, which completely meets current design standards. No further taxiway geometry issues remain or need to be rectified within this planning horizon.

Taxiway Exits

Each runway has associated taxiway exits. An exit that also forms a runway crossing is only counted as a single exit. Runway 13-31 has six exits: five right-angle exits and one high-speed exit. Runway 18-36 has five 90-degree exits. In number and location, the current exits meet FAA and operational design requirements and should be maintained through the planning period.

INSTRUMENT NAVIGATIONAL AIDS

CCIA has instrument approaches to all runway ends. Runway ends 13 and 36 are served by sophisticated ILS precision instrument approaches with Category I (CAT-I) minimums. These approaches allow properly equipped aircraft and pilots the ability to operate with weather minimums as low as 200-foot cloud heights and a 2,400-foot runway visibility range (RVR). The HI-TACAN instrument approach to Runway 8 allows for slightly lower visibility minimums (⅜-mile).

Instrument approaches based on GPS have become common across the country. All runway ends at CCIA are served by GPS approaches. A variant of GPS, required navigation performance (RNP), allows an aircraft to fly a specific path between two defined three-dimensional points in space. RNP instrument approaches allow for more efficient curved flight paths through congested airspace, around noise-sensitive areas, or through difficult terrain. CCIA has RNP instrument approaches at the ends of Runways 13, 31, and 36. Runways 18 and 31 are served by a vertically guided GPS approach, the LPV, which offers CAT-I minimums. As a result, all four runway ends are served by vertically guided approaches with CAT-I minimums.

The ILS and GPS approaches are excellent instrument approach procedures that provide all-weather capability for CCIA. As such, these procedures should be maintained in the future.

VISUAL NAVIGATION AIDS

The airport beacon is located on top of the airport traffic control tower (ATCT). The beacon provides for rapid identification of the airport with a rotating light that is green on one side and white on the opposite side. The beacon should be maintained through the planning period.

All runway ends are equipped with visual glideslope indicator light systems, except Runway 36. Four-box precision approach path indicators (PAPI-4s) are available on Runways 13, 18, and 31. If feasible, the PAPI-4 system should be considered for the approach to Runway 36.

The FAA recommends an approach lighting system for instrument approaches with lower than ¾-mile visibility minimums. All four runway ends are equipped with a medium intensity approach lighting system with runway alignment indicator lights (MALSR). These systems should be maintained in the future.

WEATHER AND COMMUNICATION AIDS

CCIA has five lighted wind cones: one near the commercial ramp between the runways and one located in proximity to the approach end of each runway. Wind cones provide information to pilots regarding wind conditions, including direction and speed. These wind cones should be maintained.

The ATCT provides an automated terminal information service (ATIS) to pilots. ATIS broadcasts contain essential information, such as weather information, active runways, available approaches, and any other information required by pilots, such as important Notices to Air Missions (NOTAMs). These broadcasts are updated hourly.

CCIA is equipped with an automated surface observing system (ASOS). This is an important system that automatically records weather conditions, such as wind speed, wind gust, wind direction, temperature, dew point, altimeter setting, visibility, fog/haze condition, precipitation, and cloud height. This information can be accessed by pilots and individuals via an automated voice recording on a published telephone number. This system should be maintained through the planning period.

Many commercial service airports provide visibility measuring and reporting equipment at specific locations adjacent to the runway. Runways 13 and 36 are equipped with RVR equipment; the same should be considered for Runways 18 and 31 in the future.

LANDSIDE REQUIREMENTS

Landside facilities are those necessary for handling aircraft and passengers while on the ground. These facilities provide the essential interface between the air and ground transportation modes. The capacities of the various components of each area were examined in relation to projected demand to identify future landside facility needs. This includes components for commercial service and general aviation needs such as:

- Passenger Terminal Complex Requirements
- Air Cargo Facilities Requirements
- General Aviation Requirements
- Airport Support Requirements

PASSENGER TERMINAL BUILDING

The following sections summarize and describe the methodology and rationale for developing the terminal building requirements and associated aircraft gate needs.

METHODOLOGY AND ASSUMPTIONS

Planners utilize various methodologies and planning metrics to develop terminal programs. The overall terminal facility requirements were developed through the knowledge of industry trends and the application of a variety of industry-accepted planning standards and guidelines. These include ACRP Report 25, Airport Passenger Terminal Planning and Design; FAA AC 150/5360-13A, Airport Terminal Planning; the TSA Checkpoint Requirements and Planning Guide (CRPG); the TSA Planning Guidelines and Design Standards (PGDS) for Checked Baggage Inspection Systems Version 7.0; ACRP Report 226, Planning and Design of Airport Terminal Restrooms and Ancillary Spaces; and the International Air Transport Association (IATA) Airport Development Reference Manual (ADRM) 12th Edition. Additionally, communication with Airport staff, the Transportation Security Administration (TSA), airline representatives, and concessionaire and rental car representatives was also utilized.

IATA's Level of Service (LoS) standards are typically utilized by airport planners to qualitatively or quantitatively provide a LoS standard at various processing functions within the terminal building. An "Optimum" LoS was used when validating the functional passenger spaces and is often referred to as LoS "C" and defined by IATA as providing "Good LoS; condition of stable flow; acceptable brief delays; good level of comfort." Current utilization ratios were determined using the existing terminal CAD plans provided by the Airport and existing 2023 passenger and aircraft operations activity, which establishes a baseline condition of demand compared to current facility capacities.

Airport terminal facilities are typically programmed using demand associated with annual and peak-hour passenger and operation projections. Although annual activity is a good indicator for overall airport size, peak hour volumes more accurately reflect demand for specific passenger processing functions within the terminal facilities. These peak hours are typically calculated from the peak month's average day (PMAD) and are called Design Hour passengers. A summary of the annual and peak hour activity is provided in **Table 3E**.

Table 3E | Annual and Peak Hour Activity Forecast Summary

	Base Year 2023	PLANNING ACTIVITY LEVEL (PAL)			
		PAL 1 2028	PAL 2 2033	PAL 3 2038	PAL 4 2043
Enplanements					
Annual	348,700	417,500	465,500	501,400	540,000
CAGR%[1]		3.7%	2.2%	1.5%	1.5%
Peak Month	33,441	41,600	46,400	50,000	53,800
% of Annual	9.6%	10.0%	10.0%	10.0%	10.0%
Design Day (PMAD)[2]	1,113	1,410	1,620	1,774	1,940
Peak Hour Passengers					
Enplaned	211	275	322	377	427
Deplaned	211	275	322	377	427
Total[3]	315	411	496	563	637
Peak Hour % of Day					
Enplaned	19.0%	19.5%	20.5%	21.3%	22.0%
Deplaned	19.0%	19.5%	20.5%	21.3%	22.0%

1 CAGR = Compound Annual Growth Rate, represents growth rate between PALs
2 PMAD = Peak Month Average Day
3 Total of Enplaned and Deplaned peak hour may not sum as each can occur in separate hours

Source: CRP Aviation Activity Forecast, June 2024 with Alliiance analysis

Typically, terminal programming utilizes two types of peak passenger levels: individual airline and Common Use. Individual airline passenger levels refer to the peak activity for each carrier that occurs over 60 minutes based on that airline's flight schedule. As a result, these individual airline peaks may occur at different times of the day and, therefore, do not all typically coincide in the same clock hour. The assumption is that this peak demand is appropriate when determining the facility requirements for individual airlines that allocate specific functional space within the terminal. Depending on the operating use agreement with the airport, these areas include individual airline ticket counters, gates/holdrooms, and sometimes baggage claim facilities.

Common use peak passenger levels refer to the cumulative peak passenger volume in a given "rolling" 60 minutes for all airlines at the airport. These common-use peak demand levels are typically used for calculating non-airline specific functions such as passenger security screening, baggage screening, and public areas, including general seating and meeter/greeter lobbies.

Other functional area projections are typically determined by their relationship to the number and type of aircraft or the number of gates/seats serving the terminal area. The relationship of area projections per aircraft operations, or by gates/seats, is also a typical way to compare airport building component requirements. These terminal areas can include airline operations space, inbound/outbound baggage operations, and secure public restrooms.

The complexities involved in understanding the aircraft capacity implications of the term "gate" have led to a methodology to standardize the capacity definition of a "gate." This standardization methodology is called the Narrowbody Equivalent Gate (NBEG) index. This index converts the gate requirements of diverse aircraft, from commuters to new larger aircraft, so that they are equivalent to the apron capacity of a narrowbody aircraft gate. The amount of space or linear frontage each aircraft requires is based on the maximum wingspan of the aircraft in its respective aircraft group. Taxiways are classified according to FAA Taxiway Design Groups, as shown in **Table 3F.**

Table 3F | Narrowbody Equivalent Index

Airplane Design Group (ADG)		Wingspan	Typical Aircraft	NBEG Index
I	Small Regional	< 49 Feet	Cessna/Learjet	0.4
II	Medium Regional	< 79 Feet	CRJ/ERJ	0.7
III	**Narrowbody/Large Regional**	**< 118 Feet**	**A220,320,321/B717,737/Q400/E175**	**1.0**
IV	B757 Specific	< 135 Feet	B757	1.1
IV	Widebody	< 171 Feet	B767	1.4
V	Jumbo	< 213 Feet	B747,777,787/A330,340	1.8
VI	Super Jumbo	< 262 Feet	A380	2.2

Source: FAA AC 150/5300-13A, Airport Design and Hirsh & Associates

Another methodology used for terminal facility program comparisons, similar to that of NBEG, is the Equivalent Aircraft (EQA) Index. This methodology looks at the passenger demand associated with gate usage. With EQA, each gate is converted based on the aircraft's seating capacity that can be accommodated. The base Equivalent Aircraft is a **Group III** narrowbody aircraft with seats in the range of 145-150 with an EQA of 1.0. Smaller aircraft may use the gate, but the EQA capacity should be based on the largest aircraft/seating typically in use. One example of where this methodology is used is ramp equipment (bag carts/containers) required for aircraft arrivals and departures at the gate. **Table 3G** summarizes the EQA of each aircraft group.

Table 3G | Equivalent Aircraft Index

Airplane Design Group (ADG)		Wingspan	Typical Aircraft	NBEG Index
I	Small Regional	< 49 Feet	Cessna/Learjet	0.4
II	Medium Regional	< 79 Feet	CRJ/ERJ	0.7
III	**Narrowbody/Large Regional**	**< 118 Feet**	**A220,320,321/B717,737/Q400/E175**	**1.0**
IV	B757 Specific	< 135 Feet	B757	1.1
IV	Widebody	< 171 Feet	B767	1.4
V	Jumbo	< 213 Feet	B747,777,787/A330,340	1.8
VI	Super Jumbo	< 262 Feet	A380	2.2

Source: The Apron & Terminal Building Planning Manual for US DOT, Ralph M. Parsons Company, July 1975 and updated values based on Hirsh & Associates data

FORECASTED GATE REQUIREMENTS

A terminal “gate” is defined as an aircraft parked at the terminal for the loading and unloading of passengers. Passengers using a gate can access a plane directly from the apron level via a stairway integrated into the aircraft, by a portable stairway, or, more typically, through a passenger boarding bridge (PBB), referred to as a “contact” gate. At full operational capacity, the airport currently has five contact gates with three operating on a “Preferential Use” agreement and the remaining two operated by the airport (Common Use). Common Use allows the airport to slot flights onto gates when available throughout the day. While the airlines are currently grouped at particular gates, it does not preclude them from operating on the airport-controlled gates. This operating environment was maintained when developing future gate requirements.

Gates 3 and 5 each include two parking positions: 3A and 3B, and 5A and 5B, respectively, with each sharing one PBB as depicted in **Figure 3-1**. These additional positions are used for Remain Overnight (RON) aircraft (late evening arrivals with early morning departures the following day). These additional positions at gates 3 and 5 are only useable via the PBB if the staggered departure times leave adequate buffer time for the airline to reposition the PBB once the earlier flight leaves. While closely spaced departure times may be achievable, they put additional strain on the gate holdroom area, as up to two flights worth of passengers may be at the gate area prior to the first departure. Having two unrestricted positions served from one PBB also limits flexibility in airline scheduling. In addition, Gate 6 provides international arrivals capabilities. Typical holdrooms that serve both domestic and international operations (called “swing” gates) must physically separate international arrivals from domestic and international departing passengers. This is achieved using a sterile corridor system with direct access from the PBB. At Gate 6, however, passengers deplane directly into the gate holdroom area, then through a set of double doors into the sterile corridor, and then down to the apron level where the international arrivals processing area (FIS) is located. As such, the gate holdroom area is partitioned off from the rest of the domestic gates when international arrivals occur. This results in the gate area being shut down for departure seating until the international passengers have all deplaned through the sterile corridor. With the limited seating availability at this gate, some additional seats are provided on the other side of the partition and in the central concourse circulation corridor. The Airport also has plans to provide a small concessions kiosk within this gate area, further reducing the effective seating capacity.

As a result, the base design day flight schedule does not show any departure flights on this gate, which results in flights only occurring from four of the five total gates, the majority of which are assigned to gates 2, 3, and 5. This, in turn, results in nearly five departures per gate. For the purposes of future gate planning activity, it's assumed Gate 6 will be reconfigured and expanded to allow for a true "swing" gate, thus bringing the total useable existing gate capacity up to 5 gates. A new existing departure-per-gate ratio was then calculated for use in the gate methodologies described below.

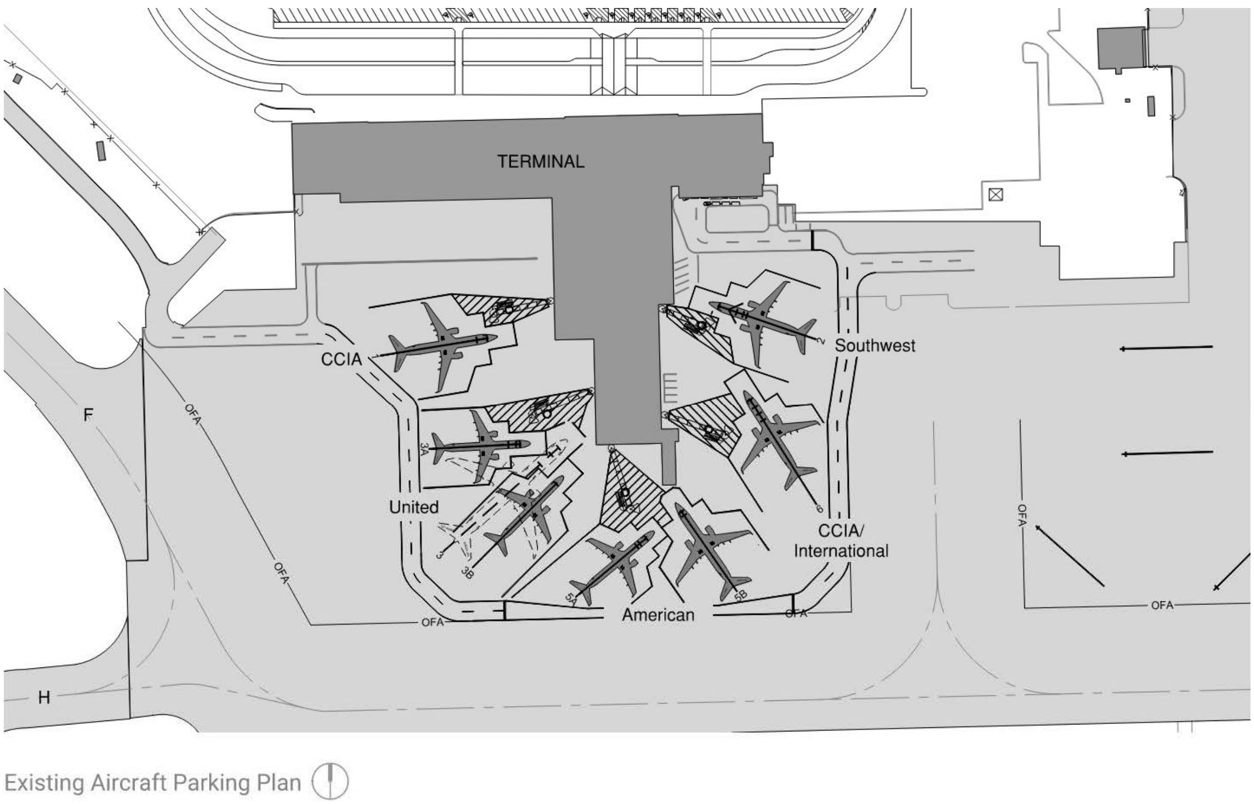


Figure 3-1: Existing Aircraft Apron Parking Plan

Gate demand can be developed using various planning methodologies, four of which were analyzed to create a range of gate requirements, including:

- Annual Enplanements per Gate
- Annual Departures per Gate
- Peak Month Average Day (Design Day) Departures per Gate
- Design Day Peak Hour Departures per Gate

The "Annual Enplaned Passengers per Gate" method calculates the current ratio of actual annual enplaned passengers per gate. This ratio is then applied to the forecast of annual enplaned passenger levels and assumes the current gate utilization is an appropriate level of usage and remains constant over the forecasted planning period. The baseline ratio is calculated by taking the base year annual enplanements and dividing by the number of base year utilized gates. This method, when using 2023 as the base, results in a need of 8 gates by 2043, which is summarized in **Table 3H**.

Table 3H | Annual Enplaned Passengers per Gate

Year	Enplaned Pax	Gates	Daily Pax/Gate	Annual Pax/Gate
2023	348,700	5	191	69,740
2028	417,500	6	191	69,740
2033	465,500	7	191	69,740
2038	501,400	7	191	69,740
2043	540,000	8	191	69,740

Source: Alliiance, 2024

The "Annual Departures per Gate" method calculates the current ratio of annual departures per gate and applies it to the forecast of annual departures by year. With this approach it is assumed that the existing utilization of the gates will, more or less, remain constant over the planning period. The base ratio is calculated by taking the base year annual departures and dividing it by the existing number of gates. This method, when using 2023 as a base, results in a requirement of 5 gates by the 2043 forecasted planning horizon. This information is summarized in **Table 3J**.

Table 3J | Annual Departures per Gate

Year	Departures	Gates	Daily Dep/Gate	Annual Dep/Gate
2023	5,468	5	3.0	1,092
2028	5,500	5	3.0	1,092
2033	5,620	5	3.0	1,092
2038	5,740	5	3.0	1,092
2043	5,860	5	3.0	1,092

Source: Alliiance, 2024

The two previous methods resulted in total gate requirements of 5 to 8 gates by 2043. While these methodologies are based on actual annual activity levels, they do not reflect the peaking characteristics that can be observed on a daily basis at most airports. In addition, due to high levels of gate sharing by different size aircraft, (e.g., a gate that can accommodate a narrowbody could be used by a regional jet aircraft) it is difficult to apply these methodologies to determine specific gate requirements by aircraft type. Of the airport's existing gates, 80 percent are narrowbody capable (B737). However, only 24 percent of the aircraft operating in the baseline schedule are narrowbody aircraft, while 59 percent are large regional (E75) with the reaming 18 percent medium regional (CRJ) aircraft. The forecast predicts a shift to larger narrowbody aircraft of approximately 52 percent by 2043, with the remaining 45 percent share using large regional aircraft. These factors were utilized for classifying new gate sizes throughout the planning horizon.

The "Peak Month Average Day Departures per Gate" method is based on the ratio of scheduled design day departures per gate utilizing the base year gated design day flight schedule. First, each gate or group of gates was categorized by the airline(s) using those positions along with number of design day departures by equipment type under existing conditions. Next, the sum of each gate's total design day departures was divided by the total number of utilized gates to determine an average number of daily turns per gate. This ratio was then adjusted as needed to reflect utilization changes in the future, and then applied to the forecast activity to determine future gate requirements by aircraft type. The gated base year design day flight schedule indicates a need for six RON aircraft; however, only three gates are utilized throughout the day, which results in 3.8 departures per gate. Maintaining this ratio results in a need for 6 gates by 2043. Results are summarized in **Table 3K**.

Table 3K | Peak Month Average Day (PMAD) Departures per Gate

Year	Departures	Gates	PMAD Dep/Gate
2023	19	5	3.8
2028	19	5	3.8
2033	20	5	3.8
2038	20	5	3.8
2043	21	6	3.8

Source: Alliiance, 2024

The “Design Day Peak Hour Departures per Gate” method, similar to the design day method, looks at gate requirements during the peak departure hour in order to understand actual active day peak gate demand. Based on the base year design day flight schedule, three gates are used during the peak hour, resulting in a ratio of 0.6 departures per gate or 60 percent gate utilization during the peak. The average time on gate during the peak hour is approximately 41 minutes, which indicates that most flights are consuming the gate for that hour with the next departure occurring outside the peak. This time on gate may increase throughout the planning horizon due to numerous factors, such as airline scheduling patterns, destinations served, and aircraft up gauging that would require additional turnaround time. Assuming this existing ratio remains constant throughout the planning horizon, a total of 8 gates would be required by 2043 with all gates utilized for RON aircraft. Results are summarized in **Table 3L**.

Table 3L | Design Day Peak Hour Departures per Gate

Year	Departures	Gates	Peak Hour Dep/Gate
2023	3	5	0.6
2028	3	5	0.6
2033	4	7	0.6
2038	4	7	0.6
2043	5	8	0.6

Source: Alliiance, 2024

All methods show a range of 5 to 8 gates required by 2043. To preserve land envelope for future terminal development, the higher end of the gate range from each method was utilized for planning purposes and summarized in **Table 3M,** with gates broken down by airplane design group in **Table 3N**.

Table 3M | Gate Methodology Summary

Year	Annual Enplanements per Gate	Annual Departures per Gate	PMAD Dep/Gate	PMAD Peak Hour Dep/Gate	Recommended Gates
2023	5	5	5	5	5
2028	6	5	5	5	6
2033	7	5	5	7	7
2038	7	5	5	7	7
2043	8	5	5	8	8

Source: Alliiance, 2024

Table 3N | Gate Demand Summary

		Base Year 2023		PLANNING ACTIVITY LEVEL (PAL)			
				PAL 1 (2028)	PAL 2 (2033)	PAL 3 (2038)	PAL 4 (2043)
Annual Enplanements		348,700		417,500	465,500	501,400	540,000
PMAD Departure Ops		19		19	20	20	21
Airplane Design Group (ADG)		**Max Gauge[1]**	**Utilized Gauge**	**Recommended Gates[2]**			
II	Medium Regional (CRJ, CR7)	-	-	-	-	-	-
III	Large Regional (E75)	-	3	4	4	4	4
	Narrowbody (737)	4 (1)	1(1)	2(1)	3(1)	3(1)	4(1)
IV	Widebody (767)	1	-	-	-	-	-
Total Contact Gates		**5(1)**	**4(1)**	**6(1)**	**7(1)**	**7(1)**	**8(1)**
Total Positions		**7**	**6**	**8**	**9**	**9**	**10**
Total RON			6	8	9	9	10
PMAD Departures per Gate		4.8		3.2	2.9	2.9	2.6
Annual Enplanements per Gate[3]		87,175		69,580	66,500	71,630	67,500

[1] Represents the largest aircraft gauge in each design group, not necessarily the aircraft gauge currently being utilized at the gate
[2] Existing and future international gate demand in parenthesis
[3] Values rounded

Source: CRP Master Plan Forecast, Alliiance, 2024

TERMINAL BUILDING REQUIREMENTS

The following sections summarize and describe the requirements for various areas of the terminal building. A detailed breakdown can be found in **Exhibit 3J**.

PUBLIC SPACE

This category of the terminal space program represents a significant portion of the public passenger processing functions of the terminal building. It contains all the areas typically required and leased by the tenants to support their operations. The following paragraphs describe the requirements for these areas: ticketing check-in locations and associated queue space; TSA passenger security screening; gate holdrooms; and baggage claim hall. Additional non-passenger processing areas in this category include restrooms and circulation.

	Existing Terminal Space (sf) Full Capacity	2023 Recommended Facilities	2028 Recommended Facilities	2033 Recommended Facilities	2038 Recommended Facilities	2043 Recommended Facilities
GENERAL STATISTICS						
General[1]						
Overall Airport Statistics						
Annual Passengers	697,404	697,404	835,000	931,000	1,002,800	1,080,000
Annual Enplanements	348,702	348,702	417,500	465,500	501,400	540,000
Peak Hour Passenger Statistics						
Peak Hour Enplaned	211	211	275	332	377	427
Peak Hour Deplaned	211	211	275	332	377	427
Total Peak Hour[2]	315	315	411	496	563	637
Gates/Positions						
Aircraft Gates/Positions						
II Medium Regional (CR2,CR7)	-	-	-	-	-	-
III Large Regional (CR9,E75,E90)	-	3	4	4	4	4
III Small Narrowbody (B717,A220)	-	-	-	-	-	-
III Narrowbody (A320,A321/B737w)	4	1	2	3	3	4
IV B-757(winglets)	-	-	-	-	-	-
IV Widebody (B767) 1	1	-	-	-	-	-
V Jumbo (B747,787,777/A330,340)	-	-	-	-	-	-
VI Super Jumbo (A380)	-	-	-	-	-	-
Total Gates	**5**	**4**	**6**	**7**	**7**	**8**
Total EQA[2]	**6.7**	**2.5**	**4.2**	**5.2**	**5.2**	**6.2**
Total NBEG[3]	**5.4**	**4.0**	**6.0**	**7.0**	**7.0**	**8.0**
Total Aircraft Positions	**7**	**6**	**8**	**9**	**9**	**10**

[1] Annual Passenger numbers are taken from the CRP Aviation Activity Forecast, June 2024

[2] EQA (Equivalent Aircraft) normalizes gate based on seating capacity of accommodated aircraft.

[3] NBEG (Narrow Body Equivalent Gate): Used to normalize the apron frontage demand and capacity to that of a typical narrowbody aircraft gate.

Sources: CRP Aviation Activity Forecast, June 2024 and Alliiance Analysis

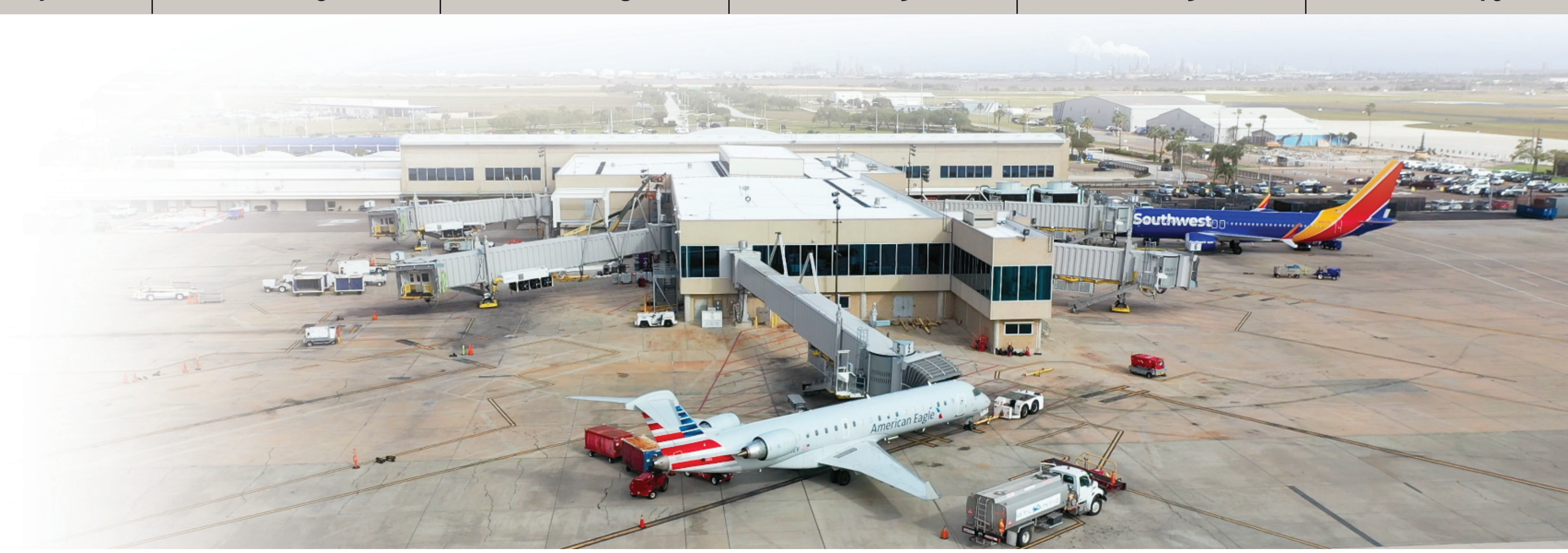


Exhibit 3J
TERMINAL BUILDING FACILITY REQUIREMENTS

	Units	Existing Terminal Space (sf) Full Capacity	2023 Recommended Facilities	2028 Recommended Facilities	2033 Recommended Facilities	2038 Recommended Facilities	2043 Recommended Facilities
PUBLIC SPACE							
Circulation							
Ticket Lobby Circulation	sf	5,321	1,230	1,690	2,070	2,070	2,380
Baggage Claim Circulation	sf	1,577	1,350	1,350	1,950	1,950	1,950
Airside Concourse Circulation	sf	4,411	5,150	7,730	9,020	9,020	10,300
General Public Circulation (Includes Vestibules, Vertical Circulation, Corridors)	sf	18,071	10,080	13,980	17,050	17,450	19,150
Subtotal:		**29,380**	**17,810**	**24,750**	**30,090**	**30,490**	**33,780**
Security Screening Checkpoint (SSCP)							
Number of Lanes	pos	2	1	2	2	2	2
Queuing Area	sf	839	600	1,200	1,200	1,200	1,200
Security Screening Area	sf	2,609	1,720	3,320	3,320	3,320	3,320
Exit Corridor	sf	214	210	210	210	210	210
TSA Offices	sf	6,832	6,830	6,830	6,830	6,830	6,830
Subtotal:		**10,494**	**9,360**	**11,560**	**11,560**	**11,560**	**11,560**
Queuing/Waiting Areas							
Public Seating	sf	1,176	730	970	1,160	1,310	1,480
Ticket Lobby/Queue (Including any Free Standing Kiosks)	sf	4,032	1,730	2,340	2,880	2,880	3,350
Baggage Claim Area							
Claim Devices (flat plate)	no	2	2	2	3	3	3
Linear Frontage Required	lf	-	129	168	203	231	261
Linear Frontage Programmed	lf	148	148	148	263	263	263
Baggage Claim Hall (Includes Device, Queues & Circulation within Positive Claim Area)	sf	3,622	3,700	3,700	6,580	6,580	6,580
Domestic Meeter/Greeter Lobby	sf	Incl. in Public Circ.	1,160	1,500	1,820	2,330	2,330
Subtotal:		**8,830**	**7,320**	**8,510**	**12,440**	**13,100**	**13,740**
Gate Lounges/Holdrooms							
Gates							
Medium Regional (CR2,CR7)	sf	-	-	-	-	-	-
Large Regional (CR9,E75,E90)	sf	-	4,670	6,220	6,220	6,220	6,220
Small Narrowbody (B717,A220)	sf	-	-	-	-	-	-
Narrowbody (A320,A321/B737w)	sf	-	2,750	5,490	8,240	8,240	10,980
B-757(winglets)	sf	-	-	-	-	-	-
Widebody (B767)	sf	-	-	-	-	-	-
Subtotal:		**8,493**	**7,420**	**11,710**	**14,460**	**14,460**	**17,200**
Restrooms							
Restrooms - Airside (Post-Security)	sf	1,108	1,170	2,000	2,360	2,360	2,600
Restrooms - Landside (Pre-Security)	sf	2,883	1,630	2,230	2,590	2,820	2,820
SARA	sf	103	100	100	100	100	100
Nursing Mothers Room	sf	71	130	130	130	130	130
Subtotal:		**4,165**	**3,030**	**4,460**	**5,180**	**5,410**	**5,650**
Other Space							
Miscellaneous Tenant							
Lease Space	sf	598	600	600	600	600	600
Frequent Flyer Club	sf	301	300	360	400	430	460
Other (Displays, Information Counters, etc)	sf	787	790	790	790	790	790
Subtotal:		**1,686**	**1,690**	**1,750**	**1,790**	**1,820**	**1,850**

Units Key: sf - square feet pos - positions no - number lf - linear feet

Exhibit 3J (continued)
TERMINAL BUILDING FACILITY REQUIREMENTS

	Units	Existing Terminal Space (sf) Full Capacity	2023 Recommended Facilities	2028 Recommended Facilities	2033 Recommended Facilities	2038 Recommended Facilities	2043 Recommended Facilities
AIRLINE SPACE							
Domestic Airline Space (Includes International Ticketing Space)							
Ticket Counter							
Linear Counter Check-in Positions (Kiosk)	pos	46(4)	16(2)	22(3)	27(4)	27(4)	31(4)
Total Check-in Positions (Kiosk)	pos	50(8)	19(5)	25(6)	31(8)	31(8)	37(10)
Total Linear Position Length	lf	233	82	113	138	138	159
Number of Vacant Check-in Positions	*pos*	*22*	-	-	-	-	-
Total Vacant Position Length	*lf*	*120*	-	-	-	-	-
Counter Area	sf	2,449	820	1,130	1 ,380	1,380	1,590
Airline Ticket Offices (ATO)	sf	6,326	2,130	2,930	3 ,590	3,590	4,120
Baggage Service Offices (BSO)	sf	-	-	-	-	-	-
Subtotal:		**8,775**	**2,950**	**4,060**	**4,970**	**4,970**	**5,710**
Other Airline Space							
Outbound Bag Make-up[1]	sf	1,517	3,150	3,960	4,520	5,650	5,650
Checked Baggage Screening (TSA Space)[2]	sf	1,633	1,090	1,930	1,930	1,930	1,930
Level 1 Inspection Units	no	3	1	2	2	2	2
Airside Operations/Storage (IT, Offices, etc.)	sf	3,808	1,430	2,390	2,960	2,960	3,530
Inbound Baggage Claim Laydown	sf	630	600	600	900	900	900
Inbound/Outbound Baggage Circulation & Storage	sf	Incl. in existing in/out	470	590	680	850	850
Other Airline Offices/Systems & Support	sf	1,042	380	650	800	800	950
Subtotal:		**8,630**	**7,120**	**10,120**	**11,790**	**13,090**	**13,810**
CONCESSIONS SPACE							
Landside Concessions (Pre-Security)							
Rental Car/Ground Transportation							
Number of Counters	pos	5	5	5	5	5	5
Counter Area/Offices	sf	1,444	1,750	1,750	1,750	1,750	1,750
Queue	sf	826	780	780	780	780	780
Landside Concessions	sf	219	230	280	310	340	360
Support/Storage (Preparation Areas, Offices, etc.)	sf	2,221	120	140	160	170	180
Subtotal:		**4,710**	**2,880**	**2,950**	**3,000**	**3,040**	**3,070**
Airside Concessions (Post Security)							
Airside Concessions	sf	3,690	3,670	4,400	4,900	5,280	5,690
Support/Storage (Preparation Areas, Offices, etc.)	sf	1,325	1,840	2,200	2,450	2,640	2,840
Subtotal:		**5,015**	**5,510**	**6,600**	**7,350**	**7,920**	**8,530**

[1] Existing areas per airline, future is common use
[2] Two existing areas, future one consolidated area

Units Key: sf - square feet pos - positions no - number lf - linear feet

	Units	Existing Terminal Space (sf) Full Capacity	2023 Recommended Facilities	2028 Recommended Facilities	2033 Recommended Facilities	2038 Recommended Facilities	2043 Recommended Facilities
U.S. CUSTOMS AND BORDER PROTECTION SERVICES (CBP/FIS)							
Subtotal:		**16,652**	**16,650**	**16,650**	**16,650**	**16,650**	**16,650**
NON-PUBLIC SPACE							
Non-Airline Tenant Space							
Airport Administration							
Offices/Support/Storage	sf	11,964	11,860	14,200	14,200	14,200	14,200
Airport Police (Includes Locker Facilities)	sf	431	430	430	430	430	430
Misc Tenant-Vacant	sf	46	50	50	50	50	50
Subtotal:		**12,441**	**12,340**	**14,680**	**14,680**	**14,680**	**14,680**
Restrooms/Circulation							
Non-Public Restrooms	sf	330	220	260	280	290	300
Non-Public Circulation (Includes Vertical Circulation)	sf	5,362	3,370	4,060	4,340	4,490	4,660
Other	sf	-	-	-	-	-	-
Subtotal:		**5,692**	**3,590**	**4,320**	**4,620**	**4,780**	**4,960**
Building Systems							
Loading Docks	sf	1,082	870	1,040	1,160	1,250	1,350
Number of Bays	no	4	1	1	1	1	1
Airport Operations (Maintenance, Janitorial, Storage, Shops)	sf	3,558	1,950	2,440	2,770	2,840	3,020
Mechanical/Electrical/Plumbing(MEP)/Communications/IT	sf	10,831	8,500	10,620	12,060	12,350	13,150
Building Structure/Non-net/Void	sf	25,511	16,780	20,980	23,800	24,400	25,980
Exterior - Outdoor Patio	sf	1,572	1,570	1,570	1,570	1,570	1,570
Subtotal:		**40,982**	**28,100**	**35,080**	**39,790**	**40,840**	**43,500**

Units Key: sf - square feet   no - number

Exhibit 3J (continued)
TERMINAL BUILDING FACILITY REQUIREMENTS

	Units	Existing Terminal Space (sf) Full Capacity	2023 Recommended Facilities	2028 Recommended Facilities	2033 Recommended Facilities	2038 Recommended Facilities	2043 Recommended Facilities
SUMMARY							
General							
Annual Enplanements		348,702	348,702	417,500	465,500	501,400	540,000
Annual O&D Enplanements (%)		348,702 (100%)	348,702 (100%)	417,500 (100%)	465,500 (100%)	501,400 (100%)	540,000 (100%)
Peak Hour Enplaned Domestic		211	211	275	332	377	427
Peak Hour Deplaned Domestic		211	211	275	332	377	427
Gates/Contact Aircraft Positions		5	4	6	7	7	8
Public Space							
Circulation (Ticketing, Baggage Claim, Seating, General Circulation, Airside Post Security)	sf	29,380	17,810	24,750	30,090	30,490	33,780
TSA Security Screening Area (Queue, Screening, Offices)	sf	10,494	9,360	11,560	11,560	11,560	11,560
Queuing/Waiting Areas (Public Seating, Ticket Lobby, Baggage Claim Hall, Meeter/Greeter)	sf	8,830	7,320	8,510	12,440	13,100	13,740
Gate Holdrooms	sf	8,493	7,420	11,710	14,460	14,460	17,200
Restrooms (Pre/Post Security)	sf	4,165	3,030	4,460	5,180	5,410	5,650
Other Space/Amenity (Misc Tenant, Displays, Information Counters, etc.)	sf	1,686	1,690	1,750	1,790	1,820	1,850
Subtotal:		**63,048**	**46,630**	**62,740**	**75,520**	**76,840**	**83,780**
Airline Space							
Domestic Airline Space (Queue, Counter, ATO, BSO)	sf	8,775	2,950	4,060	4,970	4,970	5,710
Other Airline Space (Bag Makeup, Laydown, Bag Screening, Airside Ops/Offices, Misc)	sf	8,630	7,120	10,120	11,790	13,090	13,810
Subtotal:		**17,405**	**10,070**	**14,180**	**16,760**	**18,060**	**19,520**
Concessions							
Landside Concessions (Pre-Security)	sf	4,710	2,880	2,950	3,000	3,040	3,070
Airside Concessions (Post-Security)	sf	5,015	5,510	6,600	7,350	7,920	8,530
Subtotal:		**9,725**	**8,390**	**9,550**	**10,350**	**10,960**	**11,600**
U.S. Customs & Border Protection Services							
Subtotal:		**16,652**	**16,650**	**16,650**	**16,650**	**16,650**	**16,650**
Non-Public Space							
Non-Airline Tenant Space (Airport Administration/Support, Storage, Misc. Tenants)	sf	12,441	12,340	14,680	14,680	14,680	14,680
Restrooms/Circulation	sf	5,692	3,590	4,320	4,620	4,780	4,960
Airport Operations (Maintenance, Janitorial, Storage, Shops)	sf	3,558	1,950	2,440	2,770	2,840	3,020
Building Systems (MEP, Communications/IT, Loading Docks, Structure)	sf	37,424	26,150	32,640	37,020	38,000	40,480
Subtotal:		**59,115**	**44,030**	**54,080**	**59,090**	**60,300**	**63,140**
TOTAL							
Total Functional & Support Terminal Area[1]		140,434	108,990	136,220	154,570	158,410	168,710
Total Gross Terminal Area[1]		165,945	125,770	157,200	178,370	182,810	194,690

[1] Represents the total available functional and gross terminal square footage (leased, non-leased, airport owned, and any vacant areas) and totals may not sum due to rounding

Sources: CRP Aviation Activity Forecast, June 2024 and Alliiance Analysis

Units Key: sf - square feet

Exhibit 3J (continued)
TERMINAL BUILDING FACILITY REQUIREMENTS

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Ticketing and Check-in

Typically, this airline function is based on the peak hour check-in demand, the associated early arrival passenger profiles, acceptable service times related to the check-in process, IATA's optimum passenger wait time by processor type, and acceptable LoS square feet (sf) factors utilized to evaluate current and future demand.

There are currently 20 leased agent check-in positions and eight self-service devices (SSD) either within the queue or integrated within the agent check-in counters, making for a total of 28 equivalent check-in positions (ECP). There are also a total of 22 vacant agent check-in counters with additional area for future expansion. Additionally, one baggage scale is shared between two agents. The ECP per EQA method was used to determine future ticketing requirements. This method is appropriate to use when detailed data, such as future design day flights schedules, are unavailable for queue modeling purposes and when the forecast assumes the introduction of new airlines, gates, and aircraft up gauging. This rationale includes dividing the actual combined staffed airline positions and utilized SSDs (or ECP) by the EQA factor of the existing gates. The resulting factor is then used to forecast the future overall ECP, which is then further broken down using an Agent to SSD ratio.

Future ticketing requirements were based on the following assumptions:

- U. lized actual staffed agent positions for each of the three current airlines and their SSDs.
- ECP to EQA ratio of 6.0
- A queue depth of 20 feet. Currently, the lobby provides a queue depth of approximately 18 to 22 feet.
- Approximately five linear feet per agent position (includes shared 30-inch bag scale and counter breaks).

Overall, the existing ticketing positions and queue area, as shown in **Table 3P**, are adequate throughout the 20-year planning horizon.

Table 3P | Ticketing Check-in Summary

Ticketing	BASE YEAR 2023		PLANNING ACTIVITY LEVEL (PAL)			
	Existing	Recommended	PAL 1 417,500	PAL 2 465,500	PAL 3 501,400	PAL 4 540,000
EQA	2.5		4.2	5.2	5.2	6.2
ECP to EQA Ratio	7.6		6.0	6.0	6.0	6.0
Check-in Positions						
Agent	20	14	19	23	23	27
SSD	8	5	6	8	8	10
Vacant	22	-	-	-	-	-
Total	**50**	**19**	**25**	**31**	**31**	**37**
Linear Counter Length (lf)	233	82	113	138	138	159
Check-in Queue						
Area (sf)	4,032	1,730	2,340	2,880	2,880	3,350

Source: Alliiance, 2024

TSA Passenger Security Screening Checkpoint (SSCP)

This category is dedicated to TSA space for screening departing passengers. Demand calculations were based on the common-use peak 30 minutes of the departing peak hour because all airlines will utilize a single, consolidated checkpoint for passenger screening. As previously stated, future planning requirements were based on the TSA Checkpoint Requirements and Planning Guide (CRPG) published in September 2022.

Currently, two lanes provide screening for both PreCheck and standard passengers. Future requirements were based on the following planning guidelines:

- A peak 30-minute demand of approximately 39 percent of the peak hour was calculated from the base design day flight schedule when applying the passenger early arrival profiles and held constant throughout the forecast period.
- 74 percent standard passengers and 26 percent PreCheck passengers for a weighted average throughput of 170 passengers per lane per hour.
- Approximately 8 percent (per local TSA) additional for employees/non-passengers.
- To calculate lane requirements, an industry-acceptable maximum waiting time of 10 minutes in the queue was assumed.
- A TSA guideline of 600 sf per lane was utilized equating to an IATA LoS C or “Optimum” of 12 sf per passenger.
- Two Ticket Document Checkers (TDC) per lane to provide stable passenger flow to the screening lanes.
- The screening area includes the required Private Screening Room (PSR) at 120 sf.
- An exit corridor width of 10 feet.

Table 3Q indicates the two-lane checkpoint is adequate throughout the planning horizon when utilizing the assumptions outlined. However, additional length for the two lanes would benefit passengers and make the screening operation more efficient while providing additional re-composure space. The area assumptions used for sizing the screening area account for future TSA screening equipment such as their Checkpoint Property Screening System (CPSS), which includes Computed Tomography (CT) x-ray devices, recommended divesting length, and a separate re-composure zone of approximately 10 feet in length.

The existing queue area provides three TDC for the two-lane checkpoint. Current TSA guidelines require two TDC per lane. While the area designated for the queue is sufficient for today’s activity, additional space will be required with higher forecasted peak hour loads.

The typical approach for sizing an exit lane includes using the calculated length of the screening area by an acceptable width. The airport currently utilizes a single-lane automated exit breach control device within an area of approximately 20 feet long by 10 feet wide, which is located adjacent to the secure concessions seating area and is retained for future planning purposes. However, future peak hour arriving (exiting) capacity should be compared to the stated throughput capacity of the exit breach device and adjusted accordingly by potentially adding another automated lane.

Table 3Q | Passenger Security Screening Checkpoint

SSCP	BASE YEAR 2023		PLANNING ACTIVITY LEVEL (PAL)			
	Existing	Recommended	PAL 1 417,500	PAL 2 465,500	PAL 3 501,400	PAL 4 540,000
Checkpoint Lanes	2	1	2	2	2	2
Checkpoint Screening Area[1]						
Screening Area[2]	2,609	1,720	3,320	3,320	3,320	3,320
Exit Corridor	214	214	214	214	214	214
Total Area (sf)	**2,823**	**1,930**	**3,530**	**3,530**	**3,530**	**3,530**
Queue Area (sf)	839	600	1,200	1,200	1,200	1,200

[1] Area excludes TSA office space
[2] Area includes 1-120 sf PSR

Source: Alliiance, 2024

Passenger Gate Holdrooms

Gate holdrooms are based on the required mix of aircraft gates and the average seating capacity of each airplane design group. These areas generally consist of the passenger seating area, the airline's podium, associated queue space, the loading bridge egress corridor, standing and circulation areas, and additional square footage allowances for areas such as soft-seating or charging stations. The gate holdrooms are based on the mix of aircraft found previously in **Table 3N**. Additional factors and assumptions include the following:

- An 84 percent load factor.
- An IATA "Optimum" (LoS C) of 70 percent of the passengers seated at 22 sf per passenger, and the other 30 percent standing at 15 sf per passenger, was utilized.
- A gate holdroom depth of 30 feet allows the area to provide soft seating zones and a deeper queue area at the gate podiums.
- Whenever possible, gate holdrooms are suggested to be configured in "shared" or "paired" layouts to take advantage of the adjacent gate holdroom seating area. However, this is only achievable when no near-simultaneous departures occur at the adjoining holdroom, which depends on airline scheduling patterns. This analysis utilized a 10 percent reduction factor for gates in a "paired" layout, such as the current gate holdroom configuration.

Four of the existing gates are capable of parking large narrowbody aircraft (A321/B739), with the fifth gate being widebody (B767) capable. The average gate area (excluding Gate 6) of approximately 1,800 sf, when using the assumptions stated above, is adequate for 90 seat large regional aircraft. Gate 2, which is utilized by Southwest's 143 seat narrowbody aircraft, is adequate for a 110-seat small narrowbody aircraft (B717, A220). Gates 3 and 5, which are utilized by United and American large regional 76-seat aircraft, average approximately 2,080 sf per gate, which is adequately sized for small narrowbody 110-seat aircraft. Based on the aircraft mix identified in the base design day flight schedule, the anticipated up-gauging identified in the aviation forecast, and the increase in number of gates required, the overall required gate holdroom area, as noted in **Table 3R**, will exceed capacity by PAL 1.

Table 3R| Passenger Gate Holdroom

Gate Holdrooms	BASE YEAR 2023		PLANNING ACTIVITY LEVEL (PAL)			
	Existing	Recommended	PAL 1 417,500	PAL 2 465,500	PAL 3 501,400	PAL 4 540,000
Airplane Design Seat Group						
Large Regional (70-94)	-	4,670	6,220	6,220	6,220	6,220
Narrowbody (95-199)	-	2,750	5,490	8,420	8,420	10,980
Total Area (sf)	**8,493**	**7,420**	**11,710**	**14,460**	**14,460**	**17,200**

Source: Alliiance, 2024

Baggage Claim Hall

The domestic baggage claim hall represents the area occupied by the baggage claim devices and the retrieval area for active claiming. Baggage claim requirements are primarily based on the percentage of deplaned terminating passengers in a peak 20-minute period within the peak hour, the percentage of those passengers' checking bags and, to a lesser extent, the number of bags checked. Typically, there are two methods to calculate claim capacity: by passenger or by baggage accumulation. Because most domestic passengers arrive at the claim device prior to their baggage, they will typically claim their bags on the first revolution of the device. This results in providing adequate linear claim frontage to accommodate the concentration of these peak passengers and their potential visitors. A typical industry planning standard is to assume all passengers will be no more than one person deep to be able to reach in and around to the claim device when the passenger's baggage is presented. This results in a LoS B/C planning ratio of 2.0 to 1.5 linear feet per claiming passengers. Additional factors and assumptions included:

- Assumed common use peak hour.
- Average load factor of 84 percent, 100 percent terminating passengers, with 80 percent claiming bags.
- A peak 20-minute factor of 74 percent.
- Travel party size of 1.8 passengers per group.
- 1.5 linear feet per claiming passenger.
- 25 sf per linear feet of flat plate claim unit (includes device, retrieval area, and circulation within the positive claim area).

The existing baggage claim hall includes two "T" shaped flat plate claim devices, one with 71 linear feet and the other with 77 linear feet, for a total claim frontage of approximately 148 linear feet. Using the above assumptions, these existing devices would be adequate for a small narrowbody aircraft (B717, A220). The existing linear frontage and associated claim area, as presented in **Table 3S**, will require an additional device and associated claim area by PAL 2. Given the utilization of 143-seat narrowbody aircraft in the current schedule, however, the existing devices may be at operational capacity for this type of aircraft gauge, in which case a larger, 115 linear feet flat plate device could be implemented sooner.

Table 3S | Baggage Claim Hall

Baggage Claim	BASE YEAR 2023		PLANNING ACTIVITY LEVEL (PAL)			
	Existing	Recommended	PAL 1 417,500	PAL 2 465,500	PAL 3 501,400	PAL 4 540,000
Claim Hall						
Claim Devices (Flat Plate)	2	2	2	3	3	3
Claim Length Required (lf)	-	129	168	20`3	231	261
Claim Length Provided (lf)	148	148	148	263	263	263
Total Area[1] (sf)	**3,622**	**3,700**	**3,700**	**6,580**	**6,580**	**6,580**

[1] Includes devices, queue/retrieval area, and circulation within the positive claim area

Source: Alliiance, 2024

Restrooms

This section has been divided between the landside (pre-security) and airside (post-security) portions of the terminal. The rationale for calculating the number of restroom locations, fixtures, and associated areas by landside and airside is found in the ACRP Report 226, "Planning and Design of Airport Terminal Restrooms and Ancillary Spaces." It is recommended that restroom locations provide, at a minimum, as many fixtures for women as are offered to men. For the landside portion of the existing terminal, the recently renovated central restroom area between ticketing and baggage claim provides an equal split of fixtures between women and men. The smaller restroom block at the western end of the ticket hall provides one additional men's fixture than women's, as does the recently opened pre-security restroom block on the upper concourse level. The existing landside square-foot-per-fixture ratios average 69 sf for the west end ticketing area, 81 sf for the central location, and 72 sf for the concourse level. This makes for an overall average of 73 sf per fixture.

The post-security, or airside, restroom location was also recently renovated and provides an equal split between men and women fixtures, and has an overall area of 73 sf per fixture. Each of the three recently renovated restroom locations provides a family or assisted restroom, while the airside location also provides a Nursing Mother's room and Service Animal Relief Area (SARA) room. Modern sf per fixture ratios are higher to account for increased circulation space within the restroom areas, grooming space, ledges for personal items, larger stalls for carry-on baggage, and wider chase space for easier accessibility. For the purpose of this analysis the following assumptions and guidelines were utilized for the landside (pre-security) portions of the terminal:

- A 33 percent female increase factor.
- Peak Hour departing O&D passengers and their visitors for ticketing.
- Peak hour arriving O&D passengers and their meeters/greeters for baggage claim.
- Approximately 118 sf average per fixture, plus 100 sf for each family restroom.

For the airside (post-security) concourse location, the following assumptions were utilized:

- 74 percent average peak 20-minute percent of the peak hour.
- 60 percent restroom utilization rate upon arrival.
- 50 percent male with 33 percent female increase factor.
- Approximately 118 sf average per fixture, plus 100 sf for each family restroom, 128 sf for the Nursing Mother's Room, and 100 sf for each SARA.

Based on the above factors and the calculation methods from ACRP Report 226, total landside fixtures are adequate throughout the planning horizon. An additional two women's airside fixtures by PAL 1 would enhance passenger level of service with additional fixtures for each gender required by PAL 2 and beyond. Considering the modern restroom design and best practices stated above, the existing square feet per fixture ratios are below the recommended guidelines. **Table 3T** provides a summary of fixture and space requirements.

Table 3T | Landside and Airside Restrooms

Restrooms	BASE YEAR 2023		PLANNING ACTIVITY LEVEL (PAL)			
	Existing	Recommended	PAL 1 417,500	PAL 2 465,500	PAL 3 501,400	PAL 4 540,000
Landside (Pre-Security)						
Men's Fixtures	19	5	7	8	9	9
Women's Fixtures	17	7	10	12	13	13
Family/Assisted Fixtures	2	2	2	2	2	2
Total Fixtures	**38**	**14**	**19**	**22**	**24**	**24**
Nursing Mother's Room (no.)	1	1	1	1	1	1
Total Area[1] (sf)	**2,883**	**1,630**	**2,230**	**2,590**	**2,820**	**2,820**
Airside (Post-Security)						
Men's Fixtures	7	5	9	11	11	12
Women's Fixtures	7	4	7	8	8	9
Family/Assisted Fixtures	1	1	1	1	1	1
Total Fixtures	**15**	**10**	**17**	**20**	**20**	**22**
Nursing Mother's Room (no.)	1	1	1	1	1	1
SARA (no.)	2	1	1	1	1	1
Total Area[1] (sf)	**1,282**	**1,400**	**2,230**	**2,590**	**2,590**	**2,830**

[1] Includes family/assisted, Nursing Mother, and SARA

Source: Alliiance, 2024

Ticket Lobby, Baggage Claim, and General Public Circulation

Terminal ticket lobby and baggage claim circulation areas represent the unobstructed clear paths from any seating area and vestibule leading up to the ticket counter queue lease lines and the positive claim area within the baggage claim hall. The existing ticket area provides a clear cross-circulation width of approximately 13 feet near the Southwest queue to 17 feet for the remainder of the ticket lobby. For this planning analysis a 15-foot corridor width has been utilized. The existing baggage claim general circulation area is nearly 16 feet in width. A width of 15 feet was utilized for this analysis.

General circulation accounts for all other areas of the terminal that make up the public functions of the terminal and include areas such as vertical circulation elements, corridors, and any other architectural spaces that tie the functional public elements of the terminal together. Typical planning ratios range from 15 percent to 30 percent of the public serving spaces. A ratio of 30 percent was used for this analysis.

As shown in **Table 3S**, the combined demand for public circulation space will exceed existing capacity by PAL 4. However, demand for baggage claim circulation will exceed existing capacity by PAL 2, which is when the need for a third baggage claim device is required.

Secure Airside Concourse Circulation

This category represents the area beyond the security screening checkpoint areas and consists primarily of the central corridor of the concourse. For future planning, a 30-foot corridor width has been utilized, which is a typical planning standard for a double loaded concourse (i.e., gate holdrooms on both sides of the concourse) without moving walks. The current concourse is 27 feet wide and includes seating down the middle of the circulation corridor, thereby reducing the effective available width for bi-directional movement. The future calculated area is based on the NBEG ratio, or an area-per-equivalent concourse length determined by total gates. The actual amount of secure circulation will depend, however, on the specific proposed concourse configuration(s), such as whether they consist of gates on one or both sides of the corridor, and whether those gates wrap the ends of the concourse. As a result of the recommended 30-foot corridor width, a calculated square-feet-per-NBEG ratio of approximately 1,290 sf was utilized, versus the existing approximately 1,100 sf. Given the higher SF/NBEG ratio, additional secure concourse circulation is recommended for today’s activity.

AIRLINE SPACE

This category of the terminal space program represents a significant portion of the baggage handling functions of the terminal. It contains all the areas the tenants typically require and lease to support their operations. The following paragraphs describe the requirements for these areas, such as checked baggage screening, outbound baggage make-up, and inbound baggage handling.

TSA Checked Baggage Screening

All checked baggage is currently screened in two separate locations between the three current airlines. Both American and United baggage is conveyed to a central bag screening room located behind the ticket counters and screened by TSA. Each airline utilizes a single Leidos Reveal CT-80XL EDS device fed from separate conveyors. American’s checked bags are placed onto the takeback belt by the airline agent whereas United passengers must take their checked baggage to a conveyor located west of American’s counter. Southwest passengers drop their checked baggage at a standalone Leidos CT-80XL EDS device located in the queue area adjacent to the airline’s ticket counter. For an enhanced passenger experience and future planning purposes, it’s assumed a new single baggage screening room would be provided for a “mini in-line” type of system where conveyors will feed the screening room from the ticket counters and into the EDS devices. The planned room would provide a screening area for the infeed and outfeed conveyors, manual roller tables, ETD screening tables and associated equipment, the EDS unit and viewing station, and circulation. Additional factors and assumptions included:

- Common use peak hour with early arrival passenger profiles was used to develop a peak 10-minute baggage flow typically used to calculate capacity.
- 0.8 checked bags per passenger ratio (per local TSA).
- EDS throughput of 200 bags per hour.
- 1.7 percent oversized baggage (per local TSA).
- Calculations are based on the TSA's formula for projecting peak 10-minute demand and subsequent number of EDS machines.
- Area requirements based on a future ratio of 960 sf per EDS unit, which includes 150 sf for a parts storage room.

While two devices would suffice over the planning horizon, additional area would be required by PAL 1, as shown in **Table 3U**.

Table 3U | Checked Baggage Screening

TSA Checked Bag Screening	BASE YEAR 2023		PLANNING ACTIVITY LEVEL (PAL)			
	Existing[1]	Recommended	PAL 1 417,500	PAL 2 465,500	PAL 3 501,400	PAL 4 540,000
EDS Bag Screening						
Assumed No. of Airlines	3	3	4	5	5	5
Number of EDS Units	3	1	2	2	2	2
Total Area(sf)	**1,633**	**1,090**	**1,930**	**1,930**	**1,930**	**1,930**

[1] Existing area includes two separate screening areas; future assumes a consolidated bag screen room.

Source: Alliiance, 2024

Outbound Baggage Make-up

The outbound baggage make-up function includes the area used for the accumulation, storage, and make-up of outbound baggage from the ticket counter and EDS baggage screening area. This space typically consists of the make-up units, baggage train circulation and maneuvering lanes, and the tug/cart staging areas. Depending on the airline's operational needs, additional space may be added, which includes lanes for two-way traffic, curb areas and walkways for ground handlers, and additional circulation that ties other areas of the make-up together. Current bag makeup functions occur in each airline's makeup room that can accommodate a single baggage cart. However, given the location of the bag screening room for American and United, carts for United are staged outside the screening room conveyor rollup door. For this analysis, it's assumed the consolidated bag screening room would feed a single flat plate makeup carousel for departing baggage.

Requirements are calculated based on the number of total carts required to be staged adjacent to the makeup devices during the peak departure period and the area associated with those carts, the device(s), staging areas, and maneuvering area expressed as a square-foot-per-cart ratio. Additional factors and assumptions included:

- Baggage cart requirements are based on a 60-minute staging period before a flight's departure time.
- 50 seats per cart.
- Resulting planning ratio of 565 sf per cart.
- An additional 15 percent for circulation.

As indicated in **Table 3V**, a single baggage makeup room would require more than double the space of the existing combined airline makeup rooms.

Table 3V | Outbound Baggage Makeup & Inbound Baggage Laydown

Baggage Makeup/Laydown	BASE YEAR 2023		PLANNING ACTIVITY LEVEL (PAL)			
	Existing	Recommended	PAL 1 417,500	PAL 2 465,500	PAL 3 501,400	PAL 4 540,000
Outbound Baggage Makeup[1]						
Assumed No. of Airlines	3	3	4	5	5	5
Number of Carts	3-6	6	7	8	10	10
Area (sf)	1,517	3,150	3,960	4,520	5,650	5,650
Additional circ./storage (sf)	-	470	590	680	850	850
Total Area (sf)	**1,517**	**3,620**	**4,550**	**5,200**	**6,500**	**6,500**
Inbound Baggage Laydown[2]						
Number of laydown belts	2	2	2	3	3	3
Total Area (sf)	**630**	**600**	**600**	**900**	**900**	**900**

[1] Existing area includes the three separate airline bag rooms; future assumes single consolidated makeup area.
[2] Area includes the enclosure of the laydown belt only as cart staging and bypass circulation is outside under cover.

Source: Alliiance, 2024

Inbound Baggage Laydown

The inbound bag category represents the area used to deliver bags to the baggage claim devices. This occurs on both flat plate claim devices, and while they provide approximately 34 feet of laydown belt, only 24 feet is available due to the pair of 12-foot overhead rollup doors that secure the belts when not in use. Once bags are offloaded, they circulate through the wall and into the public area for claim. Both belts are long enough for up to three carts to stage and offload. A planning ratio of 300 sf per off-load area was used in the analysis, which includes the enclosed belt space only.

As indicated in **Table 3V** above, the existing area is adequate until PAL 2 when an additional flat plate claim device is required.

CONCESSIONS SPACE

The concession areas are devoted to commercial concessions that generate revenue for the airport. These typically include food/beverage, news/gift/sundry (business centers, shoeshine, specialty stores, etc.), rental car, and other revenue generating functions. These amenities provide the passenger with necessary services during their journey and provide vital revenue to the airport.

There are two general methods to approximate overall concessions areas: one suggests approximately 8 percent to 12 percent of the public serving space be allocated to concessions, and the other utilizes a ratio of square feet of concessions space per 1,000 annual enplanements. It is also recommended that 80-90 percent of the total concessions area be allocated to the post security or airside portion the terminal, with the remaining 10-20 percent allocated to the non-secure or landside portion of the terminal. However, these “rules of thumb” can vary by airport size and annual activity levels, with some smaller airports exhibiting much higher pre-security concessions ratios. Due to the financial importance of the concession program, it is suggested that the airport seek a concession planning specialist prior to determining a final airside/landside split and to determine the breakout of supportable revenue-generating space, such as between food/beverage versus retail.

The Airport is currently embarking on a full concessions upgrade program that will overhaul their food/beverage and retail areas. Once complete, the airport will have approximately 7 percent of the public area allocated to concessions revenue generating space, which is near the typical 8 percent to 12 percent planning standard. The post-security revenue generating area will account for 94 percent of the total public concessions space with 6 percent located on the pre-security portion of the terminal.

Once the upgrades are complete, the airport will have a ratio of approximately 11 sf per 1,000 annual enplanements. This ratio was retained and utilized for future planning along with the concessions split of 94percent airside and 6 percent landside. Additionally, the existing concessions-support-to-revenue-area ratio of approximately 50 percent was utilized. This accounts for back-of-house (BOH) space such as food/prep/kitchen areas, storage, and other offices to support the public facing concessions space.

Space for rental cars was increased to account for more office and break space per responses received from the rental car representatives.

NON-PUBLIC SPACE

This category includes the “back of house” areas that are not accessible to the public and generally consists of areas such as airport administration, airport police, and any other airport-related offices and support space, restrooms, and circulation. Other areas include loading docks, maintenance, janitorial, storage and shops, mechanical/electrical/plumbing (MEP), IT/communications, and structural non-net portions of the building. These spaces and the functional areas of the terminal and the related concourse combine to create the gross building footprint.

Airport Administration

The airport administration area is located on the second level and is split by the central concourse circulation space. The east space is located above the baggage claim area while the west space (which includes a public conference room of more than 1,000 sf), is located above airline ATO space. Responses from the surveys submitted to the airport indicate the majority of the space is adequate for today's operations. Areas such as general file storage and restrooms, however, were indicated as being undersized. Using the existing ratio of approximately 34-sf-per-1,000-annual-enplanements yielded a 19 percent increase in required space by PAL 1 and beyond. As such, any future space needs should be discussed with the airport during any future expansion project.

Airport Operations (Maintenance, Janitorial, Storage, Shops)

These areas account for the building maintenance facilities and consist of shops, storage, office space, circulation, and janitorial space. Typical planning standards require 1-2 percent of the total functional areas be dedicated to these functions. Responses from surveys submitted to the airport generally considered these areas to be adequate for their current operations. As a result, a ratio of 2 percent was utilized for planning purposes, which is slightly below the existing 2.8 percent ratio.

Mechanical, Electrical, Plumbing, Communications

This program category includes all the utility support areas for the terminal and is generally a percentage of the enclosed functional areas of the terminal, which typically ranges between 8 and 15 percent. The existing ratio of approximately 8 percent was utilized. Any future building expansion must evaluate whether additional MEP capacity will be required.

Building Structure (Structural/Non-Net/Void)

This category ties together all the previous functional elements of the program to provide a better estimate of the total gross building area. Unusable space or special structures often make up this category and, depending on how the gross areas are determined, a factor of 2 percent to 5 percent is typically added to the program. The existing terminal gross area was taken from the airport terminal CAD drawings. All functional elements were then added together and subtracted from the overall gross area footprint to calculate the non-net area. The existing calculated ratio of approximately 15 percent is due to the large "open to below" spaces under the high bay roof running the length of the ticket and baggage claim lobbies. For the purpose of this analysis, the existing ratio has been utilized.

PASSENGER TERMINAL FACILITY REQUIREMENTS SUMMARY

The programmatic approach to sizing facility areas, as described in the previous sections, is commonly used as the first step during the expansion project's planning and preliminary schematic design phases. As a project proceeds through the design process, functions such as ticketing, baggage areas, gate holdrooms, circulation areas, concessions, and other space-based requirements will often change as a result of the physical configuration of the design as well as cost considerations.

The demand requirements as summarized in **Table 3W** are considered a minimum generic facilities program recommended to support the design aircraft(s) and their associated peak hour passenger activity levels. **While projected demand is not expected to exceed current facility capacity until PAL 2 (465,500 enplanements), individual spaces should be reviewed to determine when their capacity shortfalls will occur.** Industry best practice is to start planning for additional space that serves the public, airline, and baggage processing functions when demand reaches approximately 85 percent of the existing capacity. Crossing this capacity threshold triggers the need to begin planning, designing, and constructing to replace facilities in time to meet the growing passenger demand levels. **Table 3Y** indicates the point at which these trigger points will be met.

Table 3W | Terminal Facility Requirements

Program Area	BASE YEAR 2023		PLANNING ACTIVITY LEVEL (PAL)			
	Existing	Recommended	PAL 1 417,500	PAL 2 465,500	PAL 3 501,400	PAL 4 540,000
Public Space						
Circulation[1]	30,566	18,540	25,720	31,250	31,800	35,260
Ticket Counter Queue	4,032	1,730	2,340	2,880	2,880	3,350
TSA Pax Security Screening/Offices	10,494	9,360	11,560	11,560	11,560	11,560
Passenger Gate Holdrooms	8,493	7,420	11,710	14,460	14,460	17,200
Baggage Claim[2]	3,622	4,860	5,200	8,400	8,910	8,910
Restrooms (pre/post security)[3]	4,165	3,030	4,460	5,180	5,410	5,650
Other/Amenity Spaces[4]	1,686	1,690	1,750	1,790	1,820	1,850
Subtotal (sf)	***63,048***	***46,630***	***62,740***	***75,520***	***76,840***	***83,780***
Airline Space						
Ticketing (counter, ATO)	8,775	2,950	4,060	4,970	4,970	5,710
TSA Checked Baggage Screening	1,633	1,090	1,930	1,930	1,930	1,930
Outbound Baggage Makeup	1,517	3,620	4,550	5,200	6,500	6,500
Airside Operations/Storage	3,808	1,430	2,390	2,960	2,960	3,530
Inbound Baggage Claim Laydown[5]	630	600	600	900	900	900
Other Offices/Support Space	1,042	380	650	800	800	950
Subtotal (sf)	***17,405***	***10,070***	***14,180***	***16,760***	***18,060***	***19,520***
Concessions						
Rental Car/Offices/Queue	2,270	2,530	2,530	2,530	2,530	2,530
Landside/BOH, Storage	2,440	350	420	470	510	540
Airside/BOH, Storage	5,015	5,510	6,600	7,350	7,920	8,530
Subtotal (sf)	***9,725***	***8,390***	***9,550***	***10,350***	***10,960***	***11,600***
US Customs & Border Protection/FIS						
Subtotal (sf)	***16,652***	***16,650***	***16,650***	***16,650***	***16,650***	***16,650***
Non-Public Space						
Non-Airline Tenant Space[6]	477	480	480	480	480	480
Airport Administration/Conf. Room	11,964	11,860	14,200	14,200	14,200	14,200
Restrooms/Circulation	5,692	3,590	4,320	4,620	4,780	4,960
Airport Operations[7]	3,558	1,950	2,390	2,770	2,840	3,020
Building Operations/Systems[8]	37,424	26,150	31,910	37,020	38,000	40,480
Outdoor airside patio/SARA[9]	1,572	1,570	1,570	1,570	1,570	1,570
Subtotal (sf)	***59,115***	***44,030***	***53,300***	***59,090***	***60,300***	***63,140***
Total Gross (sf)	**165,945**	**125,770**	**157,200**	**178,370**	**182,810**	**194,690**

[1] Includes public seating, ticketing, bag claim, concourse, and general circulation
[2] Includes devices, retrieval areas, circulation, and meeter & greeter area
[3] Includes Family Room, Nursing Mother's/Lactation suite, and SARA
[4] Includes exhibit, displays, leasable spaces, and frequent flyer lounge
[5] Laydown belts are enclosed, staging and circulation within exterior covered space
[6] Includes Airport Police and miscellaneous leasable space
[7] Incudes maintenance, janitorial, storage, and shops
[8] Includes cargo loading dock, MEP, IT/Communications, and building structure (non-net/chase/void space)
[9] Area excluded from overall total

Source: Alliiance, 2024

Table 3Y | Terminal Program Trigger Point Summary

Program Area	BASE YEAR 2023		PLANNING ACTIVITY LEVEL (PAL)			
	Existing	Recommended	PAL 1 (2028)	PAL 2 (2033)	PAL 3 (2038)	PAL 4 (2043)
General						
Annual Enplanements	348,700		417,500	465,500	501,400	540,000
Aircraft Gates	5	✓	✗	✗	✗	✗
Public Space						
Circulation	30,566	✓	✓	✗	✗	✗
Ticket Counter Queue	4,032	✓	✓			
TSA Passenger Security Screening/Offices	10,494	⚠	✗	✗	✗	✗
No. of Screening Lanes	2	✓	⚠	⚠	⚠	⚠
Screening Area	2,609	✓	✗	✗	✗	✗
Passenger Gate Holdrooms	8,493	⚠	✗	✗	✗	✗
Baggage Claim/Meeter & Greeter	3,622	✗	✗	✗	✗	✗
No. of Devices	2	⚠	⚠	✗	✗	✗
Retrieval Area	3,622	⚠	⚠	✗	✗	✗
Restrooms (pre/post security)	4,165	✓	✗	✗	✗	✗
Other/Amenity Spaces	1,686	⚠	✗	✗	✗	✗
Subtotal (sf)	***63,048***	✓	⚠	✗	✗	✗
Airline Space						
Ticketing (counter, ATO)	8,775	✓	✓	✓	✓	✓
TSA Checked Baggage Screening	1,633	✓	✗	✗	✗	✗
No. of Devices	3	✓	✓	✓	✓	✓
Outbound Baggage Makeup	1,517	✗	✗	✗	✗	✗
Airside Operations/Storage	3,808	✓	✓	✓	✓	⚠
Inbound Baggage Claim Laydown	630	⚠	⚠	✗	✗	✗
Other Offices/Support Space	1,042	✓	✓	✓	✓	
Subtotal (sf)	***17,405***	✓	✓	⚠	✗	✗
Concessions						
Landside/BOH, Storage/Rental Cars	4,710	✓	✓	✓	✓	✓
Airside/BOH, Storage	5,015	⚠	✗	✗	✗	✗
Subtotal (sf)	***9,725***	⚠	⚠	✗	✗	✗
US Customs & Border Protection/FIS						
Subtotal (sf)	***16,652***	✓	✓	✓	✓	✓
Non-Public Space						
Non-Airline Tenant Space	477	⚠	⚠	⚠	⚠	⚠
Airport Administration/Conference Room	11,964	⚠	✗	✗	✗	✗
Restrooms/Circulation	5,692	✓	✓	✓	✓	✓
Airport Operations	3,558	✓	✓	✓	✓	✓
Building Operations/Systems	37,424	✓	⚠	⚠	✗	✗
Subtotal (sf)	***59,115***	✓	⚠	⚠	✗	✗
Total Gross (sf)	**165,945**	✓	⚠	✗	✗	✗

Source: Alliiance, 2024

Legend

✓ Programmed area is less than existing ⚠ Programmed area is at or over 85% of capacity ✗ Programmed area is greater than existing

TERMINAL CURB AND ROADWAY FACILITY REQUIREMENTS

INTRODUCTION AND METHODOLOGY

As part of the facility requirements analysis, a study was conducted to determine the capacity and curbside utilization for the passenger terminal in the existing and future traffic conditions. This report evaluates curbside traffic operations at the CCIA passenger terminal curb for the following scenarios:

- 2024 Existing Conditions
- 2029 Future Conditions
- 2034 Future Conditions
- 2044 Future Conditions

All years were analyzed for a single and dual lane pickup/drop-off operation, leading to a total of eight modeled scenarios. The analysis was performed using the microsimulation model Vissim. Available traffic data for International Drive and airport parking were used to inform the analysis.

This analysis incorporates best practices from the following documents: Airport Cooperative Research Program (ACRP) Report 25 – Airport Passenger Terminal Planning and Design, and ACRP Report 40 – Airport Curbside and Terminal Area Roadway Operations.

STUDY AREA

The study area is shown in **Figure 3-2**. It encompasses the International Drive loop that starts and ends at State Highway 44 (SH-44). International Drive is a 2-lane road with one additional lane at the terminal curb area. The speed limit on International Drive varies – it is 45 miles per hour (mph) near SH-44, and it drops to 15mph at the curb area.

The focus of this study is on the passenger pickup/drop-off area of the curb that is approximately 570 feet long and has approximately 520 feet available for pickup/drop-off operations (see **Figure 3-3**). The rest of the curb is for pedestrian crossings. The commercial part of the curb is used by buses, taxis, and other commercial vehicles to pickup/drop-off passengers. There was insufficient traffic information for the commercial curb, so only the portion of the curb that is used by private vehicles was analyzed.

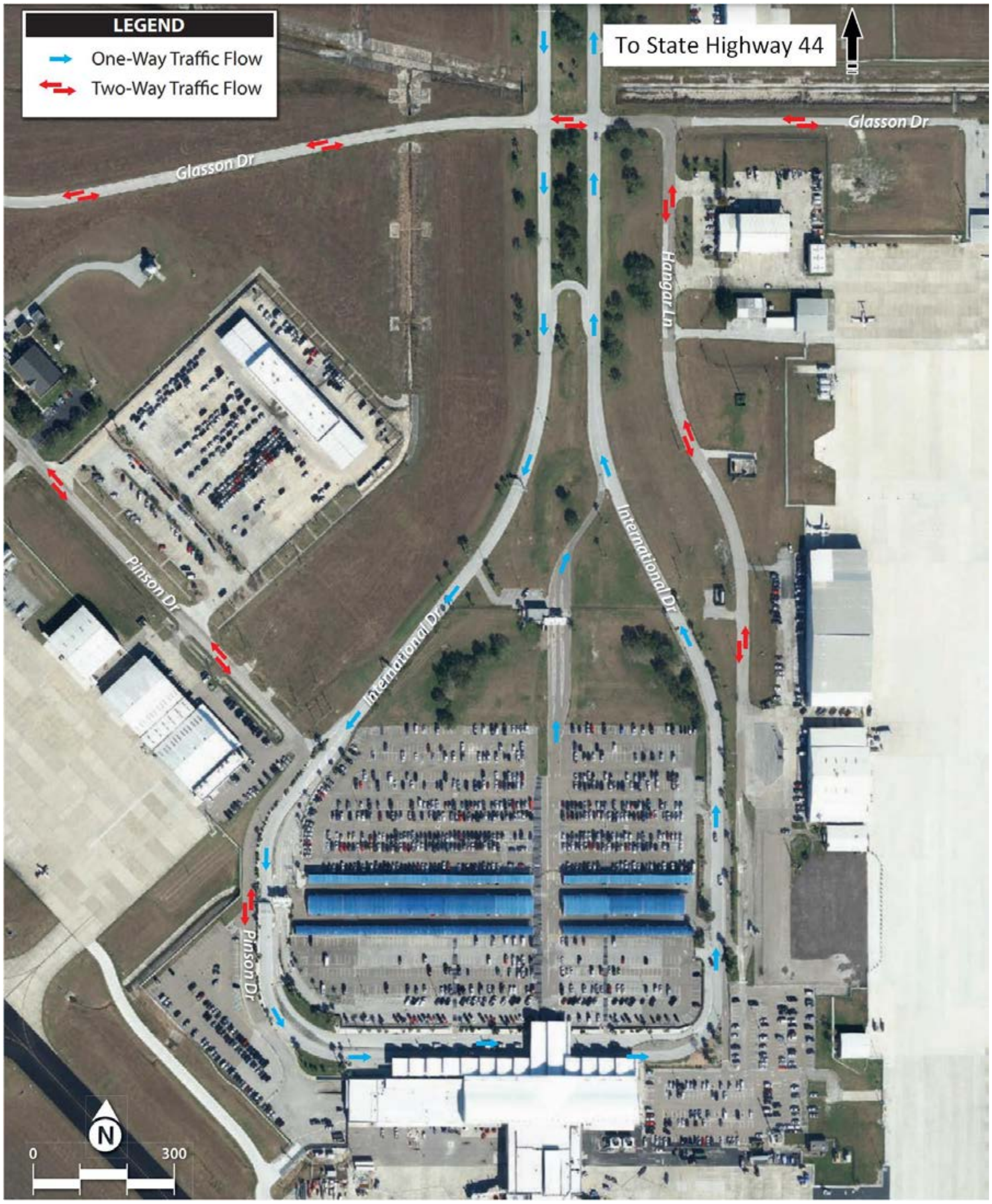

Figure 3-2: International Drive Study Area

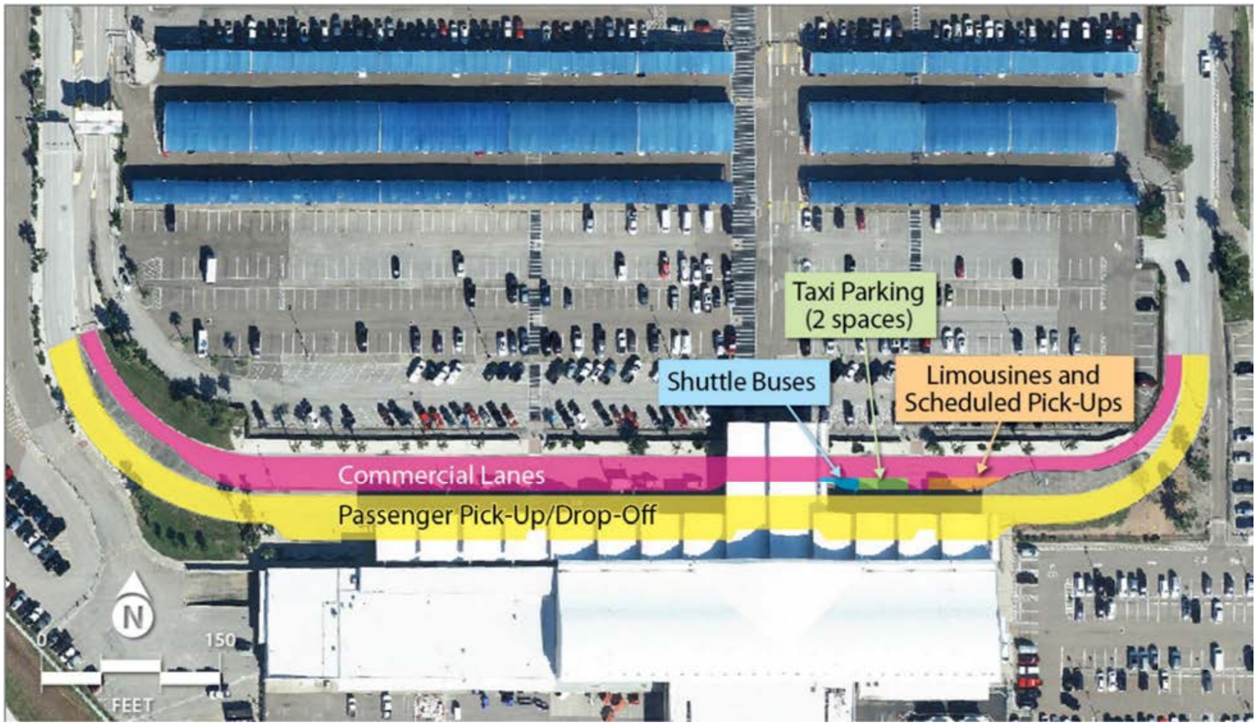

Figure 3-3: Terminal Curb Area

TRAFFIC VOLUMES DEVELOPMENT

Along International Drive, Annual Average Daily Traffic (AADT) volumes and hourly counts were obtained from the Texas Department of Transportation's (TxDOT) Statewide Traffic Analysis and Reporting System (STARS). This database contains detailed traffic data, including traffic counts, travel times, and traffic signal information. In 2023, AADT on International Drive was 4,958 vehicles. For International Drive, the database has AADTs recorded since 2014, except for the years 2020, and 2021. The data reveals that the traffic has historically grown at an average rate of 5% per year on International Drive, which aligns with the forecasted growth rate discussed in the Forecast Chapter.

TxDOT STARS data counts for the year 2023 shows that the highest hourly count of 218 vehicles was recorded from 7:00AM to 8:00AM. Since International Drive is used to access multiple hangars and other developments it can be assumed that all 218 vehicles did not utilize the passenger terminal curb or airport parking facilities.

The CCIA Master Plan shows 211 passenger enplanements in the design hour for the same year. In an effort to provide a conservative evaluation of curb capacity, 211 vehicles were used as a baseline assumption for the total number of vehicles using International Drive to access the terminal curb or parking facilities even though the actual number is likely lower. The airport provided a daily summary report for the number of vehicles entering and exiting CCIA parking facilities. This information was used to properly distribute design hourly volumes between the parking lots and terminal curb. It is assumed that 10% of the total daily parking numbers occur during the design hour.

Because traffic data was available for the year 2023, a 5% yearly growth rate was used to estimate the design hour volumes for the existing year (2024), and for the future years (2029, 2034, and 2044). The equation used to calculate traffic growth for each analysis year is:

$$V_{future} = V_{current} \cdot (1 + 0.05)^{Years\ Projected}$$

The projected design hourly volumes on International Drive for each year are given in **Table 3Z**.

Table 3Z | Traffic Volumes for Existing and Future Years

Year	Design Hour Volume (veh/hr)	To Terminal (veh/hr)	To Parking (veh/hr)
2024	222	170	52
2029	288	222	66
2034	349	264	85
2044	448	310	138

VISSIM MODEL DEVELOPMENT

The Vissim model developed for International Drive starts and ends at SH-44. Speed limits were obtained from Google Steet View and placed accordingly in the model. A total of 19 curb spaces were analyzed in the single lane scenario, and 36 in the dual lane scenario, as shown in **Figure 3**. Input volumes were distributed using parking routing decisions. Routing decisions in Vissim are set in a way that vehicles must wait in a queue if there are no curb spaces available, thus preventing vehicles from moving through the curb area without stopping. The curb wait time was set to 3 minutes (180 seconds) for all the vehicles. Vissim's default time to remove vehicles from the model if no parking space is available is 60 seconds. This was increased to 350 seconds to accurately model airport traffic conditions. A total of eight scenarios were modeled, four scenarios for a single lane curb pickup/drop-off and four scenarios for dual lane curb parking. Each scenario was run for 10 simulation runs with random seeds and the results were averaged to account for the model's stochastic behavior.

A) Single Lane Curb Pickup/Drop-Off

B) Dual Lane Curb Pickup/Drop-Off

Figure 3-4: Vissim Curbside Modeling

RESULTS AND CONCLUSION

Table 3AA shows the Vissim outputs for a single curbside lane pickup/drop-off operations. The Total Number of Pickup/Drop-off Vehicles is the number of vehicles that parked at the curb in the design hour. As the volume increases over the years, the Average Occupancy Time of the Curb (curb utilization) also rises. In 2024, the average occupancy is estimated to be 37.2%, while in 2044, the average occupancy of the curb is estimated to be 81.3%. The queue length is the number of vehicles waiting to enter the curbside parking area. The Average Queue Length is zero feet for the years 2024-2034, and 9 feet for the year 2044. Maximum Queue Length of 150 feet estimated by Vissim is recorded for the year 2044. Note that the average queue length is based on 10 simulations. The maximum queue length is the maximum queue recorded in any of these standalone simulations.

Table 3AA | Single Lane Pickup/Drop-off Occupancy and Queue Length Vissim Output

Year	Total Number of Pickup/ Drop-off Vehicles	Average Occupancy Time of the Curb (%)	Average Queue Length (ft)	Maximum Queue Length (ft)
2024	172	37.2	0	0
2029	222	52.5	0	2
2034	264	66.3	0	16
2044	306	81.3	9	150

Table 3BB shows the results for dual curbside lane pickup/drop-off scenarios. The total number of simulated vehicles is similar to the single curbside lane scenarios. Minor differences in volume are due to the stochastic nature of the simulation software. The average occupancy of the curb space is lower due to more space being available. The average queue lengths are similar to a single lane scenario, while the maximum queue length of 120 feet for the year 2044 is lower in this case.

Table 3BB | Dual Lane Pickup/Drop-off Occupancy and Queue Length Vissim Output

Year	Total Number of Pickup/Dropoff Vehicles	Average Occupancy Time of the Curb (%)	Queue Length Average (ft)	Queue Length Maximum (ft)
2024	171	20.6	0	6
2029	224	29.6	0	6
2034	265	38.0	1	52
2044	307	47.1	4	120

Table 3CC shows travel times outputs from the Vissim model. The travel time is collected on a segment of International Drive that includes the terminal curb area and approximately 500 feet before and after the curb. The speed limit in this area is 15mph. Free Flow Travel Time of 75.6 seconds is the time the vehicle would traverse this distance if driving at the speed limit with no obstructions. Average Vissim Travel Time is the average time it took a vehicle to traverse this distance including the curb dwell time. The Average Curb Dwell Time is the average time it takes a driver to pickup/drop-off passengers. As the table shows, modeled dwell time is around 3 minutes for all the scenarios. The three-minute wait time was used in Vissim as suggested by ACRP research reports. The Moving Time is the time it took a driver to traverse this link without accounting for the curb dwell time. The results show that as the volume increases, the moving time increases as well. This is due to more interaction between vehicles and more weaving maneuvers; thus, the drivers experience more stops along the curb. The Percent Increase shows how much more time the drivers need to traverse this link when compared to the free flow travel time.

Table 3CC | Curbside LOS Analysis

Year	Free Flow Travel Time (sec) (1)	Average Vissim Travel Time (sec) (2)	Average Curb Dwell Time (sec) (3)	Moving Time (sec) (2)-(3)	Percent Increase	Time in Queue (sec) (2)-(3)-(1)	LOS
2024 Single	75.6	265.5	185.9	79.6	5.2%	4.0	A
2029 Single		267.6	184.7	82.9	9.6%	7.3	A
2034 Single		271.3	184.9	86.4	14.2%	10.7	A
2044 Single		314.6	185.3	129.3	70.9%	53.6	B
2024 Dual		285.8	186.6	99.2	31.1%	23.5	A
2029 Dual		298.0	185.1	112.9	49.3%	37.3	B
2034 Dual		308.3	185.2	123.1	62.8%	47.5	B
2044 Dual		320.8	184.8	136.0	79.8%	60.3	B

According to ACRP Report 40 - Airport Curbside and Terminal Area Roadway Operations Chapter 5, Level of Service (LOS) for the airport curb is directly related to the maximum acceptable time spent in queue in seconds. As shown in **Table 3DD**, for small hub and smaller medium hub airports, given a maximum acceptable time spent in queue of 300 seconds, LOS A is achieved if the time in queue is 30 seconds or less. For LOS B, the time in a queue should be less than 98 seconds. For this study, the Time in Queue is calculated as:

Time in Queue = Average Vissim Travel Time – Average Curb Dwell Time – Free Flow Travel Time

The curb is expected to operate at LOS B at worst. Thus, the current curb length should efficiently handle the projected traffic volumes.

Table 3DD: Level of Service Thresholds (source: ACRP 40 Report) – Time spent in queue for level of service

	GIVEN MAXIMUM ACCEPTABLE TIME SPENT IN QUEUE IN SECONDS[1]					
	Small-hub and smaller medium-hub airports[1]			Large medium-hub and large-hub airports[1]		
Maximum for LOS E	60	120	300	600	900	1,200
Maximum for LOS D	47	93	233	465	698	930
Maximum for LOS C	33	66	165	330	495	660
Maximum for LOS B	20	39	98	195	293	390
Maximum for LOS A	6	12	30	60	90	120

Notes:
Input data are to be taken from microsimulation modeling output

[1] Analyst must first select a value for the maximum acceptable time spent in queue for the subject airport. Then, using queue length and average speed outputs from the microsimulation model, the level of service can be identified.

Overall, the current available curbside space is sufficient to handle projected traffic volumes for all scenarios analyzed. Dual curb lanes may add some disturbances to the traffic flow and slightly increase the travel time, thus a strong enforcement of the curb area to minimize pickup/drop-off dwell times is strongly encouraged.

ROADWAY ANALYSIS

Regarding the overall 1.5 mile long, two-lane International Drive loop, there should be no operational issues as the capacity of the existing roadway exceeds both current and projected traffic demand. Projected traffic for the year 2044 is 448 vehicles in the design hour. Even if this number doubles, the road will be able to handle this traffic demand without any operational issues as the theoretical capacity of a single lane is 1,900 passenger vehicles per hour per lane.

VEHICLE PARKING

Vehicle parking associated with the Corpus Christi International Airport includes spaces utilized by passengers, visitors, employees, rental car companies, public transit, rideshare, and taxis/shuttles. Existing parking availability was previously presented on Exhibit 1R. Parking needs are generally established by taking into consideration peak hour passengers, peak hour visitors, and the travel mode split. In accordance with airport parking industry standards, the existing and long-term parking needs for the Corpus Christi International Airport is shown in **Table 3EE**.

TABLE 3EE | Passenger Vehicle Parking

	Existing	Initial	Short Term	Intermediate	Long Term
Annual Enplanements		348,702	417,500	465,500	540,000
Design Day Enplanements		1,113	1,410	1,620	1,940
Peak Hour Pax		211	275	332	427
Deplaning Pax		557	705	810	970
Auto Parking					
Short Term	440	314	376	419	486
Long Term	720	488	585	652	756
Covered	319	63	83	100	128
Overflow	300	401	508	583	698
Total Public Parking	**1,779**	**1,266**	**1,552**	**1,754**	**2,068**
Employee Parking	145	139	167	186	216
Rental Car Ready/Return	250	192	230	256	297
Cell Phone Lot	7	28	35	41	49

The Corpus Christi International Airport does not have enough on-airport public parking to accommodate the current need for total parking. As a result, a portion of the public will rely on off-airport public parking options. The combination of paved and unpaved overflow public parking provides enough spaces to accommodate forecast growth through the intermediate term planning horizon, however, the overflow parking area could need to be paved accordingly to serve as permanent long-term parking and a new overflow lot identified for peak parking period by the intermediate term. Approximately 300 additional spaces could be needed if long-term enplanement levels are achieved.

Employee parking is estimated as 400 spaces per one million enplaned passengers which is on the high side of industry standard being as low at 200 per one million enplanements. The current supply of employee parking should be adequate through the intermediate forecast. Rental car parking is consolidated in the rental car parking ready/return area at the east end of the terminal building. This area currently provides 250 ready/return spaces. Future rental car ready/return needs are calculated at 550 spaces per one million originating passengers. Again, this is a high forecast factor and is used because Corpus Christi attracts a higher than typical destination passenger. Rental car service and storage space is calculated as seven acres per one million originating passengers. Based on the high estimate, additional rental car spaces could be needed by the end of the intermediate term. Overall, the combination of all forms of parking is adequate to meet projected needs until the long-term forecast.

ELECTRICAL RESILIENCY FACILITY REQUIREMENTS

Based on the review of the exis. ng electrical facilities at CCIA that was completed as part of the inventory effort, a list of proposed electrical resiliency improvements was established. The focus of these improvements is to enhance electrical reliability by reducing the potential for commercial power interruptions and/or electrical equipment failures.

Enhancing electrical reliability at the airport will require close coordination between the City of Corpus Christi and AEP, the local electrical provider, as some of the proposed improvements will likely be the responsibility of AEP. To inform the development of this proposed list of electrical reliability improvements, a meeting was held between AEP and the City of Corpus Christi to discuss existing and future risks related to electrical resiliency. The results of the meeting were used to inform the proposed list of electrical resiliency improvements.

Table 3FF and **Table 3GG** provide a prioritized list of the recommended electrical improvements proposed for CCIA. **Table 3FF** identifies improvements that would likely be led by CCIA while **Table 3GG** identifies improvements that would likely be led by AEP. Each table provides a general description of the project and the justification for the improvement.

The prioritization of projects shown in each table was based on the following factors:

- **Worker Safety** – Electrical improvements that reduce the risk to personnel working on the electrical equipment were prioritized.
- **Impact of an Electrical Outage** – Electrical improvements related to facilities where electrical outages would have a greater impact (e.g., operation of aircraft, passenger movement, emergency response, etc.) were prioritized.
- **Age and Condition of Existing Electrical Systems** – Existing electrical systems that were older or operating in a diminished condition were prioritized.

It should be noted that these improvements may be packaged with other capital projects to minimize facility closures and impacts. For example, the proposed electrical resiliency improvements to the ARFF building may be incorporated into a broader ARFF station rehabilitation project instead of being completed as a standalone project.

Table 3FF | Prioritized Resiliency Improvements Related to CCIA Electrical Infrastructure

Priority	Project Name	Project Description	Project Justification
1	**Airport Power System Study**	This project is a study documenting the layout of existing electrical infrastructure in detail and labeling all equipment per code requirements. Project includes the following analysis work : Arc-flash, short circuit analysis, equipment evaluation, labeling, code compliance, one-line documents, and equipment location. Will also identify existing electrical loads, capacity, and where improvements may be needed.	During the electrical infrastructure site visit conducted in February 2024, it was identified that multiple electrical panels weren't labeled and Arc-flash labels were not present. Additionally, other code compliance issues were identified. This can be a life safety issue for personnel working on electrical equipment. This effort will also aid in analyzing future capacity needs to support electric vehicles and GSE.
2	**Airport East Vault Building Improvements and Airfield Lighting Control and Monitoring System (ALCMS)**	This project includes the replacement of the old medium-voltage (MV) switchgear, electrical distribution equipment, and emergency systems distribution equipment in the Airport East Vault Building. Additionally, this includes the replacement of the outdated Airfield Lighting Control and Monitoring System.	The East Vault is the primary power distribution point for most of the airport. Consequently, the replacement of the old equipment associated with the vault should be prioritized to prevent power outages and improve resiliency. Additionally, the ALCMS system is old and needs to be replaced.
3	**Terminal Main Building Improvements**	This project includes the replacement of the electrical distribution equipment and emergency systems distribution equipment in the terminal building.	Due to the high-profile nature of terminal building power outages, it is recommended to replace the old electrical distribution equipment and emergency systems distribution equipment to improve resiliency.
4	**Airfield Lighting Vault Improvements**	This project includes the replacement of the constant current regulators, HVAC equipment, and generator replacement in the airfield electrical vault.	Project is needed to improve resiliency related to the airfield lighting systems.
5	**ARFF Building**	This project includes the replacement of the electrical distribution equipment and emergency systems distribution equipment in the ARFF station.	Project is needed to improve resiliency related to the ARFF station.
6	**Rental Car Maintenance Building**	This project includes the replacement of the electrical distribution equipment and emergency systems distribution equipment in the rental car maintenance building.	Project is needed to improve resiliency related to the rental car maintenance building.
7	**Airport Maintenance Building**	This project includes the replacement of the electrical distribution equipment and emergency systems distribution equipment in the airport maintenance building.	Project is needed to improve resiliency related to the airport maintenance building.
8	**Parking Plaza Improvements**	This project includes the replacement of the electrical distribution equipment and emergency systems distribution equipment in the parking plaza building.	Project is needed to improve resiliency related to the parking plaza building.
9	**Installation of LED HIRLs on Runways 13-31 and 18-36**	This project should be completed as part of a pavement rehabilitation project for each runway. This project includes the installation of LED HIRLs and wiring on each runway.	Project is needed as replacement parts for existing incandescent systems are becoming increasingly difficult to find.
10	**Terminal Parking Improvements**	This project includes making modifications to the lighting in the covered parking area to reduce glare. It also includes eliminating Metal Halide lighting fixtures in the parking lots and upgrading them to new LED fixtures.	Project is needed to reduce glare and reduce power consumption.
11	**Beacon Replacement**	Replace existing beacon with an LED beacon with a tip-down pole.	Project is needed to reduce power consumption and maintenance costs.

Source: Garver, LLC, 2024

Table 3GG | Prioritized Resiliency Improvements Related to AEP Electrical Infrastructure

Priority	Project Name	Project Description	Project Justification
1A	**Replace MV Switchgear**	This project includes the replacement of the AEP owned MV switchgear at the entrance to the airport.	The equipment is estimated to be approximately 40 years old.
1B	**Electrical Resiliency Improvements**	This project includes the establishment of a utility loop around the airport and the relocation of above ground utilities to underground utilities. Existing wires would be replaced.	Providing an electrical loop and relocating utilities underground will improve resiliency.

Source: Garver, LLC, 2024

It should be noted that both electrical improvements described in **Table 3GG** were identified as being highly important. Consequently, the improvements were prioritized as 1A and 1B verses 1 and 2.

PASSENGER TERMINAL ELECTRICAL LOAD ANALYSIS

The purpose of this electrical load analysis is to determine if the existing electrical service at Corpus Christi International Airport (CCIA) has the capacity to support the anticipated future expansion of the passenger terminal building through 2043. The future passenger terminal space requirements described previously in this chapter were used as a basis for this analysis.

Table 3HH shows the amount of anticipated increase in the square footage of the passenger terminal building from 2023 thru 2028 (PAL 1). The table calculates the change in square footage and the estimated resulting increase in electrical load based on an estimated design power density for each area on a per square foot basis. To provide a conservative estimate of future electrical loads, it was assumed that any increases in terminal square footage would be realized via building expansion and not the reconfiguration of the existing terminal space.

Table 3JJ shows the amount of anticipated increase in the square footage of the passenger terminal from the year 2033 (PAL 2) to 2038 (PAL 3). The table calculates the change in square footage and the estimated resulting increase in electrical load.

Table 3HH | Estimated Electrical Demand Increase PAL 2

	2023 Existing Space (sf)	2028 (PAL 1) Recommended Space Size (sf)	Anticipated Increase PAL 1 (sf)	Estimated Design Power Density (watts per sf)	Expected Increase (watts)
Public Space					
Circulation (public seating, ticketing, concourse, bag claim, general circ)	30556	25720	0	10 w/sf	0
Ticket Lobby Queue	4032	2340	0	10 w/sf	0
Passenger Security Screening & TSA Offices	10494	11560	1066	17 w/sf	18122
Passenger Holdrooms	8493	11710	3217	5 w/sf	16085
Baggage Claim (retrieval/device/meeter & greeter)	3622	5200	1578	20 w/sf	31560
Restrooms/SARA/Nursing Mothers (pre/post security)	4165	4460	295	5 w/sf	1475
Other/Amenity (frequent flyer club, displaces, information counter)	1686	1750	64	17 w/sf	1088
Airline Space					
Ticketing (counter, ATO)	8775	4060	0	15 w/sf	0
TSA Checked Baggage Screening	1633	1930	297	15 w/sf	4455
Outbound Baggage Makeup	1517	3960	2443	15 w/sf	36645
Airside Ops/Storage	3808	2390	0	5 w/sf	0
Inbound Bag Claim Laydown	630	600	0	5 w/sf	0
Inbound/Outbound Baggage Circulation & Cart Staging	-	590	590	10 w/sf	5900
Other Offices/Support Space	1042	650	0	17 w/sf	0
Concessions					
Landside/Storage (includes Rental Cars)	4710	2950	0	30 w/sf	0
Airside/Storage	5015	6600	1585	30 w/sf	47550
Customs					
US Customs & Border Protection Services/FIS	16652	16650	0	N/A	0
Non-Public Space					
Non-Airline Tenant Space (Airport Police)	477	480	3	20 w/sq ft	60
Airport Administration	11964	14200	2236	20 w/sf	44720
Restrooms/Circulation	5692	4320	0	10 w/sf	0
Airport Operations (Maintenance, Janitorial, Storage, Shops)	3558	2440	0	10 w/sf	0
Building Systems (MEP, Communications/IT, Structure)	37424	32640	0	25 w/sf	0
Gross Space per phase (sq. ft.)	165945	157200	-	-	-
Space Increase per phase (sq. ft)	-	-	13374	-	-
Increase of Electrical Load per project phase (watts)	-	-	-	-	207660
Estimated Increase in Amperage for PAL 1 (480V 3PH) (Amp)					**250.07**
Note: sf = square feet					

Table 3JJ – Estimated Electrical Demand Increase PAL 2

	2028 After PAL1 (sf)	2033 (PAL 2) Recommended Space Size (sf)	Anticipated Increase PAL 2 (sf)	Estimated Design Power Density (watts per sf)	Expected Increase (watts)
Public Space					
Circulation (public seating, ticketing, concourse, bag claim, general circ)	30556	31250	694	10 w/sf	6940
Ticket Lobby Queue	4032	2880	0	10 w/sf	0
Passenger Security Screening & TSA Offices	11560	11560	0	17 w/sf	0
Passenger Holdrooms	11710	14460	2750	5 w/sf	13750
Baggage Claim (retrieval/device/meeter & greeter)	5200	8400	3200	20 w/sf	64000
Restrooms/SARA/Nursing Mothers (pre/post security)	4460	5180	720	5 w/sf	3600
Other/Amenity (frequent flyer club, displaces, information counter)	1750	1790	40	17 w/sf	680
Airline Space					
Ticketing (counter, ATO)	8775	4970	0	15 w/sf	0
TSA Checked Baggage Screening	1930	1930	0	15 w/sf	0
Outbound Baggage Makeup	3960	4520	560	15 w/sf	8400
Airside Ops/Storage	3808	2960	0	5 w/sf	0
Inbound Bag Claim Laydown	630	900	270	5 w/sf	1350
Inbound/Outbound Baggage Circulation & Cart Staging	590	680	90	10 w/sf	900
Other Offices/Support Space	1042	800	0	17 w/sf	0
Concessions					
Landside/Storage (includes Rental Cars)	4710	3000	0	30 w/sf	0
Airside/Storage	6600	7350	750	30 w/sf	22500
Customs					
US Customs & Border Protection Services/FIS	16652	16650	0	N/A	0
Non-Public Space					
Non-Airline Tenant Space (Airport Police)	480	480	0	20 w/sq ft	0
Airport Administration	14200	14200	0	20 w/sf	0
Restrooms/Circulation	5692	4620	0	10 w/sf	0
Airport Operations (Maintenance, Janitorial, Storage, Shops)	3558	2770	0	10 w/sf	0
Building Systems (MEP, Communications/IT, Structure)	37424	37020	0	25 w/sf	0
Gross Space per phase (sq. ft.)	-	178370	-	-	-
Space Increase per phase (sq. ft)	-	-	9074	-	-
Increase of Electrical Load per project phase (watts)	-	-	-	-	122120
Estimated Increase in Amperage for PAL 2 (480V 3PH) (Amp)					**147.06**

Table 3KK shows the amount of anticipated increase in the square footage of the passenger terminal from the year 2033 (PAL 2) to 2038 (PAL 3). The table calculates the change in square footage and the estimated resulting increase in electrical load.

Table 3KK – Estimated Electrical Demand Increase PAL 3

	2033 After PAL 2 (sf)	2038 (PAL 3) Recommended Space Size (sf)	Anticipated Increase PAL 3 (sf)	Design Power Density (watts per sf)	Increase (watts)
Public Space					
Circulation (public seating, ticketing, concourse, bag claim, general circ)	31250	31800	550	10 w/sf	5500
Ticket Lobby Queue	4032	2880	0	10 w/sf	0
Passenger Security Screening & TSA Offices	11560	11560	0	17 w/sf	0
Passenger Holdrooms	14460	14460	0	5 w/sf	0
Baggage Claim (retrieval/device/meeter & greeter)	8400	8910	510	20 w/sf	10200
Restrooms/SARA/Nursing Mothers (pre/post security)	5180	5410	230	5 w/sf	1150
Other/Amenity (frequent flyer club, displaces, information counter)	1790	1820	30	17 w/sf	510
Airline Space					
Ticketing (counter, ATO)	8775	4970	0	15 w/sf	0
TSA Checked Baggage Screening	1930	1930	0	15 w/sf	0
Outbound Baggage Makeup	4520	5650	1130	15 w/sf	16950
Airside Ops/Storage	3808	2960	0	5 w/sf	0
Inbound Bag Claim Laydown	900	900	0	5 w/sf	0
Inbound/Outbound Baggage Circulation & Cart Staging	680	850	170	10 w/sf	1700
Other Offices/Support Space	1042	800	0	17 w/sf	0
Concessions					
Landside/Storage (includes Rental Cars)	4710	3040	0	30 w/sf	0
Airside/Storage	7350	7920	570	30 w/sf	17100
US Customs & Border Protection Services/FIS	16652	16650	0	N/A	0
Non-Public Space					
Non-Airline Tenant Space (Airport Police)	480	480	0	20 w/sq ft	0
Airport Administration	14200	14200	0	20 w/sf	0
Restrooms/Circulation	5692	4780	0	10 w/sf	0
Airport Operations (Maintenance, Janitorial, Storage, Shops)	3558	2840	0	10 w/sf	0
Building Systems (MEP, Communications/IT, Structure)	37424	38000	576	25 w/sf	14400
Gross Space per phase (sq. ft.)		182810			
Space Increase per phase (sq. ft)			3766		
Increase of Electrical Load per project phase (watts)					67510
Estimated Increase in Amperage for PAL 3 (480V 3PH) (Amp)					**81.30**

Table 3LL shows the amount of anticipated increase in the square footage of the passenger terminal from the year 2038 (PAL 3) to 2043 (PAL 4). The table shows the increase in square footage and the estimated resulting increase in electrical load.

Table 3LL – Estimated Electrical Demand Increase PAL 4

	2038 After PAL 3 (sf)	2043 (PAL 4) Recommended Space Size (sf)	Anticipated Increase PAL 4 (sf)	Design Power Density (watts per sf)	Increase (watts)
Public Space					
Circulation (public seating, ticketing, concourse, bag claim, general circ)	31,800	35,260	3460	10 w/sf	34600
Ticket Lobby Queue	4032	3350	0	10 w/sf	0
Passenger Security Screening & TSA Offices	11560	11560	0	17 w/sf	0
Passenger Holdrooms	14460	17200	2740	5 w/sf	13700
Baggage Claim (retrieval/device/meeter & greeter)	8910	8910	0	20 w/sf	0
Restrooms/SARA/Nursing Mothers (pre/post security)	5410	5650	240	5 w/sf	1200
Other/Amenity (frequent flyer club, displaces, information counter)	1820	1850	30	17 w/sf	510
Airline Space					
Ticketing (counter, ATO)	8775	5710	0	15 w/sf	0
TSA Checked Baggage Screening	1930	1930	0	15 w/sf	0
Outbound Baggage Makeup	5650	5650	0	15 w/sf	0
Airside Ops/Storage	3808	3530	0	5 w/sf	0
Inbound Bag Claim Laydown	900	900	0	5 w/sf	0
Inbound/Outbound Baggage Circulation & Cart Staging	850	850	0	10 w/sf	0
Other Offices/Support Space	1042	950	0	17 w/sf	0
Concessions					
Landside/Storage (includes Rental Cars)	4710	3070	0	30 w/sf	0
Airside/Storage	7920	8530	610	30 w/sf	18300
US Customs & Border Protection Services/FIS	16652	16650	0	N/A	0
Non-Public Space					
Non-Airline Tenant Space (Airport Police)	480	480	0	20 w/sq ft	0
Airport Administration	14200	14200	0	20 w/sf	0
Restrooms/Circulation	5692	4960	0	10 w/sf	0
Airport Operations (Maintenance, Janitorial, Storage, Shops)	3558	3020	0	10 w/sf	0
Building Systems (MEP, Communications/IT, Structure)	38000	40480	2480	25 w/sf	62000
Gross Space per phase (sq. ft.)	-	194690	-	-	-
Space Increase per phase (sq. ft)	-	-	9560	-	-
Increase of Electrical Load per project phase (watts)	-	-	-	-	130310
Estimated Increase in Amperage for PAL 4 (480V 3PH) (Amp)					**156.92**

Table 3MM calculates the total estimated increase in electrical loads for all PALs based on the square footage increases identified for each PAL. The forecasted electrical load increase for each of the PALs was combined and a 25% spare capacity factor was included. The results of the analysis show the need for a total of 794 additional amps of future electrical capacity. It is recommended that this demand be rounded up to 800 additional amps of future electrical capacity.

Table 3MM | Total Estimated Electrical Demand Based on Terminal Expansion

Expansion Details	Increase in space per phase (sq. ft)	Increase in Electrical Load (watts)	Increase in Amperage (480V/3PH) (Amp)
Building Expansion 2028 PAL1	13,374	207,660	250
Building Expansion 2033 PAL2	9,074	122,120	147
Building Expansion 2038 PAL3	3,766	67,510	81
Building Expansion 2043 PAL4	9,560	130,310	156
Total Increase	**35,774 Sq. Ft**	**527,600 Watt**	**635 Amp**
Future Electrical Service Size			
Estimated Future Electrical Amperage Need:			**635 Amp**
Spare Capacity 25%			159 Amp
Total:			794 Amp
Recommended New 480/277V 3PH Electrical Service Size:			**800 Amp**

The existing electrical service for the Corpus Christi International Airport passenger terminal is provided through two primary electrical feeds. The first feed is referred to as NDP and it provides a 900-amp trip rating. The second feed is referred to as SDP and it provides a 1200-amp trip rating.

Ideally, the peak load usage for the last 12 months for both the NDP and SDP feed would be collected from the Power Logic Circuit Monitor on the distribution panels associated with each feed. Due to those Power Logic Circuit Monitors not functioning, the peak usage data from the last 12 months is unavailable. To gather a reasonable estimate of the current peak usage for NDP and SDP – the peak demand data from ten years ago was used with a 20% load contingency added to account for any expansion in the terminal since the data was collected. Using this estimated peak load, the National Electrical Code (NEC) standards were used as a reference to estimate the existing terminal loads.

Based upon the guidance provided in NEC 220.87, **Table 3NN** and **Table 3PP** show the estimated existing electrical load the terminal has in its current configuration. An additional 25% load is added per the NEC 220.87(2) for using metered data in lieu of having 12-months of maximum demand data. The 12-month maximum demand is not available, therefore the loads for the existing chillers and associated pumps will be taken into this total per the NEC 220.87(1) exception.

Table 3NN | NDP Feed Existing Electrical Load Estimate	
Load Summary for Panel NDP	
Existing Panel Rating:	900 Amps
Existing Panel Voltage:	480/277V
Existing Transformer Size:	750KVA
Measured Peak Load from 2010 With Estimated Load Increase of 20% for Growth	**502 Amps**
Add 25% based on NEC 220.87	628 Amps
Add Cooling Load - chiller and associated pumps	325 Amps
Total Amp for Panel:	**953.5 Amps**
Amps of Capacity Remaining:	*-53.5 Amps*

Table 3PP | SDP Feed Existing Electrical Load Estimate	
Load Summary for Panel SDP	
Existing Panel Rating:	1200 Amps
Existing Panel Voltage:	480/277V
Existing Transformer Size:	1000KVA
Measured Peak Load from 2010 With Estimated Load Increase of 20% for Growth	**584 Amps**
Add 25% based on NEC 220.87	731 Amps
Add Cooling Load - chiller and associated pumps	325 Amps
Total Amp for Panel:	**1056 Amps**
Amps of Capacity Remaining:	*144 Amps*

Table 3NN shows that the existing NDP feed's calculated current usage is over 900A which leaves no capacity. As a result, it should be assumed that the NDP side of the power distribution to the terminal does not have the capacity to support the expected growth and expansion of the passenger terminal. However, the existing NDP feed is not actually overloaded as the table might be interpreted to mean. The identified overage is likely due to the conservative nature of this electrical load analysis model. If the maximum peak usage for the last 12 months was available, the estimated existing load would likely be lower. However, based on the analysis, there is no anticipated available capacity for the NDP electrical feed.

Table 3PP calculates that the existing SDP feed's calculated current usage is 1056 amps leaving approximately 12% capacity or 144 amps. Based on the estimated future electrical demand calculated in **Table 3MM**, the SDP side of the distribution does not have the capacity to support the expected square footage increase in the passenger terminal.

Based on the estimated future electrical need described in **Table 3MM**, the existing electrical service cannot accommodate the estimated additional load. A new 800A at 480/277V 3PH electrical switchboard is recommended to support the future renovations and expansions. If the airport requires this new additional load to be on standby power, a new generator would be required.

PASSENGER TERMINAL WATER UTILITY ANALYSIS

The purpose of this evaluation is to determine the plumbing utility improvements necessary to support the anticipated future expansion of the passenger terminal building. The future passenger terminal space requirements described previously in this chapter were used as a basis for this analysis. Specifically, the estimated additional terminal space needs set forth previously in **Table 3W** were used to estimate the need for additional domestic water demand using applicable plumbing codes for Corpus Christi.

The airport is currently served by a collection of water meters. These water meters serve everything from tenant buildings to property irrigation systems across the airport. A list of relevant water meters and the water usage associated with each meter for 2023 is shown in Table X. It should be noted that this list is not inclusive of every water meter at the airport. However, the water usage data provided in **Table 3QQ** provides insight into the annual usage and peak usage of each meter for important airport facilities.

There are two water meters that currently serve the terminal. One meter measures terminal water usage (meter #MW1866173) while the other is metering the water used by the cooling towers to meet the terminal cooling needs (meter #WT14000031). The terminal building was not specifically identified in the meter data that was reviewed but assumptions can be made regarding which meter supplies the terminal based on the usage amounts. As shown in **Table 3QQ**, the passenger terminal water use peaked in September 2023 where it consumed approximately 399,000 gallons of water during that billing cycle.

Table 3QQ – 2023 Water Bill Usage

Meter	Service	Building	CONSUMPTION IN THOUSANDS OF GALLONS											
			Jan.	Feb.	Mar.	Apr.	May	Jun.	July	Aug.	Sept.	Oct.	Nov.	Dec.
WT152076	Irrigation	Cell Phone Lot	0	0	0	0	0	0		0	0	0	0	0
WT14000031	Water	Cooling Towers	292	435	402	306	499	561	679	740	566	482	256	300
WT106162	Water	Rental Car	2	2	1	2	1	4	2	2	2	2	2	1
WT152184	Irrigation	Monument Sign	0	0	0	0	-	1	0	0	0	0	0	0
WT152077	Irrigation	By Sterling FBO	0	0	0	0	0	0	3	10	0	0	0	0
WT704240	Water	By Main Parking Lot	1	1	1	1	2	0	1	0	1	10	1	1
WT11001939	Water	Hangar - Private Business	0	0	0	0	0	0	0	0	0	0	0	1
WT152192	Irrigation	Monument Sign	0	0	0	0	0	0	0	0	0	0	0	0
WT70333180	Water	ARRF	6	7	7	7	7	7	8	6	6	6	5	7
MW1866173	Water	Main Terminal	97	79	225	205	379	311	488	265	399	279	139	134
Total monthly gallons (in thousands)			**569**	**548**	**703**	**547**	**890**	**886**	**693**	**758**	**976**	**781**	**551**	**663**

The existing terminal drawings indicate that the passenger terminal is served by a 6” domestic water line and meter. The facility contains flush valves for urinal and water closets throughout. With the existing 6” domestic water line, the peak available load for use is approximately 700 gpm (gallons per minute). This service and available load is quite robust. Converting the peak load to water supply fixture units (WSFU) shows that the existing domestic water supply can easily support north of 5000 WSFUs, which would translate to more than 500 water closets.

Domestic water demand for each PAL was calculated based on Corpus Christi plumbing codes. The results of the analysis are shown in **Table 3RR** through **Table 3UU**.

Table 3RR | PAL 1 Domestic Water Minimum Fixture Needs

	Additional SF	Classification	Occupancy Density (SF/occupant)	Increase Occupancy	Water Closets fixture/occupant		Lavatories		Drinking Fountains
					Male	Female	Male	Female	
Public Space									
Circulation	0	Concourse	100	0	0	0	0	0	0
Ticket Lobby Queue	0	Concourse	100	0	0	0	0	0	0
Passenger Security	1066	Concourse	100	11	0.022	0.022	0.015	0.015	0.011
Passenger Holdrooms	3217	Concourse	100	32	0.064	0.064	0.043	0.043	0.032
Baggage Claim	1578	Baggage Claim	20	79	0.158	0.158	0.105	0.105	0.079
Restrooms/SARA/Nursing Mother Pre/post security	295	Concourse	100	3	0.006	0.006	0.004	0.004	0.003
Other/Amenity Spaces	64	Concourse	100	1	0.002	0.002	0.001	0.001	0.001
Total public space				*126*	*0.252*	*0.252*	*0.168*	*0.168*	*0.126*
Airline Space									
Ticketing	0	Baggage Handling	300	0	0	0	0	0	0
TSA Checked	297	Baggage Handling	300	1	0.002	0.002	0.001	0.001	0.001
Outbound Baggage Makeup	2443	Baggage Handling	300	8	0.016	0.016	0.011	0.011	0.008
Airside Ops/Storage	0	Concourse	100	0	0	0	0	0	0
Inbound Bag Claim	0	Baggage Claim	20	0	0	0	0	0	0
Inbound /Outbound Baggage Circulation	0	Baggage Claim	20	0	0	0	0	0	0
Other Offices/Support Space	0	Concourse	100	0	0	0	0	0	0
Total Airline Space				*9*	*0.018*	*0.018*	*0.012*	*0.012*	*0.009*
Concessions									
Landside/Storage (included car rental)	0	Kitchens, Commercial	200	0	0	0	0	0	0
Airside /Storage	1585	Kitchens, Commercial	200	8	0.016	0.016	0.011	0.011	0.008
Total Concessions Space				*8*	*0.016*	*0.016*	*0.011*	*0.011*	*0.008*
US Customs & Border Protection Services FIS									
Ticketing	0	Waiting Areas	15	0	0	0	0	0	0
Total US Customs & Border Protection Services FIS Space				*0*	*0*	*0*	*0*	*0*	*0*
Airline Space									
Non-Airline	3	Concourse	100	0	0	0	0	0	0
Airport Administration	2236	Concourse	100	22	0.044	0.044	0.029	0.029	0.022
Restrooms/Circulation	0	Concourse	100	0	0	0	0	0	0
Airport Operations (Maintenance, Janitorial, Storage Shops)	0	Concourse	100	0	0	0	0	0	0
Building Systems (MEP, Communications/IT, Structure)	0	Concourse	100	0	0	0	0	0	0
Total Airline Space				*22*	*0.044*	*0.044*	*0.029*	*0.029*	*0.022*
Total Additions				**165**	**0.33**	**0.33**	**0.220**	**0.220**	**0.165**

Table 3SS | PAL 2 Domestic Water Minimum Fixture Needs

	Additional SF	Classification	Occupancy Density (SF/occupant)	Increase Occupancy	Water Closets fixture/occupant		Lavatories		Drinking Fountains
					Male	Female	Male	Female	
Public Space									
Circulation	694	Concourse	100	7	0.014	0.014	0.009	0.009	0.007
Ticket Lobby Queue	0	Concourse	100	0	0	0	0	0	0
Passenger Security	1066	Concourse	100	11	0.022	0.022	0.015	0.015	0.011
Passenger Holdrooms	5967	Concourse	100	60	0.120	0.120	0.080	0.080	0.06
Baggage Claim	4778	Baggage Claim	100	48	0.096	0.096	0.064	0.064	0.048
Restrooms/SARA/Nursing Mother Pre/post security	1015	Concourse	100	11	0.022	0.022	0.015	0.015	0.011
Other/Amenity Spaces	104	Concourse	100	2	0.004	0.004	0.003	0.003	0.002
			Total public space	***139***	***0.278***	***0.278***	***0.185***	***0.185***	***0.139***
Airline Space									
Ticketing	0	Baggage Handling	100	0	0	0	0	0	0
TSA Checked	297	Baggage Handling	100	3	0.006	0.006	0.004	0.004	0.003
Outbound Baggage Makeup	3003	Baggage Handling	100	31	0.062	0.062	0.041	0.041	0.031
Airside Ops/Storage	0	Concourse	100	0	0	0	0	0	0
Inbound Bag Claim	270	Baggage Claim	100	3	0.006	0.006	0.004	0.004	0.003
Inbound /Outbound Baggage Circulation	0	Baggage Claim	100	0	0	0	0	0	0
Other Offices/Support Space	0	Concourse	100	0	0	0	0	0	0
			Total Airline Space	***37***	***0.074***	***0.074***	***0.049***	***0.049***	***0.037***
Concessions									
Landside/Storage (included car rental)	0	Kitchens, Commercial	100	0	0	0	0	0	0
Airside /Storage	2335	Kitchens, Commercial	100	24	0.048	0.048	0.032	0.032	0.024
			Total Concessions Space	***24***	***0.048***	***0.048***	***0.032***	***0.032***	***0.024***
US Customs & Border Protection Services FIS									
Ticketing	0	Waiting Areas	100	0	0	0	0	0	0
			Total US Customs & Border Protection Services FIS Space	***0***	***0***	***0***	***0***	***0***	***0***
Airline Space									
Non-Airline	3	Concourse	100	1	0.002	0.002	0.001	0.001	0.001
Airport Administration	2236	Concourse	100	23	0.046	0.046	0.031	0.031	0.023
Restrooms/Circulation	0	Concourse	100	0	0	0	0	0	0
Airport Operations (Maintenance, Janitorial, Storage Shops)	0	Concourse	100	0	0	0	0	0	0
Building Systems (MEP, Communications/IT, Structure)	0	Concourse	100	0	0	0	0	0	0
			Total Airline Space	***24***	***0.048***	***0.048***	***0.032***	***0.032***	***0.024***
			Total Additions	**224**	**0.448**	**0.448**	**0.298**	**0.298**	**0.224**

Table 3TT | PAL 3 Domestic Water Minimum Fixture Needs

	Additional SF	Classification	Occupancy Density (SF/occupant)	Increase Occupancy	Water Closets fixture/occupant		Lavatories		Drinking Fountains
					Male	Female	Male	Female	
Public Space									
Circulation	1244	Concourse	100	13	0.026	0.026	0.017	0.017	0.013
Ticket Lobby Queue	0	Concourse	100	0	0	0	0	0	0
Passenger Security	1066	Concourse	100	11	0.022	0.022	0.015	0.015	0.011
Passenger Holdrooms	5967	Concourse	100	60	0.12	0.120	0.080	0.080	0.06
Baggage Claim	5288	Baggage Claim	20	265	0.53	0.530	0.353	0.353	0.265
Restrooms/SARA/Nursing Mother Pre/post security	1245	Concourse	100	13	0.026	0.026	0.017	0.017	0.013
Other/Amenity Spaces	134	Concourse	100	2	0.004	0.004	0.003	0.003	0.002
			Total public space	*364*	*0.728*	*0.728*	*0.485*	*0.485*	*0.364*
Airline Space									
Ticketing	0	Baggage Handling	300	0	0	0	0	0	0
TSA Checked	297	Baggage Handling	300	1	0.002	0.002	0.001	0.001	0.001
Outbound Baggage Makeup	4133	Baggage Handling	300	14	0.028	0.028	0.019	0.019	0.014
Airside Ops/Storage	0	Concourse	100	0	0	0	0	0	0
Inbound Bag Claim	270	Baggage Claim	20	14	0.028	0.028	0.019	0.019	0.014
Inbound /Outbound Baggage Circulation	0	Baggage Claim	20	0	0	0	0	0	0
Other Offices/Support Space	0	Concourse	100	0	0	0	0	0	0
			Total Airline Space	*29*	*0.058*	*0.058*	*0.039*	*0.039*	*0.029*
Concessions									
Landside/Storage (included car rental)	0	Kitchens, Commercial	200	0	0	0	0	0	0
Airside /Storage	2905	Kitchens, Commercial	200	15	0.03	0.03	0.02	0.02	0.015
			Total Concessions Space	*15*	*0.03*	*0.03*	*0.02*	*0.02*	*0.015*
US Customs & Border Protection Services FIS									
Ticketing	0	Waiting Areas	15	0	0	0	0	0	0
			Total US Customs & Border Protection Services FIS Space	*0*	*0*	*0*	*0*	*0*	*0*
Airline Space									
Non-Airline	3	Concourse	100	1	0.002	0.002	0.001	0.001	0.001
Airport Administration	2236	Concourse	100	23	0.046	0.046	0.031	0.031	0.023
Restrooms/Circulation	0	Concourse	100	0	0	0	0	0	0
Airport Operations (Maintenance, Janitorial, Storage Shops)	0	Concourse	100	0	0	0	0	0	0
Building Systems (MEP, Communications/IT, Structure)	576	Concourse	100	6	0.012	0.012	0.008	0.008	0.006
			Total Airline Space	*30*	*0.06*	*0.06*	*0.040*	*0.040*	*0.03*
			Total Additions	**438**	**0.876**	**0.876**	**0.584**	**0.584**	**0.438**

Table 3UU | PAL 4 Domestic Water Minimum Fixture Needs

	Additional SF	Classification	Occupancy Density (SF/occupant)	Increase Occupancy	Water Closets fixture/occupant		Lavatories		Drinking Fountains
					Male	Female	Male	Female	
Public Space									
Circulation	4704	Concourse	100	48	0.096	0.096	0.064	0.064	0.048
Ticket Lobby Queue	0	Concourse	100	0	0	0	0	0	0
Passenger Security	1066	Concourse	100	11	0.022	0.022	0.015	0.015	0.011
Passenger Holdrooms	8707	Concourse	100	88	0.176	0.176	0.117	0.117	0.088
Baggage Claim	5288	Baggage Claim	20	265	0.53	0.53	0.353	0.353	0.265
Restrooms/SARA/Nursing Mother Pre/post security	1485	Concourse	100	15	0.03	0.03	0.020	0.020	0.015
Other/Amenity Spaces	164	Concourse	100	2	0.004	0.004	0.003	0.003	0.002
			Total public space	***429***	***0.858***	***0.858***	***0.572***	***0.572***	***0.429***
Airline Space									
Ticketing	0	Baggage Handling	300	0	0	0	0	0	0
TSA Checked	297	Baggage Handling	300	1	0.002	0.002	0.001	0.001	0.001
Outbound Baggage Makeup	4133	Baggage Handling	300	14	0.028	0.028	0.019	0.019	0.014
Airside Ops/Storage	0	Concourse	100	0	0	0	0	0	0
Inbound Bag Claim	270	Baggage Claim	20	14	0.028	0.028	0.019	0.019	0.014
Inbound /Outbound Baggage Circulation	0	Baggage Claim	20	0	0	0	0	0	0
Other Offices/Support Space	0	Concourse	100	0	0	0	0	0	0
			Total Airline Space	***29***	***0.058***	***0.058***	***0.039***	***0.039***	***0.029***
Concessions									
Landside/Storage (included car rental)	0	Kitchens, Commercial	200	0	0	0	0	0	0
Airside /Storage	3515	Kitchens, Commercial	200	18	0.036	0.036	0.024	0.024	0.018
			Total Concessions Space	***18***	***0.036***	***0.036***	***0.024***	***0.024***	***0.018***
US Customs & Border Protection Services FIS									
Ticketing	0	Waiting Areas	15	0	0	0	0	0	0
			Total US Customs & Border Protection Services FIS Space	***0***	***0***	***0***	***0***	***0***	***0***
Airline Space									
Non-Airline	3	Concourse	100	1	0.002	0.002	0.001	0.001	0.001
Airport Administration	2236	Concourse	100	23	0.046	0.046	0.031	0.031	0.023
Restrooms/Circulation	0	Concourse	100	0	0	0	0	0	0
Airport Operations (Maintenance, Janitorial, Storage Shops)	0	Concourse	100	0	0	0	0	0	0
Building Systems (MEP, Communications/IT, Structure)	3056	Concourse	100	31	0.062	0.062	0.041	0.041	0.031
			Total Airline Space	***55***	***0.11***	***0.11***	***0.073***	***0.073***	***0.055***
			Total Additions	**531**	**1.062**	**1.062**	**0.708**	**0.708**	**0.531**

Even though PAL 4 forecasts the need for approximately 35,000 sq. ft. of addi. onal terminal space, the code required additional minimum number of plumbing fixtures is less than five. This is mostly due to the transient nature of the terminal. The reality is that more fixtures than the minimum required by plumbing code will likely be included in the future terminal build out.

However, the existing domestic 6” water service line should provide sufficient water capacity to meet future water demand for the expanded passenger terminal. The terminal currently has roughly 879 WSFUs utilized for base building water fixtures. There is likely another 800 WSFU utilized by tenant spaces, bringing the current total usage to 1,679 WSFUs. This leaves approximately 3,321 WSFUs available within the existing domestic water service supply to meet future capacity needs.

NATURAL GAS DEMAND

According to as-built terminal renovation plans for FAA AIP grant 3-48-0051-28-00, the existing gas service to the terminal is a 5psi service line with a capacity of 13,060 cubic feet per hour (CFH). The existing gas service is shown on drawing P13.06C of the aforementioned terminal renovation plan set. The vast majority of the gas service goes to feeding the hydronic heating boilers and gas fired make up air systems. A separately metered and smaller service is shown for kitchen gas loads. This load is anticipated to have been sub metered for individual tenants.

No size or indications of existing gas demand were found in the existing record documents. For this reason, assumptions regarding gas usage and load have been applied to both existing and proposed future new terminal concession spaces. Gas requirements related to the airport’s hydronic heating boilers and gas fired make up air systems were not considered.

The existing concessions area in the passenger terminal building is approximately 9,725 sq. ft. Only a portion of the existing concession space is anticipated to have cooking needs and therefore gas fired kitchen appliances. However, to provide a conservative estimate of gas demand for the passenger terminal it is assumed that the entire concessions area could be used as restaurant space and therefore could have gas fire kitchen appliances. Sizing estimates for gas appliances in a kitchen are conservatively estimated at 1.4 CFH per square foot of kitchen area. Normal restaurant tenants utilize roughly 20 percent of their leasable space for kitchen usage. However, restaurant tenants in airports vary widely depending on the restaurant type. Counter service restaurants will typically utilize 50 percent or more of their leasable space as kitchens. Table service restaurants will utilize closer to 10% of their leasable space as kitchens. Using the average of the parameters above, we can attempt to reasonably estimate the existing gas service for the passenger terminal building:

- 9,725 SF x .30 (conservative estimated of % of kitchen space) = 2,917.5 SF
- 2,917.5 SF (Dedicated to Kitchen) x 1.4 CFH/SF = 4,084 CFH

Using the formula established above, the estimated existing gas demand for terminal concessions is 4,048 CFH which is approximately 31% of the existing capacity.

Using the same methodology we can analyze future gas demand based on the proposed expansion of concessions spaces shown below. It should be noted that the only expansions that are planned are to airside concession facilities.

- **PAL 1** – 2028 Additional Concession Square Footage: 0 sq. ft.
- **PAL 2** – 2033 Additional Concession Square Footage: 2,335 sq. ft.
- **PAL 3** – 2038 Additional Concession Square Footage: 2,905 sq. ft.
- **PAL 4** – 2043 Additional Concession Square Footage: 3,515 sq. ft.

No additional concession space is shown in PAL 1. If 2,335 sq. ft. of concession is space is added by PAL 2, gas demand would increase as shown below:

- 2,335 SF x .30 = 700 SF (Dedicated to Kitchen)
- 700 SF (Dedicated to Kitchen) x 1.4 CFH/SF = 980 CFH

If 2,905 sq. ft. of concession is space is added by PAL 3, gas demand would increase as shown below:

- 2,905 SF x .30 = 871.5 SF (Dedicated to Kitchen)
- 871.5 SF (Dedicated to Kitchen) x 1.4 CFH/SF = 1,220 CFH

If 3,515 sq. ft. of concession is space is added by PAL 4, gas demand would increase as shown below:

- 3,515 SF x .30 = 1,054.5 SF (Dedicated to Kitchen)
- 1,370.8 SF (Dedicated to Kitchen) x 1.4 CFH/SF = 1,919.1 CFH

Based on the analysis, the existing gas service is expected to be sufficient until PAL 2. Additional gas service may be required in PAL 2 and beyond. The gas distribution shown on sheet P13.06C of the terminal renovation project (FAA AIP 3-48-0051-28-00) shows the distribution pressure of the existing gas line at 5 psi. It is expected that the existing gas line is already at its maximum pressure. Consequently, a new gas line may be needed to support future gas demand. A single new utility meter, with 5-psi regulator and meter bank should be able to supply the expected future gas demand.

AIR CARGO REQUIREMENTS

CCIA is currently served by small feeder air cargo services with only direct load and unload on the ramp. Future requirements could include the development of a dedicated air cargo facility, especially if the facility will serve aircraft such as the Boeing 757. Some airports have still only had on-apron loading and unloading with such large jet aircraft, however, this analysis will consider the needs of a building if necessary. The primary future cargo-related facilities requiring analysis include the cargo apron, sort building space, and landside staging area (delivery truck and vehicle parking).

Estimates of the appropriate size of an air cargo sort facility are based upon national industry standards and range between 1.0 and 2.5 square feet per total tonnage shipped. Generally, 1.0 square foot per ton typically indicates that the facility is more efficiently utilized, and 2.0 square feet per ton typically indicates that the facility has some capacity for near-term growth. Future space requirements were calculated by multiplying the projected tons shipped and received by a 1.25 utilization rate. Based upon this space calculation, the building will need to be approximately 10,000 square feet by the long-term to meet industry utilization standards. **Table 3VV** presents future air cargo facility requirements.

Table 3VV | Air Cargo Requirements

	Current	Short Term	Intermediate Term	Long Term
Total Cargo (tons)	489	5,250	6,113	7,887
Air Cargo Building (sf)	-	6,560	7,640	9,860
Truck Dock Positions	-	4	4	5
Truck Staging/Parking (sf)	-	2,190	3,060	4,930
Air Cargo Positions	-	1	1	2
Total Cargo Apron (sy)	-	5,300	5,300	10,600
Ground Support Equipment Space (sy)	-	1,640	1,910	2,470

Truck dock requirements are based on a planning factor of 0.3 truck docks per 1,000 square feet of building space. Five dock positions are projected for the long term. Truck parking and staging national average is approximately one-third of the building size. Because the nature of air cargo is changing to include a larger percentage of truck deliveries, future estimates for staging and parking utilize the 48 percent factor as shown reaching approximately 5,000 square feet by the long term.

The cargo apron area requirements are based on the current and projected aircraft type to be utilized in air cargo service at the Corpus Christi International Airport. As presented in the Forecasts chapter, total tons shipped are forecast to grow to just under 8,000 tons annually. As projected, a Boeing 757 could be utilized by FedEx (or similar large jets). Future cargo apron requirements are primarily based on the type and number of aircraft utilizing the ramp. The apron should also provide for circulation and access lanes for active GSE. At CCIA, future cargo apron requirements are estimated at 10,600 square yards. These calculations include space for active ground service equipment and circulation, which includes the access taxilane and space for the one large jet and other turboprops to pull out without the need for a push-back.

Air cargo activities require extensive ground service equipment including cargo lifters, moveable stairs, cargo containers, tug vehicles, and container movement vehicles. While some of this equipment is parked in the vicinity of the aircraft, most is stored to the sides of the cargo building. Following national trends, the space requirements for GSE storage space is estimated at 25 percent of the air cargo building size.

GENERAL AVIATION FACILITIES

General aviation facilities are those necessary to accommodate airport activity by all aviation segments except commercial passenger service. This includes recreational flying, business aviation, charter, military, and some portions of air cargo and air ambulance activity. These airport users require a variety of services, such as fueling, terminal services, maintenance, and aircraft storage. The primary components considered for general aviation needs include:

- Aircraft Hangars
- Aircraft Parking Aprons
- General Aviation Terminal Building Services
- Auto Parking and Access

The future need for each of these components has been analyzed based on the aviation demand forecasts.

AIRCRAFT HANGARS

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

The demand for aircraft storage hangars is dependent upon the number and type of aircraft expected to be based at an airport in the future; however, hangar construction should be based upon actual demand trends and financial investment conditions. While a majority of aircraft owners prefer enclosed aircraft storage, a number of based aircraft owners may still tie-down outside due to the lack of hangar availability, hangar rental rates, and/or operational needs.

Hangar requirements are general in nature and are based on standard hangar size estimates and typical user preferences. If a private developer desires to construct or lease a large hangar to house one plane, any extra space in that hangar may not be available for other aircraft. The actual hangar area needs will be dependent on the usage within each hangar. All current general aviation aircraft hangars are privately owned and maintained. The same will be true of future hangar facilities. Private developers, under land lease agreement with CCIA, will build to suit and offer the most practical and demand based/proven method to meet hangar demand in a timely manner.

Existing space currently meets demand while additional space is needed to meet based aircraft storage needs in the future. The hangars will likely fall into either corporate/executive (less than 10,000 square feet) and/or conventional (more than 10,000 square feet) hangar facilities as demand dictates. Areas for this type of development will be outlined in the following chapter.

AIRCRAFT PARKING APRONS

A general aviation aircraft apron is an expanse of paved area intended for aircraft parking and circulation. Typically, a main apron is centrally located near the airside entry point, such as the general aviation terminal building or FBO facility. Ideally, the main apron is large enough to accommodate transient airport users, as well as a portion of locally based aircraft. Often, smaller aprons are available adjacent to FBO hangars, aviation businesses, and at other locations around an airport. An aircraft parking apron should provide space for the number of locally based aircraft that are not stored in hangars, transient aircraft, maintenance activity, and circulation. The general aviation apron layout at CCIA follows this typical pattern.

The general aviation apron space consists of several distinct apron areas, all northwest and north of the passenger terminal building. FAA AC 150/5300-13A, *Airport Design*, suggests a methodology by which transient apron requirements can be determined from knowledge of busy-day operations. The current apron areas appear to be adequate for existing and long-term demand and should be enlarged only as new hangar facilities are built.

GENERAL AVIATION TERMINAL BUILDING FACILITIES

The general aviation terminal facilities at the Corpus Christi International Airport are often the first impression of the community that corporate officials and other visitors will encounter. General aviation terminal facilities at an airport provide space for passenger waiting, pilots' lounge, pilot flight planning, concessions, management, storage, and various other needs. This space is not necessarily limited to a single, separate terminal building, but can include space offered by fixed base operators (FBOs) and other specialty operators for these functions and services. This is the case at the CCIA, as general aviation terminal space is currently provided by both airport FBOs. The commercial passenger terminal building also provides additional elements, such as restaurants and concessions and, if the itinerant passengers choose, to shuttle over to the terminal for those services.

AUTO PARKING AND ACCESS

General aviation parking needs are attributable to transient airport users (visitors and employees), locally based users, and aviation businesses. Locally based users primarily include those attending to their based aircraft. Airport businesses need parking to accommodate employees and customers. (Airport business parking needs should be based on the needs of the individual business and are not specifically included in this analysis.) The current parking associated with the FBOs appears to be sufficient to meet demand and can be enlarged if demand dictates or new facilities are developed.

AIRPORT SUPPORT REQUIREMENTS

Various facilities that do not logically fall within classifications of airside or landside facilities have also been identified. These other areas provide certain support functions related to the overall operation of the airport.

AIRCRAFT RESCUE AND FIREFIGHTING (ARFF) FACILITIES

Part 139 commercial service airports are required to provide ARFF services and must meet the level commiserate with the level of commercial services provided. Each certificated airport is required to maintain equipment and personnel based on an ARFF Index established according to the length of aircraft and scheduled daily flight frequency. There are five indices, A through E, with A applicable to the smallest aircraft and E the largest aircraft. The Corpus Christi International Airport falls within ARFF Index B, based on an average of five or more scheduled departures per day by large air carrier aircraft with a length between 90-126 feet (i.e., Boeing 737). **Table 3WW** presents the vehicle requirements and capacities for each index level.

TABLE 3WW | ARFF Index Requirements

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

AFFF: Aqueous Film-Forming Foam
ARFF: Aircraft Rescue and Firefighting

Source: 14 CFR Part 139

CCIA meets ARFF standards required by the aircraft utilizing the facilities at the Corpus Christi International Airport under ARFF Index B. The ARFF Index applicable to the Corpus Christi International Airport is anticipated to increase to ARFF Index C which would require modifications to number of vehicles and specific storage capacities. These changes would only be required if and when a larger aircraft such at the Boeing 757 were utilized for cargo operations. Moreover, when any rescue vehicle approaches the end of their useful life, they should be replaced in a timely manner.

AIRPORT MAINTENANCE FACILITIES

The maintenance building is a single story 11,7000-square-foot facility with 3 large drive through maintenance bays, workshop, office, breakroom, restrooms, and storage spaces. This facility appears to be sufficient for current needs and should be improved to meet any future changing requirements and/or needs.

FUEL STORAGE

As discussed in Chapter One – Inventory, fuel sales and delivery to aircraft is managed by the two fixed base operators (FBOs). Additional fuel storage capacity should be planned when the Corpus Christi International Airport is unable to maintain an adequate supply and reserve. While each fuel retailer determines their own desired reserve, a 14-day reserve is common for AvGas fuel and a seven-day supply is common for Jet A. When additional capacity is needed, it should be planned in 10,000- to 12,000-gallon increments, which can accommodate common fuel tanker trucks that typically have an 8,000-gallon capacity. Fuel storage requirements can vary based upon individual supplier and distributor policies. For this reason, fuel storage requirements will be dependent upon the individual distributors.

PERIMETER FENCING

Perimeter fencing is used at airports primarily to secure the aircraft operational area. The physical barrier of perimeter fencing provides the following functions:

- Gives notice of the legal boundary of the outermost limits of a facility or security-sensitive area.
- Assists in controlling and screening authorized entries into a secured area by deterring entry elsewhere along the boundary.
- Supports surveillance, detection, assessment, and other security functions by providing a zone for installing intrusion-detection equipment and closed-circuit television (CCTV).
- Deters casual intruders from penetrating a secured area by presenting a barrier that requires an overt action to enter.
- Demonstrates the intent of an intruder by their overt action of gaining entry.
- Causes a delay to obtain access to a facility, thereby increasing the possibility of detection.
- Creates a psychological deterrent.
- Optimizes the use of security personnel while enhancing the capabilities for detection and apprehension of unauthorized individuals.
- Demonstrates a corporate concern for facility security.
- Limits inadvertent access to the aircraft operations area by wildlife.

The Corpus Christi International Airport is served by perimeter fencing that meets standards for Part 139 airports. The fencing serves to provide both operational security as well as a deterrent to wildlife accessing the airfield movement areas. The fencing should be maintained through the planning period.

SUMMARY

This chapter has outlined the facilities required to meet potential aviation demands projected for the Corpus Christi International Airport for the next 20 years. The next chapter, Chapter Four - Alternatives, examines potential improvements to the airport to alleviate any identified deficiencies found in this chapter. Most of the discussion focuses on those capital improvements that would be eligible for federal grant funds. Other projects of local concern are also presented on a limited basis. Several facility layouts that meet the forecast demands over the next 20 years are presented in Chapter Four, and an overall ALP that presents a long-term vision will ultimately be developed in later chapters.