Facility Requirements

Proper airport planning requires the translation of forecast aviation demand into the specific types and quantities of facilities that can adequately serve the identified demand. This chapter will analyze the existing capacities of Mesquite Metro Airport (HQZ) facilities. The existing capacities will then be compared to the forecast activity levels prepared in Chapter Two to determine the adequacy of existing facilities and to identify if deficiencies currently exist or may be expected to materialize in the future. This chapter will present the following elements:

- Planning Horizon Activity Levels
- Airfield Capacity
- Airport Physical Planning Criteria
- Airside and Landside Facility Requirements

The objective of this effort is to identify – in general terms – the adequacy of existing airport facilities, outline what new facilities may be needed, and determine when these may be needed to accommodate forecast demands. Having established these facility requirements, alternatives for providing these facilities will be evaluated to determine the most practical, cost-effective, and efficient means for implementation.

The facility requirements for HQZ were evaluated using guidance contained in several Federal Aviation Administration (FAA) publications, including the following:

- Advisory Circular (AC) 150/5300-13B, *Airport Design*
- AC 150/5060-5, *Airport Capacity and Delay*
- AC 150/5325-4B, *Runway Length Requirements for Airport Design*
- Federal Aviation Regulation (FAR) Part 77, *Objects Affecting Navigable Airspace*
- FAA Order 5090.5, *Field Formulation of the National Plan of Integrated Airport Systems* (NPIAS) *and the Airports Capital Improvement Plan* (ACIP)

DEMAND-BASED PLANNING HORIZONS

An updated set of aviation demand forecasts for HQZ has been established and was detailed in Chapter Two. These activity forecasts include annual aircraft operations, based aircraft, aircraft fleet mix, and peaking characteristics. 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 upon actual demand at an airport 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 which takes into consideration the reasonable range of aviation demand projections. The planning horizons are the short term (years 1-5), the intermediate term (years 6-10), and the long term (years 11-20).

It is important to consider that the 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 by allowing airport management the flexibility to make decisions and develop facilities based on need 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. **Table 3A** presents the short-, intermediate-, and long-term planning horizon milestones for each aircraft activity level forecasted in Chapter Two.

TABLE 3A | Aviation Demand Planning Horizons

	Base Year (2023)	Short Term (1-5 Years)	Intermediate Term (6-10 Years)	Long Term (11-20 Years)
BASED AIRCRAFT				
Single-Engine	147	159	170	193
Multi-Engine	16	14	10	8
Turboprop	7	8	11	14
Jet	10	12	15	22
Helicopter	1	2	2	4
Total Based Aircraft	**181**	**194**	**209**	**241**
ANNUAL OPERATIONS				
Itinerant				
Air Carrier	2	-	-	-
Air Taxi	1,124	1,400	1,700	2,600
General Aviation	25,985	29,700	31,600	35,700
Military	73	95	95	95
Total Itinerant	27,184	31,195	33,395	38,395
Local				
General Aviation	82,375	86,700	94,500	115,500
Military	58	186	186	186
Total Local	82,433	86,886	94,686	115,686
Total Operations	**109,617**	**118,081**	**128,081**	**154,081**

Source: Coffman Associates analysis

AIRFIELD CAPACITY

An airport's airfield capacity is expressed in terms of its annual service volume (ASV). ASV is a reasonable estimate of the maximum level of aircraft operations that can be accommodated in a year without incurring significant delay factors. As aircraft operations near or surpass the ASV, delay factors increase exponentially. The airport's ASV was examined utilizing FAA AC 150/5060-5, *Airport Capacity and Delay*.

FACTORS AFFECTING ANNUAL SERVICE VOLUME

This analysis takes into account specific factors about the airfield in order to calculate the airport's ASV. These various factors are depicted in **Exhibit 3A**. The following describes the input factors as they relate to HQZ and include airfield layout, weather conditions, aircraft mix, and operations.

- **Runway Configuration –** The existing airfield configuration consists of a single runway supported by a full-length parallel taxiway. Runway 18-36 is 6,000 feet long and 100 feet wide.

- **Runway Use –** Runway use in capacity conditions is controlled by wind and/or airspace conditions. For HQZ, the direction of takeoffs and landings is typically determined by the speed and direction of the wind, or as directed by the airport traffic controller. It is generally safest for aircraft to take off and land into the wind, avoiding a crosswind (wind that is blowing perpendicular to the travel of the aircraft) or tailwind components during these operations. Wind conditions dictate the use of Runway 18 approximately 52 percent of the time, while Runway 36 is used approximately 27 percent of the time. Calm wind conditions are present approximately 21 percent of the time.

- **Exit Taxiways –** Exit taxiways have a significant impact on airfield capacity because the number and location of exits directly determine the occupancy time of an aircraft on the runway. The airfield capacity analysis gives credit to taxiway exits located within the prescribed range from a runway's threshold. This range is based on the mix index of the aircraft that use the runways. Based on mix, only exit taxiways between 2,000 feet and 4,000 feet from the landing threshold count in the exit rating at HQZ. The exits must be at least 750 feet apart to count as separate exit taxiways. Utilizing these criteria, Runway 18-36 is credited with two exit taxiways in each direction.

- **Weather Conditions –** Weather conditions can have a significant impact on airfield capacity. Airport capacity is usually highest in clear weather when flight visibility is at its best. Airfield capacity is diminished as weather conditions deteriorate and cloud ceilings and visibility are reduced. As weather conditions deteriorate, the spacing of aircraft must increase to provide allowable margins of safety and air traffic vectoring. The increased distance between aircraft reduces the number of aircraft that can operate at the airport during any given period, thus reducing overall airfield capacity.

AIRFIELD LAYOUT

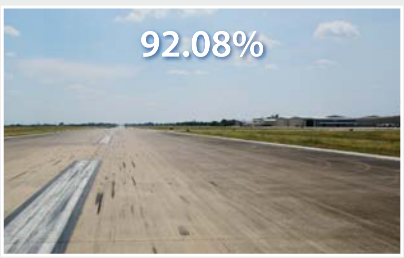
Runway Configuration

Runway Use

Number of Exits

WEATHER CONDITIONS

VMC (VFR)
Visual Meteorological Conditions



IMC (IFR)
Instrument Meteorological Conditions

PVC
Poor Visibility Conditions

AIRCRAFT MIX

Category A & B Aircraft

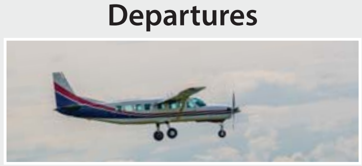
Category C Aircraft

Category D Aircraft

OPERATIONS

Arrivals

Departures



Touch-and-Go Operations

Total Annual Operations

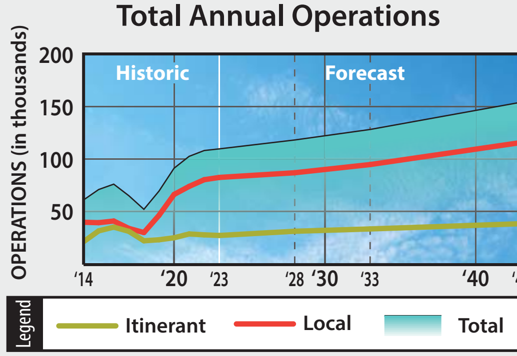


Exhibit 3A
AIRFIELD CAPACITY FACTORS

According to local meteorological data, the airport operates under visual meteorological conditions (VMC) approximately 92 percent of the time. VMC exist whenever the cloud ceiling is greater than 1,000 feet above ground level (AGL) and visibility is greater than three statute miles. Instrument meteorological conditions (IMC) are defined when cloud ceilings are between 500 and 1,000 feet AGL or visibility is between one and three miles. Poor visibility conditions (PVC) apply for cloud ceilings below 500 feet and visibility minimums below one mile. **Table 3B** summarizes the weather conditions experienced at the airport over a 10-year period of time.

TABLE 3B | Weather Conditions

Condition	Cloud Ceiling	Visibility	Percent of Total
VMC	≥ 1,000' AGL	> 3 statute miles	92.08%
IMC	≥ 500' AGL to < 1,000' AGL	1-3 statute miles	4.79%
PVC	< 500' AGL	< 1 statute mile	2.41%

VMC = visual meteorological conditions
IMC = instrument meteorological conditions
PVC = poor visibility conditions
AGL = above ground level

Source: HQZ Weather Station, All Weather Observations from January 1, 2013, through December 31, 2022

- **Aircraft Mix –** The aircraft mix for the capacity analysis is defined in terms of four aircraft classifications. Classes A and B consist of small- and medium-sized propeller and some jet aircraft, all weighing 12,500 pounds or less. These aircraft are associated primarily with general aviation activity, but do include some air taxi, air cargo, and commuter aircraft. Class C consists of aircraft weighing between 12,500 pounds and 300,000 pounds. These aircraft include most business jets and some turboprop aircraft that utilize the airport on a regular basis. Class D aircraft consist of aircraft weighing more than 300,000 pounds.

  Most operations at HQZ are by aircraft in Classes A, B, and C. According to the FAA's Traffic Flow Management System Counts (TFMSC) data for 2023, there were approximately 310 total operations by Class C aircraft at HQZ, which represents approximately 0.3 percent of all operations, while Class D aircraft did not conduct any operations in 2023. The remaining operations are within Classes A and B, which represent 99.7 percent of total operations. It is anticipated that operations by Class C aircraft will represent 10 percent or less of total operations by 2043.

- **Percent Arrivals –** The percentage of arrivals as they relate to total operations of the airport is important in determining airfield capacity. Under most circumstances, the lower the percentage of arrivals, the higher the hourly capacity will be. The aircraft arrival-departure percentage split is typically 50/50, which is the case at HQZ.

- **Touch-and-Go Activity –** A touch-and-go operation involves an aircraft making a landing and then an immediate takeoff without coming to a full stop or exiting the runway. As previously discussed in Chapter Two, these operations are normally associated with general aviation training activity and classified as local operations. A high percentage of touch-and-go traffic normally results in a higher operational capacity because one landing and takeoff occurs within a shorter time period than an individual operation. Touch-and-go operations at HQZ accounted for 75 percent of total annual operations in 2023. This percentage is anticipated to remain constant or increase slightly throughout the planning horizon, as flight training activities are expected to represent a large portion of operations through the long term.

- **Peak Period Operations –** Average daily operations and average peak hour operations during the peak month are utilized for the airfield capacity analysis. Operations activity is important in the calculation of an airport's ASV, as peak demand levels occur sporadically. The peak periods used in the capacity analysis are representative of normal operational activity and can be exceeded at various times throughout the year.

CAPACITY ANALYSIS CONCLUSION

Given the factors outlined above, the airfield's ASV will range between 200,000 and 230,000 annual operations. The ASV does not indicate a point of absolute gridlock for the airfield; however, it does represent the point at which operational delay for each aircraft operation will increase exponentially.

It is estimated that HQZ experienced approximately 109,617 annual operations in 2023. This operational level for the airport represents approximately 48 percent of the airfield's ASV if the ASV is considered at the high end of the typical range of 230,000 annual operations. By the end of the long-term planning period, total annual operations are expected to represent 67 percent of the airfield's ASV.

FAA Order 5090.3C, *Field Formulation of the National Plan of Integrated Airport Systems*, indicates that improvements for airfield capacity purposes should be considered when operations reach 60 to 75 percent of the ASV. This is an approximate level to begin the detailed planning of capacity improvements. When 80 percent of the ASV is reached, capacity improvement projects should become higher priority capital improvements. According to this analysis, operations levels at HQZ will reach approximately 67 percent of the ASV by the long-term planning period. That level does not warrant significant capacity improvements; however, options to improve airfield efficiency, such as additional exit taxiways, will still be considered as part of this master plan.

AIRSIDE FACILITY REQUIREMENTS

Airside facilities include those facilities related to the arrival, departure, and ground movement of aircraft. Airside facility requirements are based primarily on the runway design code (RDC) for each runway. Analysis in Chapter Two identified the existing RDC for Runway 18-36 as B-II-4000 and the ultimate RDC as C-II-4000.

RUNWAYS

Runway conditions – such as orientation, length, width, and pavement strength – were analyzed at HQZ. From this information, requirements for runway improvements were determined for the airport.

Runway Orientation

Key considerations in the runway configuration of an airport involve the orientation for wind coverage and the operational capacity of the runway system. FAA AC 150/5300-13B, *Airport Design*, recommends that a crosswind runway should be made available when the primary runway orientation provides less than 95 percent wind coverage for any aircraft forecast to use the airport on a regular basis.

The 95 percent wind coverage is computed on the basis of the crosswind component not exceeding 10.5 knots (12 miles per hour [mph]) for airport reference code (ARC) A-I and B-I; 13 knots (15 mph) for ARC A-II and B-II; 16 knots (18 mph) for ARC A-III, B-III, and C-I through D-II; and 20 knots (23 mph) for ARC C-III through D-IV.

Exhibit 3B presents the all-weather wind rose for the airport. Wind data[1] for the previous 10 years were obtained from the on-airport automated weather observation station (AWOS) and have been analyzed to identify wind coverage provided by the existing runway orientations. At HQZ, the orientation of the runways provides 97.78 percent coverage for the 10.5-knot component, 98.93 percent coverage for 13 knots, and greater than 99 percent coverage for 16- and 20-knot components. The instrument flight rule (IFR) wind rose, presented on the back side of **Exhibit 3B**, shows a similar distribution of crosswind components for Runway 18-36; thus, the current runway orientation at HQZ provides adequate wind coverage for all-weather and IFR conditions.

Runway Length

AC 150/5325-4B, *Runway Length Requirements for Airport Design*, provides guidance for determining runway length needs. A draft revision of this AC is currently available (150/5325-4C) and the FAA is utilizing the draft revision in most cases when evaluating runway length needs for airports.

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

- Mean maximum temperature of the hottest month
- Airport elevation
- Runway gradient
- Critical aircraft type expected to use the runway
- Stage length of the longest nonstop destination (specific to larger aircraft)

The mean maximum daily temperature of the hottest month for HQZ is 97.1 degrees Fahrenheit (°F), which occurs in August. The airport elevation is 446 feet mean sea level (MSL). Runway 18-36 has a gradient of 0.07 percent, which conforms to FAA design standards for gradient.

Airplanes operate on a wide variety of available runway lengths. Many factors govern the suitability of runway lengths for aircraft, such as elevation, temperature, wind, aircraft weight, wing flap settings,

[1] 160,393 observations were collected for the period from January 1, 2014, through December 31, 2023.

runway condition (wet or dry), runway gradient, vicinity airspace obstructions, and any special operating procedures. Airport operators can pursue policies that maximize the sustainability of the runway length. Policies such as area zoning and height and hazard restricting can protect an airport's runway length. Airport ownership (fee simple or easement) of land leading to the runway ends reduces the possibility of natural growth or manmade obstructions. Planning of runways should include an evaluation of aircraft types expected to use the airport now and in the future. Future planning should be realistic and supported by the FAA-approved forecasts and should be based on the critical design aircraft (or family of aircraft).

General Aviation Aircraft

Most operations occurring at HQZ are conducted using smaller general aviation (GA) aircraft weighing less than 12,500 pounds. Following guidance from AC 150/ 5325-4B, to accommodate 95 percent of these small aircraft with less than 10 passenger seats, a runway length of 3,300 feet is recommended. For 100 percent of these small aircraft, a runway length of 3,900 feet is recommended. For small aircraft with 10 or more passenger seats, 4,400 feet of runway length is recommended.

The airport is also utilized by aircraft weighing more than 12,500 pounds, including small- to medium-sized business jet aircraft. Runway length requirements for business jets weighing less than 60,000 pounds have also been calculated. These calculations take into consideration the runway gradient and landing length requirements for contaminated (wet) runways. Business jets tend to need greater runway length when landing on a wet surface because of their increased approach speeds. AC 150/5325-4B stipulates that runway length determination for business jets consider a grouping of airplanes with similar operating characteristics. The AC provides two separate family groupings of airplanes, each of which is based on its representative percentage of aircraft in the national fleet. The first grouping is those business jets that make up 75 percent of the national fleet, and the second group is those that make up 100 percent of the national fleet. **Table 3C** presents a partial list of common aircraft in each aircraft grouping. A third group considers business jets weighing more than 60,000 pounds. Runway length determination for these aircraft must be based on the performance characteristics of the individual aircraft.

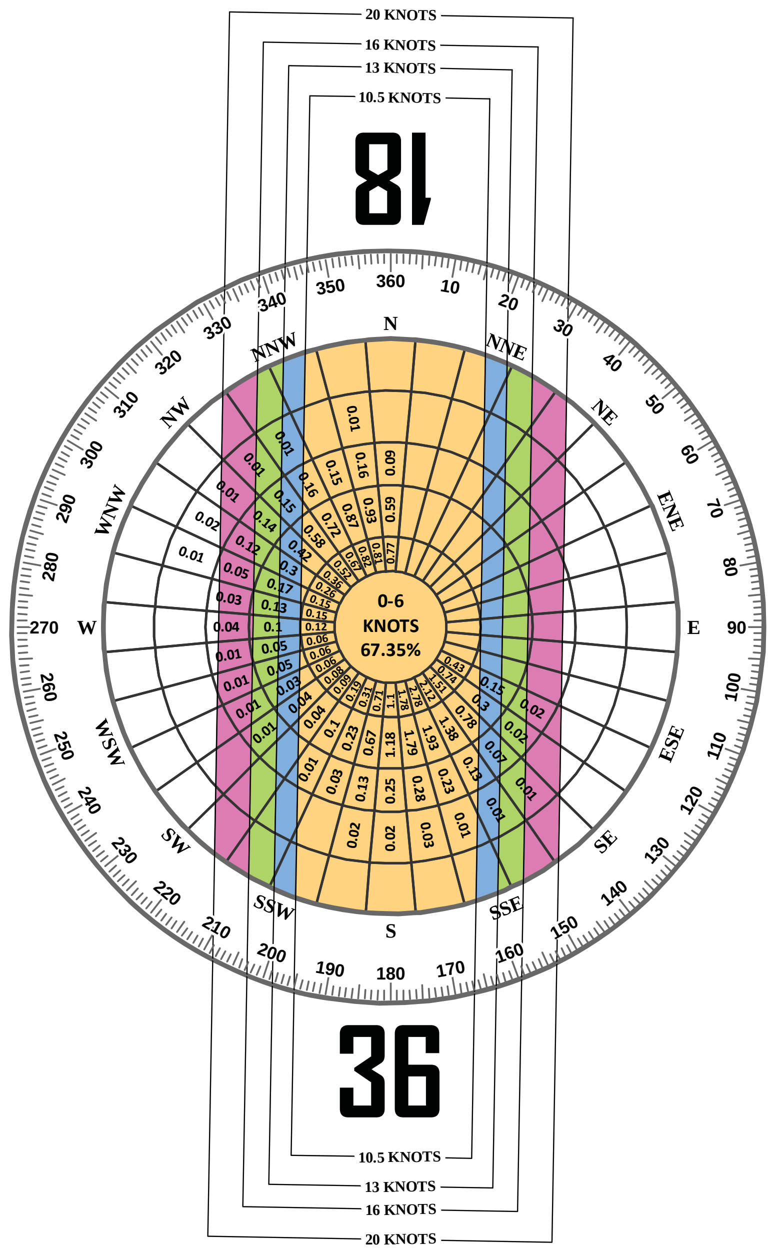
TABLE 3C | Business Jet Categories for Runway Length Determination

75 Percent of the National Fleet	MTOW (lbs.)	75-100 Percent of the National Fleet	MTOW (lbs.)	Greater than 60,000 Pounds	MTOW (lbs.)
Lear 35	20,350	Lear 55	21,500	Gulfstream II	65,500
Lear 45	20,500	Lear 60	23,500	Gulfstream IV	73,200
Cessna 550	14,100	Hawker 800XP	28,000	Gulfstream V	90,500
Cessna 560XL	20,000	Hawker 1000	31,000	Global Express	98,000
Cessna 650 (VII)	22,000	Cessna 650 (III/IV)	22,000	Gulfstream 650	99,600
IAI Westwind	23,500	Cessna 750 (X)	36,100		
Beechjet 400	15,800	Challenger 604	47,600		
Falcon 50	18,500	IAI Astra	23,500		

MTOW = maximum takeoff weight

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

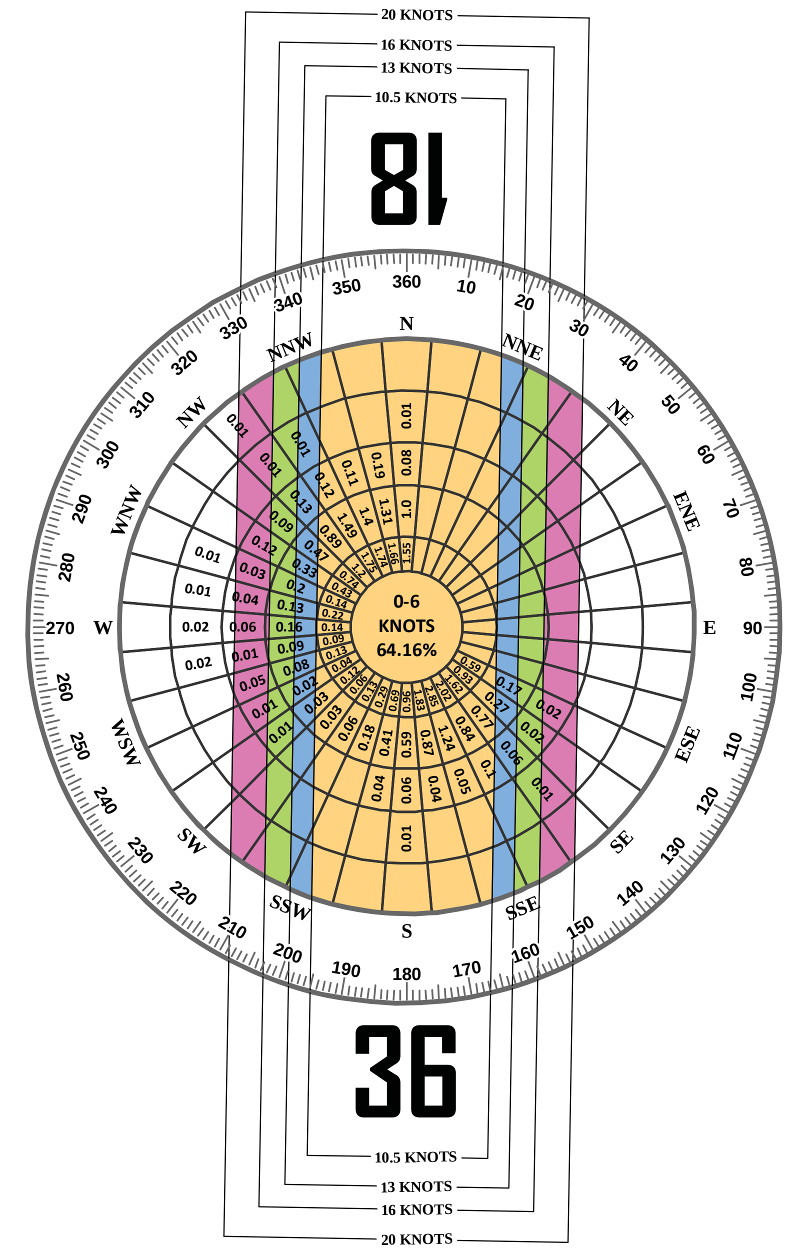
ALL WEATHER WIND COVERAGE				
Runways	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 18-36	97.78%	98.93%	99.65%	99.92%



SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
Mesquite Metro Airport
Mesquite, Texas

OBSERVATIONS:
160,393 All Weather Observations
Jan. 1, 2014 - Dec, 31 2023

IFR WIND COVERAGE				
Runways	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 18-36	97.68%	98.86%	99.65%	99.92%



SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
Mesquite Metro Airport
Mesquite, Texas

OBSERVATIONS:
12,869 IFR Observations
Jan. 1, 2014 - Dec, 31 2023

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Table 3D presents the results of the runway length analysis for business jets developed following the guidance provided in AC 150/5325-4B. To accommodate 75 percent of the business jet fleet at 60 percent useful load, a runway length of 5,500 feet is recommended. This length is derived from a raw length of 4,828 feet that is adjusted, as recommended, for runway gradient and consideration of landing length needs on a contaminated (wet and slippery) runway. To accommodate 100 percent of the business jet fleet at 60 percent useful load, a runway length of 6,000 feet is recommended.

TABLE 3D | Runway Length Requirements

Airport Elevation	446 feet MSL
Average High Monthly Temperature	97.1°F (August)
Primary Runway End Elevation Difference	4.1'

Fleet Mix Category	TAKEOFF LENGTHS		LANDING LENGTHS	Final Runway Length
	Raw Runway Length from FAA AC	Runway Length with Gradient Adjustment (+41')	Wet Surface Landing Length for Jets (+15%)*	
75% of fleet at 60% useful load	4,828'	4,869'	5,500'	5,500'
100% of fleet at 60% useful load	5,893'	5,934'	5,500'	6,000'
75% of fleet at 90% useful load	7,246'	7,287'	7,000'	7,300'
100% of fleet at 90% useful load	9,555'	9,596'	7,000'	9,600'

*Max 5,500' for 60% useful load and max 7,000' for 90% useful load in wet condition.

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

Utilization of the 90 percent category for runway length determination is generally not considered by the FAA unless there is a demonstrated need at an airport. This could be documented activity by a business jet operator that flies out frequently with heavy loads. To accommodate 75 percent of the business jet fleet at 90 percent useful load, a runway length of 7,300 feet is recommended. To accommodate 100 percent of business jets at 90 percent useful load, a runway length of 9,600 feet is recommended.

Another method to determine runway length requirements for aircraft at HQZ is to examine aircraft flight planning manuals under conditions specific to the airport. Several aircraft were analyzed for takeoff length requirements at a design temperature of 97.1°F at a field elevation of 446 feet MSL. **Table 3E** 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.

The analysis shows that the current length of 6,000 feet available on Runway 18-36 is adequate for nearly all business jet takeoffs up to 80 percent useful load. Aircraft included in the analysis that cannot take off at 80 percent useful load fall within the airplane design group (ADG) of C-I or C-II. At 90 percent useful load, nine aircraft become weight-restricted, and progressively fewer jet turbine aircraft can operate on the available runway as the useful load increases.

TABLE 3E | Business Aircraft Takeoff Length Requirements – Runway 18-36

		TAKEOFF LENGTH REQUIREMENTS (FEET)				
		Useful Load				
Aircraft Name	MTOW (lbs.)	60%	70%	80%	90%	100%
Pilatus PC-12	9,921	2,069	2,236	2,411	2,595	2,786
Citation CJ3	13,870	2,909	3,118	3,347	3,590	3,855
Citation Sovereign	30,300	3,341	3,415	3,580	3,617	4,074
Citation (525A) CJ2	12,375	3,194	3,431	3,699	3,964	4,247
King Air 350	15,000	3,486	3,632	3,788	4,037	4,348
Citation 560 XLS	20,200	3,367	3,624	3,893	4,187	4,492
Citation II (550)	13,300	3,125	3,441	3,776	4,128	4,499
Citation Encore Plus	16,830	3,095	3,411	3,746	4,113	4,515
Citation Bravo	14,800	3,401	3,657	3,942	4,271	4,635
Citation (525) CJ1	10,600	3,345	3,764	4,182	4,593	5,013
Citation III	21,500	4,351	4,772	5,225	5,710	5,712
Hawker 4000	39,500	4,250	4,604	4,984	5,389	5,878
Hawker 800XP	28,000	4,444	4,846	5,318	5,832	5,899
Citation VII	23,000	4,552	4,868	5,207	5,582	5,916
Lear 40	21,000	4,148	4,517	4,937	5,437	6,044
Challenger 300	38,850	4,385	4,800	5,230	5,680	6,149
Falcon 900EXA	49,200	4,250	4,710	5,230	5,780	6,330
Citation X	35,700	4,478	4,872	5,337	5,844	6,362
Global 5000	92,500	4,355	4,837	5,342	5,871	6,423
Falcon 2000B	35,800	4,748	5,140	5,516	5,960	6,467
Falcon 7X	70,000	4,399	4,871	5,381	5,929	6,512
Gulfstream 450	74,600	4,496	4,941	5,442	5,975	6,557
Hawker 1000	31,000	5,330	5,960	6,570	6,909	6,909
Challenger 604/605	48,200	4,853	5,326	5,866	6,451	7,055
Global XRS	98,000	4,730	5,292	5,883	6,503	7,153
Gulfstream 650	99,600	4,912	5,404	5,963	6,602	7,339
Lear 60	23,500	5,213	5,664	6,163	6,724	7,350
Embraer 135	49,604	5,284	5,871	6,279	6,680	7,380
Gulfstream 550	91,000	4,630	5,295	5,958	6,678	7,441
Lear 55	21,500	5,387	5,985	6,635	7,338	8,096
Gulfstream 200	35,450	5,418	6,063	6,771	7,534	8,377

Green figures are less than or equal to the length of the primary runway at HQZ; red figures are greater than the length of the primary runway at HQZ.
Runway length calculation assumptions: 446 MSL field elevation; 97.1°F ambient temperature; 0.07% runway grade.
MTOW = maximum takeoff weight
Source: Ultranav software

Table 3F presents 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 operators to land at the destination airport within 60 percent of the effective runway length. An additional rule allows operators to land within 80 percent of the effective runway length if the operator has an approved destination airport analysis in the airport's program operating manual. The landing length analysis conducted accounts for both scenarios.

TABLE 3F | Business Aircraft Landing Length Requirements – Runway 18-36

		LANDING LENGTH REQUIREMENTS (FEET)					
		Dry Runway Condition			Wet Runway Condition		
Aircraft Name	MLW (lbs.)	Part 25	80% Rule	60% Rule	Part 25	80% Rule	60% Rule
Pilatus PC-12	9,921	2,323	2,904	3,872	N/A	N/A	N/A
Citation II (550)	12,700	2,692	3,365	4,487	3,096	3,870	5,160
Citation 560 XLS	18,700	2,692	3,365	4,487	3,096	3,870	5,160
Citation X	31,800	2,708	3,385	4,513	3,105	3,881	5,175
Citation Bravo	13,500	2,836	3,545	4,727	3,261	4,076	5,435
Citation Encore Plus	15,200	2,948	3,685	4,913	3,390	4,238	5,650
Citation III	19,000	2,852	3,565	4,753	3,602	4,503	6,003
Citation Sovereign	27,100	2,855	3,569	4,758	3,619	4,524	6,032
Citation VII	20,000	3,153	3,941	5,255	3,626	4,533	6,043
Citation (525) CJ1	9,800	3,218	4,023	5,363	3,701	4,626	6,168
Citation (525A) CJ2	11,500	2,893	3,616	4,822	3,945	4,931	6,575
Citation CJ3	12,750	2,920	3,650	4,867	3,951	4,939	6,585
Challenger 300	33,750	3,538	4,423	5,897	4,069	5,086	6,782
Challenger 604/605	38,000	2,679	3,349	4,465	4,096	5,120	6,827
Embraer 135	40,785	3,003	3,754	5,005	4,104	5,130	6,840
Falcon 7X	62,400	3,144	3,930	5,240	4,241	5,301	7,068
Falcon 900EX	44,500	3,701	4,626	6,168	4,256	5,320	7,093
Falcon 2000	33,000	2,812	3,515	4,687	4,374	5,468	7,290
Gulfstream 200	30,000	3,019	3,774	5,032	4,584	5,730	7,640
Gulfstream 450	66,000	3,187	3,984	5,312	4,633	5,791	7,722
Gulfstream 550	75,300	3,642	4,553	6,070	4,899	6,124	8,165
Gulfstream 650	83,500	2,798	3,498	4,663	5,011	6,264	8,352
Global 5000	78,600	2,629	3,286	4,382	5,038	6,298	8,397
Global XRS	78,600	3,847	6,326	6,412	5,061	6,326	8,435
Hawker 800XP	23,350	3,782	4,728	6,303	5,370	6,713	8,950
Hawker 1000	25,000	3,366	4,208	5,610	5,386	6,733	8,977
Hawker 4000	33,500	3,427	4,284	5,712	5,392	6,740	8,987
King Air 350	15,000	3,289	4,111	5,482	5,583	6,979	9,305
Lear 40	19,200	3,572	4,465	5,953	5,605	7,006	9,342
Lear 55	18,000	2,446	3,058	4,077	5,912	7,390	9,853
Lear 60	19,500	4,176	5,220	6,960	6,056	7,570	10,093

Green figures are less than or equal to the length of the primary runway at HQZ; red figures are greater than the length of the primary runway at HQZ.
Runway length calculation assumptions: 446' MSL field elevation; 97.1°F ambient temperature; 0.07% runway grade.
MLW = maximum landing weight
N/A = not applicable; turboprop aircraft landing lengths are not adjusted for wet runway conditions.
Source: Ultranav software

The landing length analysis shows that all the aircraft examined operating under Part 25 can land on the available runway length at HQZ during dry and wet/contaminated runway conditions, with the exception of the Lear 60, which is an ARC C-I aircraft. The analysis for landing length shows that most of the business jets analyzed can be accommodated under Part 25, the 80 percent rule, and the 60 percent rule under dry runway conditions. When factoring in wet conditions, the landing length often increases, and many jet aircraft exceed the current runway length under the 80 and 60 percent rules.

As shown in **Tables 3E** and **3F**, the existing critical design aircraft (Cessna Citation CJ2+) can take off at 100 percent useful load on the current runway; however, the aircraft needs 6,600 feet of landing length under the 60 percent rule on a wet or contaminated runway. The ultimate critical design aircraft (Bombardier Challenger 300) needs approximately 6,200 feet of runway length to take off at MTOW and approximately 6,800 feet of landing length under the 60 percent rule on a contaminated or wet runway environment.

Runway Length Summary

Many factors are considered when determining appropriate runway length for safe and efficient operations of aircraft at HQZ. The airport should strive to accommodate business jets and turboprop aircraft to the greatest extent possible, as demand dictates. Runway 18-36 is currently 6,000 feet long and can accommodate most of these aircraft under moderate loading conditions, even during hot temperatures and at high percentage useful loads. At MTOW or 100 percent useful load, several aircraft do have runway length requirements that exceed the available length on Runway 18-36.

Justification for any runway extension to meet the needs of turbine aircraft would require regular use (500 annual itinerant operations), which is the minimum threshold required to obtain FAA grant funding assistance. The Cessna Citation CJ2+, the critical design aircraft, can operate at up to 100 percent useful load. Most aircraft currently using the runway at HQZ can do so without significant weight restrictions; however, as operations by larger business jets increase over time, an extension may become justified. The ultimate critical design aircraft, the Bombardier Challenger 300, is classified as an ARC C-II aircraft and is limited by runway length when taking off at 100 percent useful load, as well as landing under the 60 percent rule and wet runway conditions. As such, there is merit to examining extension options. Analysis in the next chapter will examine potential impacts of an extension to Runway 18-36 while considering appropriate safety design standards, which will be detailed later in this chapter.

Runway Width

Runway width design standards are primarily based on the critical aircraft but can also be influenced by the visibility minimums of published instrument approach procedures. For Runway 18-36, the existing RDC B-II-4000 design criteria stipulate a runway width of 75 feet. Under ultimate RDC C-II-4000, the design criteria specify a runway width of 100 feet; therefore, the existing width of 100 feet on Runway 18-36 should be maintained.

Pavement Strength

An important feature of airfield pavement is its ability to withstand repeated use by aircraft. The FAA reports the pavement strength for each runway at HQZ as follows:

	Single Wheel Loading (SWL)	Dual Wheel Loading (DWL)	Double Tandem (DT)	Dual Double Tandem (2D)
Runway 18-36	70,000	100,000	100,000	NA

The strength rating of a runway does not preclude aircraft weighing more than the published strength rating from using the runway. All federally obligated airports must remain open to the public, and it is typically up to the pilot of an aircraft to determine if a runway can support their aircraft safely. An airport sponsor cannot restrict an aircraft from using the runway simply because its weight exceeds the published strength rating. On the other hand, the airport sponsor has an obligation to properly maintain the runway and protect the useful life of the runway, typically for 20 years. The strength rating of a runway can change over time. Regular usage by heavier aircraft can decrease the strength rating, while periodic runway resurfacing can increase the strength rating.

The existing critical aircraft (Cessna Citation CJ2) has a MTOW of 12,375 pounds on dual wheel main landing gear (DWL). The airport is also regularly used by Beechcraft King Air 200 turboprop aircraft, which have a MTOW of 12,500 pounds on DWL. The ultimate critical aircraft (Challenger 300) has a MTOW of 38,850 pounds, also on DWL. The current runway strength rating on Runway 18-36 is adequate to accommodate the current and future users of the airport. As such, the airport should maintain the existing pavement strength rating throughout the long-term planning horizon.

Blast Pads

Runway blast pads provide resistance to jet blast erosion beyond runway ends. Under existing B-II and ultimate C-II design standards, blast pads are not a design requirement; however, the construction of blast pads could be considered if the airport experiences significant erosion of soil adjacent to the runway ends due to increased jet traffic. The recommended blast pad dimensions under existing and ultimate conditions are as follows:

- Existing RDC B-II-4000: 150’ long by 95’ wide
- Ultimate RDC C-II-4000: 150’ long by 120’ wide

Given that Runway 18-36 is already 100 feet wide, any blast pads constructed in the future should be built to RDC C-II-4000 standards. This will ensure that the blast pads are correctly sized for the existing runway width.

SAFETY AREA DESIGN STANDARDS

The FAA has established several imaginary surfaces to protect aircraft operational areas and keep them free from obstructions. These include the runway safety area (RSA), runway object free area (ROFA), runway obstacle free zone (ROFZ), and runway protection zone (RPZ).

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. RPZs should also be under airport ownership. An alternative to outright ownership of the RPZ is the purchase of avigation easements (acquiring control of designated airspace within the RPZ); another option is having sufficient land use control measures in place which ensure the RPZ remains free of incompatible development. The various airport safety areas are presented on **Exhibit 3C**. **Table 3G** presents the FAA design standards as they apply to the runway at HQZ.

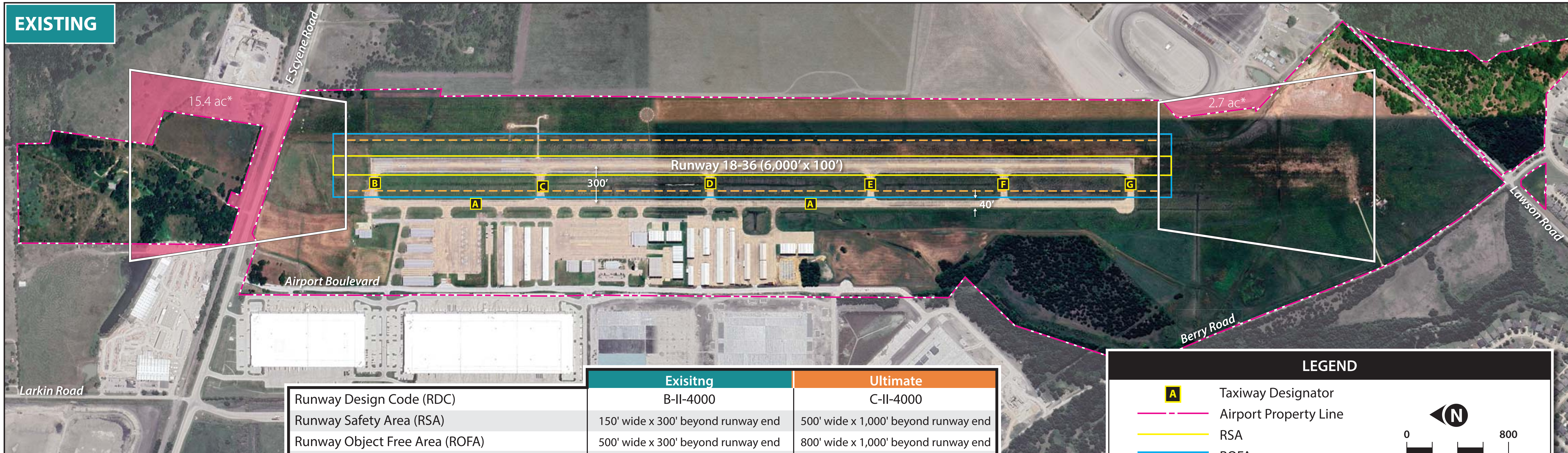
TABLE 3G | Runway Design Standards

	Runway 18-36 (Existing)	Runway 18-36 (Ultimate)
Runway Design Code	B-II-4000	C-II-4000
Visibility Minimums	¾-mile	¾-mile
RUNWAY DESIGN		
Runway Width	75	100
Blast Pad Length x Width	150 x 95	150 x 120
RUNWAY PROTECTION		
Runway Safety Area		
Width	150	500
Length Beyond Departure End	300	1,000
Length Prior to Threshold	300	600
Runway Object Free Area		
Width	500	800
Length Beyond Departure End	300	1,000
Length Prior to Threshold	300	800
Runway Obstacle Free Zone		
Width	400	400
Length Beyond Runway End	200	200
Approach Runway Protection Zone		
Runway End	18/36	18/36
Inner Width	1,000	1,000
Outer Width	1,510	1,510
Length	1,700	1,700
Acres	48.98	48.98
Departure Runway Protection Zone		
Inner Width	500	500
Outer Width	700	1,010
Length	1,000	1,700
Acres	13.77	29.47
RUNWAY SEPARATION		
Runway Centerline to:		
Hold Line Position	200	250
Parallel Taxiway	240	300
Aircraft Parking Apron	500	800

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

Runway Safety Area

The RSA is defined in FAA AC 150/5300-13B, *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 using 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 not fixed by navigational purpose (such as runway edge lights or approach lights).



	Exisitng	Ultimate
Runway Design Code (RDC)	B-II-4000	C-II-4000
Runway Safety Area (RSA)	150' wide x 300' beyond runway end	500' wide x 1,000' beyond runway end
Runway Object Free Area (ROFA)	500' wide x 300' beyond runway end	800' wide x 1,000' beyond runway end
Runway Obstable Free Zone (ROFZ)	400' wide x 200' beyond runway end	400' wide x 200' beyond runway end
Runway Protection Zones		
Approach (inner width x outer width x length)	1,000' x 1,510' x 1,700'	1,000' x 1,510' x 1,700'
Departure (inner width x outer width x length)	500' x 1,010' x 1,700'	500' x 1,010' x 1,700'

LEGEND

- A Taxiway Designator
- Airport Property Line
- RSA
- ROFA
- ROFZ
- RPZ
- Uncontrolled Safety Area

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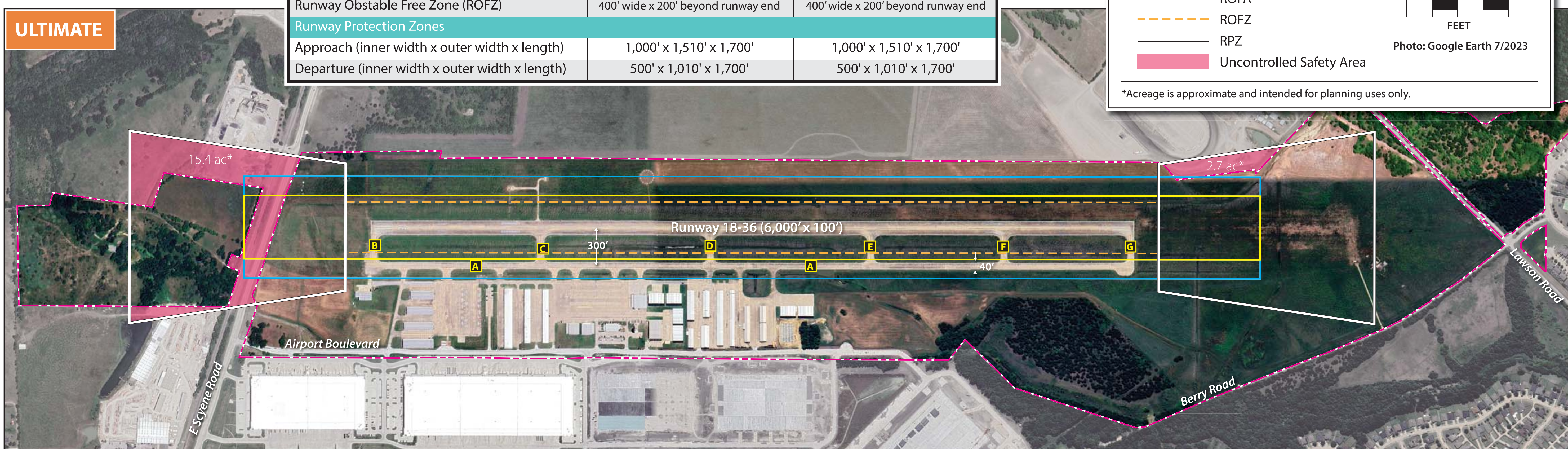
Photo: Google Earth 7/2023

*Acreage is approximate and intended for planning uses only.



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The FAA places high significance on maintaining adequate RSA at all airports. Under Order 5200.8, effective October 1, 1999, the FAA established the *Runway Safety Area Program.* The Order states, "The objective of the Runway Safety Area Program is that all RSAs at federally-obligated airports…shall conform to the standards contained in AC 150/5300-13, *Airport Design*, to the extent practicable." Each Regional Airports Division of the FAA is obligated to collect and maintain data on the RSA for each airport runway and perform airport inspections.

Under existing RDC B-II-4000 design standards on Runway 18-36, the RSA is 150 feet wide and extends 300 feet beyond the runway ends. Under ultimate conditions, the RSA is 500 feet wide and extends 1,000 feet beyond each runway end. As depicted on **Exhibit 3C**, an examination of the RSA under existing conditions did not identify any non-standard conditions and should be maintained as such. Under ultimate conditions, the RSA extends beyond the airport property boundary to the north and is traversed by E Scyene Road. The alternatives analysis will consider measures to meet the ultimate design standards.

Runway Object Free Area

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 utilizing the runway.

For existing RDC B-II-4000 design standards on Runway 18-36, the ROFA is 500 feet wide, extending 300 feet beyond each runway end. For ultimate RDC C-II-4000 design standards, the ROFA is 800 feet wide and extends 1,000 feet beyond each runway end. As shown on **Exhibit 3C** the existing ROFA meets FAA design standards. Under ultimate conditions, the ROFA extends beyond the airport property boundary to the north and is traversed by E Scyene Road. Additionally, the ROFA extends slightly beyond the airport property boundary on the southeast side of the runway. The alternatives analysis will consider measures to meet the ultimate design standards.

Runway Obstacle Free Zone

The ROFZ is an imaginary surface 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 location 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 approach minimums could be increased.

For all runways serving aircraft over 12,500 pounds, the ROFZ is 400 feet wide, centered on the runway, and extends 200 feet beyond the runway ends. This standard applies to Runway 18-36 at HQZ in the existing and ultimate conditions. Under current evaluation with available data, there are no ROFZ obstructions at the airport and this situation should be maintained.

Runway Protection Zone

An RPZ is a trapezoidal area centered on the extended runway centerline beginning 200 feet from the end of the 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, such as those required for airport facilities that are fixed by function in regard to the RPZ; and
- 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:

- 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 containing the RPZ;
- Possessing and exercising the power of eminent domain over the property; or
- 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 proposed projects that would shift an RPZ into an area with existing incompatible land uses – such as a runway extension or 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, agreement with property owners on land uses, easements, or other such measures. These efforts should be revisited during master plan or ALP updates, and periodically thereafter, and should be documented to demonstrate compliance with FAA grant assurances. If new or proposed incompatible land uses impact 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 uses.

For new incompatible land uses that result from a sponsor-proposed action (i.e., 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 is aware 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.

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 give full consideration to appropriate and reasonable alternatives. **The FAA will not approve or disapprove the airport sponsor's preferred alternative; rather, the FAA will only evaluate whether an acceptable level of alternatives analysis has been completed before the sponsor makes the decision to allow or not allow 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. The decision to permit or disallow existing or new incompatible land uses within an RPZ is ultimately up to the airport sponsor, 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 have been further designated as 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.

As shown on **Exhibit 3C**, the existing and ultimate RPZs associated with each runway end are largely controlled by the airport through outright ownership; however, portions of each RPZ serving Runway 18-36 extend beyond airport property. The RPZ serving Runway 18 extends beyond airport property to the north and encompasses approximately 15.4 acres of uncontrolled property, while the Runway 36 RPZ extends beyond airport property to the southeast and encompasses approximately 2.7 acres of uncontrolled property. It should be noted that the uncontrolled property within the Runway 18 RPZ also contains a portion of commercial use property that is currently used by a pavement contractor to store raw materials. In addition, the Runway 18 RPZ is traversed by E Scyene Road, which is a public roadway. As mentioned previously, public roadways are generally considered incompatible uses within an RPZ;

however, the FAA often considers existing roads to be grandfathered so that no corrective action is necessary. It should be noted that a change to the runway environment that alters the size or position of the RPZ may negate the grandfathered condition. If – in the future – the runways were equipped with lower instrument visibility minimums or the runway was extended, the area contained within the applicable RPZs would increase; thus, the level of potentially incompatible land uses within the larger or repositioned RPZ would also increase. To lower the visibility minimums or extend the runway, the airport will have to develop a plan of action to mitigate the newly introduced incompatible land uses and work in consultation with the FAA to determine if the additional incompatible land is acceptable. The alternatives discussion in the next chapter will discuss options to mitigate potential incompatibilities (i.e., roads and uncontrolled property).

RUNWAY SEPARATION STANDARDS

There are several other standards related to separation distances from runways. Each of these is designed to enhance the safety of the airfield.

Runway/Taxiway Separation

The design standard for the separation between runways and parallel taxiways is a function of the critical design aircraft and the instrument approach visibility minimum. The separation standard for Runway 18-36 is 240 feet from the runway centerline to the parallel taxiway centerline for existing RDC B-II-4000. The separation standard for the ultimate RDC of C-II-4000 is 300 feet. Parallel Taxiway A currently has a separation of 300 feet from Runway 18-36, meeting ultimate FAA design standards.

Hold Line Position Separation

Hold line position markings are placed on taxiways leading to runways. When instructed, pilots are to stop short of the holding position marking line. For Runway 18-36, hold line position markings are situated at 250 feet from the runway centerline. The existing RDC B-II-4000 design standards call for hold line position markings to be a minimum of 200 feet from runway centerline, while ultimate RDC C-II-4000 design standards call for a separation of 250 feet. As such, the existing location of the hold line position markings meets the design standard under existing and ultimate conditions and should be maintained through the planning horizon.

Aircraft Parking Area Separation

Aircraft parking areas should be located in a manner that ensures no aircraft components (wings, tail, and fuselage) conflict with the object free area for adjacent runways or taxiways. This includes the ROFA, taxiway object free area (TOFA), and taxilane object free area (TLOFA). In addition, aircraft parking areas should not be located within any of the following aeronautical surfaces and areas: runway approach or departure surface, runway visibility zone (RVZ), ROFZ, and navigational aid equipment critical areas. Currently, the aircraft parking areas at HQZ are clear of all abovementioned safety and critical areas, meeting the existing and ultimate design standard for the airport.

TAXIWAYS

The design standards associated with taxiways are determined by the taxiway design group (TDG) or the ADG of the critical design aircraft. As determined previously, the applicable ADG for Runway 18-36 is ADG II under the existing and ultimate conditions. **Table 3H** presents the various taxiway design standards related to ADG II. The table also shows those taxiway design standards related to TDG. The TDG standards are based on the main gear width (MGW) and 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 planned to the most appropriate TDG design standards, based on usage.

The current design for taxiways serving HQZ is TDG 2A, based on the existing critical aircraft (Cessna Citation CJ2+) and the ultimate critical aircraft (Bombardier Challenger 300), which dictate a taxiway width of 35 feet. Certain portions of the landside area that are utilized exclusively by small aircraft, such as the T-hangar areas, should adhere to TDG 1A/1B standards.

All taxiway widths on the airfield should at least be maintained unless financial constraints dictate. The width could remain until such time as rehabilitation is needed and financial resources to support such are not available. FAA grant availability can only be provided if the project meets eligibility thresholds, as determined by the FAA.

TABLE 3H | Taxiway Dimensions and Standards

Standards Based on Wingspan	ADG I	ADG II
TAXIWAY PROTECTION		
Taxiway Safety Area width (feet)	49	79
Taxiway Object Free Area width (feet)	89	124
Taxilane Object Free Area width (feet)	79	110
TAXIWAY SEPARATION		
Taxiway Centerline to:		
Fixed or Movable Object (feet)	44.5	62
Parallel Taxiway/Taxilane (feet)	70	101.5
Taxilane Centerline to:		
Fixed or Movable Object (feet)	39.5	55
Parallel Taxilane (feet)	64	94.5
Wingtip Clearance		
Taxiway Wingtip Clearance (feet)	20	22.5
Taxilane Wingtip Clearance (feet)	15	15.5
Standards Based on TDG	**TDG 1A/1B**	**TDG 2A**
Taxiway Width Standard (feet)	25	35
Taxiway Edge Safety Margin (feet)	5	7.5
Taxiway Shoulder Width (feet)	10	15

ADG = airplane design group
TDG = taxiway design group
Note: All dimensions are in feet.
Source: FAA AC 150/5300-13B, *Airport Design*

Figure 3A depicts the taxiway object free area (TOFA), which is based on ADG standards. The TOFA on taxiways serving Runway 18-36 is 124 feet wide, as centered on the taxiway. Like the ROFA, the TOFA should be cleared of objects and parked aircraft, except objects needed for air navigation or aircraft ground maneuvering purposes. The TOFAs associated with the airfield taxiways are clear of obstructions.

Taxiway Design Considerations

FAA AC 150/5300-13B, *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 HQZ generally provides for the efficient movement of aircraft; however, AC 150/5300-13B, *Airport Design*, provides 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 being 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 is when a pilot must intentionally steer the cockpit outside the marked centerline in order to ensure the aircraft remains on the taxiway pavement.

2. **Steering Angle:** Taxiways should be designed such that the nose gear steering angle is no more than 50 degrees, 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:** Turns should be designed to 90 degrees wherever possible. For acute-angle intersections, standard angles of 30, 45, 60, 120, 135, and 150 degrees are preferred.

5. **Runway Incursions:** Taxiways should be designed to reduce the probability of runway incursions.

   - *Increase Pilot Situational Awareness*: A pilot who knows where he/she is on the airport is less likely to enter a runway improperly. Complexity leads to confusion. Keep taxiway systems simple using the three-node concept.

Figure 3A – Taxiway Object Free Area

- *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 simple reduction in the number of occurrences and through a reduction in air traffic controller workload.
- *Avoid High Energy Intersections*: These are intersections in the middle third of runways. By limiting runway crossings to the first and last thirds of the 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 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*: Do not design taxiways to lead directly from an apron to a runway. Such configurations can lead to confusion when 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 Angles*: 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 originating from aprons and forming a straight line across runways at mid-span should be avoided.

   - *Wide Throat Taxiways*: Wide throat taxiway entrances should be avoided. Such large expanses of pavement may cause pilot confusion, as well as making lighting and marking more difficult.
   - *Direct Access from Apron to 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.
   - *Apron to Parallel Taxiway End*: Avoid direct connection from an apron to a parallel taxiway at the end of a runway.

FAA AC 150/5300-13B, *Airport Design*, states that "existing taxiway geometry should be improved whenever feasible, with emphasis on designated 'hot spots.'" There are no FAA-designated hot spots at HQZ; however, there are multiple non-standard taxiway geometry conditions, as detailed in **Figures 3B** and **3C**, including:

- The taxilane linkage from the private hangar, adjacent to the Runway 18 threshold, provides direct access to Runway 18-36.
- Taxiway D also provides direct access to Runway 18-36 from an apron/aircraft hangar storage area.

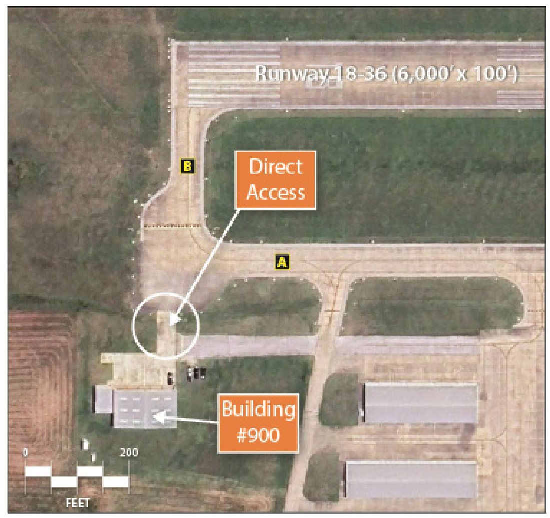


Figure 3B – Direct Access: Taxiway B

In the alternatives chapter, potential solutions to these non-standard conditions will be presented. Analysis in the next chapter will also consider improvements that could be implemented on the airfield to minimize runway incursion potential and conform to FAA standards for taxiway design. Options to correct the abovementioned issues will be included in the next chapter, and any future taxiways planned will also consider the taxiway design standards.

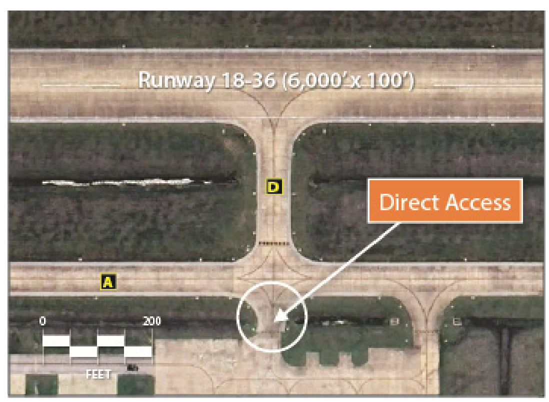


Figure 3C – Direct Access: Taxiway D

Taxilane Design Considerations

Taxilanes are distinguished from taxiways in that they do not provide access directly to or from the runway system. Taxilanes typically provide access to hangar areas. As a result, taxilanes can be planned to varying design standards, depending on the type of aircraft utilizing the taxilane. For example, a taxilane leading to a T-hangar area only needs to be designed to accommodate those aircraft typically accessing the T-hangar.

NAVIGATIONAL AND APPROACH AIDS

Navigational aids are devices that provide pilots with guidance and position information when utilizing the runway system. Electronic and visual guidance to arriving aircraft enhance the safety and capacity of the airfield. Such facilities are vital to the success of an airport and provide additional safety to passengers using the air transportation system. While instrument approach aids are especially helpful during poor weather, they are often used by pilots conducting flight training and operating larger aircraft when visibility is good.

Instrument Approach Aids

HQZ has two published instrument approach procedures to Runway 18-36. Runways 18 and 36 each have localizer performance with vertical guidance (LPV), lateral navigation (LNAV), and circling approaches, all of which are GPS-based instrument approaches. The lowest instrument approach minimums for each runway are provided by the LPV approach, with Runway 18 being served by instrument approach minimums down to ¾-mile. Similarly, Runway 36 is served by instrument approach minimums down to ⅞-mile. It should be noted that HQZ is equipped with a precision instrument landing system (ILS); however, it was recently decommissioned. Since HQZ accommodates primarily general aviation activity and the area experiences a high percentage of VFR weather conditions, the existing instrument approach minimums are sufficient and lower visibility minimums will not be explored.

Runways 18 and 36 are equipped with approach lighting systems (ALS) that enhance safety at the airport, especially during inclement weather or nighttime activity. Both ends of Runway 18-36 are equipped with lead-in light systems (LDIN). These systems provide positive visual guidance to landing aircraft by displaying flashing lead-in lights in sequence toward the runway and should be maintained.

Visual Approach Aids

In most instances, the landing phase of any flight must be conducted in visual conditions. To provide pilots with visual guidance information during landings to the runway, electronic visual approach aids are commonly provided at airports. Currently, Runways 18 and 36 are equipped with a four-box precision approach path indicator (PAPI-4). These approach aids should be maintained through the planning period.

Runway end identification lights (REILs) are flashing lights, located at the runway threshold end, that facilitate rapid identification of the runway end at night and during poor visibility conditions. REILs provide pilots with the ability to identify the runway thresholds and distinguish the runway end lighting from the other lighting on the airport and in the approach areas. Both ends of Runway 18-36 are currently equipped with REILs, which should be maintained throughout the planning horizon.

Weather Reporting Aids

HQZ has a lighted wind cone and segmented circle, which are located on the east side of the runway between Taxiways C and D. The wind cone provides information to pilots regarding wind speed and direction. Typically, the wind cone is centralized on the airfield system and is often co-located within a segmented circle, which is the case at HQZ. The segmented circle consists of a system of visual indicators designed to provide traffic pattern information to pilots.

HQZ is equipped with an AWOS-3, which provides weather observations 24 hours per day. The system updates weather observations every minute, continuously reporting significant weather changes as they occur in real time. This information is then transmitted via a designated radio frequency at regular intervals. This system should be maintained through the planning period.

In addition, the City of Mesquite has installed a Collaborative Adapting Sensing of the Atmosphere (CASA) radar tower at HQZ. This system allows the National Weather Service to receive better detection of storm cell development in the area by transmitting data every minute; it operates at a short range, scanning the lower atmosphere, which improves the quality of the readings.

Communication Facilities

HQZ has an operational airport traffic control tower (ATCT) located on the apron to the south of the terminal building. The ATCT operates from 7:00 a.m. to 9:00 p.m. daily. This site provides clear lines-of-sight to all areas of the airfield. The ATCT enhances safety at the airport and should be maintained through the planning period.

AIRFIELD LIGHTING, MARKING, AND SIGNAGE

Several lighting and pavement marking aids serve pilots using the airport. These aids assist pilots in locating an airport and runway at night or in poor visibility conditions. They also serve aircraft navigating the airport environment on the ground when transitioning to/from aircraft parking areas to/from the runway.

Airport Identification Lighting | HQZ's rotating beacon is located on top of the ATCT. The beacon is in good working order and should be maintained through the planning period.

Runway and Taxiway Lighting | Runway 18-36 is equipped with a medium intensity runway lighting (MIRL) system. The taxiway system is equipped with medium intensity taxiway lighting (MITL). These systems are adequate and should be maintained. Planning should consider expansion of the MIRL and MITL systems when/if new pavements are constructed, as well as upgrading to light emitting diode (LED) systems for new lighting as systems are being repaired or replaced.

Pavement Markings | Runway markings are typically designed to the type of instrument approach available on the runway. FAA AC 150/5340-1K, *Standards for Airport Markings*, provides guidance necessary to design airport markings. Runway 18-36 has precision markings which aid in accommodating the instrument approach procedures and provide enhanced identification for both ends of the runway. These runway markings should be maintained through the long-term planning horizon.

Airfield Signs | Airfield identification signs assist pilots in identifying their locations on the airfield and directing them to their desired locations. Lighted signs are installed on the runway and taxiway systems on the airfield. The signage system includes runway and taxiway designation, routing/directional, runway exit, and mandatory instruction signs. All signs should be maintained throughout the planning period and future consideration should be given to runway distance remaining signage.

It should be noted that many airports are transitioning to LED systems. LEDs have many advantages, including lower energy consumption, longer lifespan, increased durability, reduced size, greater reliability, and faster switching. While a larger initial investment is required up front, the energy savings and reduced maintenance costs will outweigh any additional costs in the long run. As systems need to be repaired/replaced, consideration should be given to upgrading to LED systems.

A summary of the airside facilities at HQZ is presented on **Exhibit 3D**.

LANDSIDE FACILITY REQUIREMENTS

Landside facilities are those necessary for the handling of aircraft and passengers while on the ground. These facilities provide the essential interface between air and ground transportation modes. The capacity of the various components of each element was examined in relation to projected demand to identify future landside facility needs. At HQZ, this includes components for general aviation needs and support facilities.

GENERAL AVIATION ACTIVITIES

General aviation facilities are those necessary for handling general aviation aircraft, passengers, and cargo while on the ground. This section is devoted to identifying future general aviation facility needs during the planning period for the following types of facilities normally associated with general aviation terminal areas:

- General Aviation Terminal Services
- Aircraft Hangars
- Aircraft Parking Aprons

General Aviation Terminal Services

The general aviation terminal facilities at an airport are often the first impression of the community that corporate officials and other visitors will encounter. General aviation terminal facilities at an airport

CATEGORY	EXISTING	ULTIMATE
Runway 18-36		
Runway Design Code (RDC)	B-II-4000	C-II-4000
Dimensions	6,000’ x 100’	Consider runway extension alternatives
Pavement Strength	70,000 lbs S | 100,000 lbs D / DT	Maintain
Safety Areas		
RSA	Standard RSA	Meet C-II RSA standards
ROFA	Standard ROFA	Meet C-II ROFA sttandards
ROFZ	Standard ROFZ	Maintain
RPZ	RPZs extended beyond airport property; public road in Runway 18 RPZ	Consider mitigation measures for RPZ incompatiblities
Taxiways		
Design Group	2A	Maintain
Parallel Taxiway	Taxiway A	Maintain
Parallel Taxiway Separation from Runway	300'	Maintain
Widths	40' (Taxiway A and connectors)	Maintain
Holding Position Separation	250'	Maintain
Notable Conditions	Direct access	Implement corrective measures
Navigational and Weather Aids		
Instrument Approaches	LPV, LNAV, Circling GPS (18, 36)	Maintain
Weather Aids	AWOS, wind cones, rotating beacon	Maintain
Approach Aids	PAPI-4, REILS, LDIN (18, 36)	Maintain
Lighting and Marking		
Runway Lighting	MIRL	Maintain
Runway Marking	Precision	Maintain
Taxiway Lighting	MITL	Maintain
Airfield Signage	Runway/taxiway designation, routing, Runway exits, mandatory instruction signs	Maintain/Consider Runway Distance Remaining Signage

KEY

AWOS - Automated Weather Observing System
D - Dual Wheel
2D - Dual Tandem Wheel
LDIN - Lead-in Light System
LNAV - Lateral Navigation
LPV - Localizer Performace with Vertical Guidance
MIRL - Medium Intensity Runway Lighting
MITL - Medium Intensity Taxiway Lighting
PAPI - Precision Approach Path Indicator
RDC - Runway Design Code
REIL - Runway End Identification Lights
ROFA - Runway Object Free Area
ROFZ - Runway Obstacle Free Zone
RPZ - Runway Protection Zone
RSA - Runway Safety Area

Exhibit 3D
AIRSIDE FACILITY REQUIREMENTS

provide space for passenger waiting, a pilot's lounge, flight planning, concessions, management, storage, and many other various 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. At HQZ, general aviation terminal services are provided by the FBO managed by the City of Mesquite. The airport also has a separate pilot's lounge and restrooms located at the east end of Building 1520. This facility is independent of the FBO terminal facility and is accessible via keypad entry. The FBO offers approximately 5,000 square feet (sf) of terminal facility area, while the separate pilot's lounge offers approximately 1,000 sf. HQZ offers approximately 6,000 total sf of terminal area for local and transient pilots and passengers.

The methodology used in estimating general aviation terminal facility needs was based on the number of airport users expected to utilize general aviation facilities during the design hour. Space requirements for terminal facilities were based on providing 125 sf per design hour itinerant passenger. A multiplier of 2.5 in the short term, increasing to 4.0 in the long term, was also applied to terminal facility needs to better determine the number of passengers associated with each itinerant aircraft operation. This increasing multiplier indicates an expected increase in larger aircraft operations through the long term. These operations typically support larger turboprop and jet aircraft, which can accommodate an increasing passenger load factor. Such is the case at HQZ, where an increasing number of turbine operations are anticipated.

Table 3J outlines the space requirements for general aviation terminal services at HQZ through the long-term planning period. As previously stated, the amount of space currently offered by the FBOs, combined, is approximately 6,000 sf. Other specialty aviation service operators (SASOs) on the airfield also provide space for pilots and passengers; however, these areas are not widely utilized by transient operators. As shown in the table, demand will exceed the space currently provided over the long-term planning horizon.

TABLE 3J | General Aviation Terminal Area Facilities

	Currently Available	Short-Term Need	Intermediate-Term Need	Long-Term Need
General Aviation Terminal Facility Area (sf)	6,000	3,100	4,300	6,300
General Aviation Design Hour Passengers		25	34	50
Passenger Multiplier		2.5	3.2	4.0
Terminal Building Vehicle Parking		30	39	55
SASO/Tenant Vehicle Parking		98	104	122
Total Vehicle Parking Spaces	**109**	**128**	**143**	**177**

Source: Coffman Associates analysis

General aviation vehicle parking demands have also been determined for HQZ. Space determinations for passengers were based on an evaluation of existing airport use, as well as standards set forth to help calculate projected terminal facility needs. There are currently 109 individual spaces provided at the terminal building and at various other parking lots located on the airfield, which can also serve general aviation vehicle parking needs. As can be seen in the table, additional vehicle parking could be needed over the course of the planning period.

Although some based aircraft owners prefer to park their vehicles in their hangars, safety can be compromised when automobile and aircraft movements are intermixed. For this reason, separate parking requirements – which consider one half of based aircraft at the airport – were applied to general aviation automobile parking space requirements. Total parking requirements for general aviation activity at HQZ call for approximately 128 spaces in the short term, increasing to approximately 177 marked vehicle parking spaces by the long-term planning horizon. Ultimately, local demand will dictate the future parking area sizes and marked parking spaces allotted. Future consideration in the master plan will be given to providing vehicle parking to support additional development potential.

Aircraft Hangars

Utilization of hangar space varies as a function of local climate, security, and owner preference. The trend in general aviation aircraft is toward more sophisticated (and consequently, more expensive) aircraft; therefore, many aircraft owners prefer enclosed hangar space, as opposed to outside tiedowns.

The demand for aircraft storage hangars is dependent upon the number and type of aircraft expected to be based at the airport in the future. For planning purposes, it is necessary to estimate hangar requirements based on forecast operational activity; however, hangar development should be based on actual demand trends and financial investment conditions.

While most aircraft owners prefer enclosed aircraft storage, several based aircraft will still use outdoor tiedown spaces, usually due to lack of available hangar space, high hangar rental rates, or operational needs; therefore, enclosed hangar facilities do not necessarily need to be planned for each based aircraft.

Hangar types vary greatly in size and function. T-hangars, box hangars, and shade hangars are popular with aircraft owners that need to store individual private aircraft. These hangars often provide individual spaces within a larger structure or in standalone portable buildings. There is 194,700 sf of T-hangar storage space at the airport, which comprises the main type of aircraft storage space at HQZ. For determining future aircraft storage needs, a planning standard of 1,200 sf per aircraft is utilized for these types of hangars.

Executive box hangars are open-space facilities with no interior supporting structure. These hangars can vary in size between 1,500 and 2,500 sf, with some approaching 10,000 sf. They are typically able to house single-engine, multi-engine, turboprop, and jet aircraft, as well as helicopters. Executive box hangar space at HQZ is estimated at 83,400 sf. For future planning, a standard of 3,000 sf per turboprop, 5,000 sf per jet, and 1,500 sf per helicopter is utilized for executive box hangars.

Conventional hangars are large, open-space facilities with no supporting interior structure. These hangars provide for bulk aircraft storage and are often utilized by airport businesses, such as an FBO or an aircraft maintenance operator. Conventional hangars are generally larger than executive box hangars and can range in size from 10,000 sf to more than 20,000 sf. Often, a portion of a conventional hangar is utilized for non-aircraft storage needs, such as maintenance or office space. Conventional hangar space at HQZ totals approximately 54,500 sf, while existing maintenance area accounts for approximately 10,000 sf. The same aircraft sizing standards utilized for executive hangars are also utilized for conventional hangars. For the purposes of this analysis, the maintenance area has been combined with the conventional/executive hangar area.

Future hangar requirements for the airport are summarized in **Table 3K**. While some based aircraft will continue to utilize aircraft parking apron space – as opposed to enclosed hangar space – the overall percentage of aircraft seeking hangar space is projected to increase during the long-term planning period.

TABLE 3K | Aircraft Hangar Requirements

	Currently Available	Short-Term Need	Intermediate-Term Need	Long-Term Need	Difference
Total Based Aircraft	181	195	208	243	+62
Aircraft to be Hangared	166	185	198	231	+65
Hangar Area Requirements					
T-Hangar/Box Hangar Area (sf)	194,700	240,300	258,300	301,400	+106,700
Executive/Conventional Hangar Area (sf)	147,900	166,900	202,900	249,900	+112,000
Total Hangar Area (sf)	**342,600**	**407,200**	**461,200**	**551,300**	**+218,700**

Source: Coffman Associates analysis

The analysis shows that future hangar requirements indicate a potential need for almost 220,000 sf of new hangar storage capacity through the long-term planning period. This includes a mixture of hangar types, with the largest needs projected in the executive and conventional hangar categories. Due to the projected increase in based aircraft, annual general aviation operations, and hangar storage needs, facility planning will consider additional hangars at the airport. It is expected that the aircraft storage hangar requirements will continue to be met through a combination of hangar types.

It should be noted that hangar requirements are general in nature and are based on the aviation demand forecasts. The actual need for hangar space will further depend on the usage within the hangars. For example, some hangars may be utilized entirely for non-aircraft storage, such as maintenance, although they have an aircraft storage capacity from a planning standpoint; therefore, the needs of an individual user may differ from the calculated space necessary.

Aircraft Parking Aprons

The aircraft parking apron is an expanse of paved area intended for aircraft parking and circulation. FAA AC 150/5300-13B, *Airport Design*, suggests a methodology by which transient apron requirements can be determined from knowledge of busy day operations. The number of itinerant parking spaces required was determined to be approximately 25 percent of the busy day itinerant operations for general aviation operations. A planning standard of 800 square yards (sy) per aircraft was applied to determine future transient apron requirements for single- and multi-engine piston aircraft. For business jets, which are often much larger, a planning standard of 1,600 sy per aircraft position was used. In addition, HQZ has aircraft that use outside aircraft tiedowns for storage. It is assumed that these aircraft require less space than transient aircraft; therefore, a planning standard of 650 sy per aircraft was applied. For local tiedown needs, five percent of total based aircraft was added for maintenance activities and temporary storage needs. Apron parking requirements are presented in **Table 3L**. Transient apron parking needs are divided into business jet needs and smaller single- and multi-engine aircraft needs.

TABLE 3L | Aircraft Parking Apron Requirements

	Currently Available	Short-Term Need	Intermediate-Term Need	Long-Term Need	Difference
Based GA Parking		10	10	12	
Transient GA Parking		31	34	39	
Corporate Jet Parking		2	3	5	
Helicopter Parking		1	1	2	
Total Parking Positions	**42***	**44**	**48**	**58**	**+16**
Local Aircraft Apron (sy)		7,000	7,400	9,200	
Transient Apron (sy)		28,000	32,000	39,200	
Total Apron Area (sy)	**33,400**	**35,000**	**39,400**	**48,400**	**+15,000**

*Current parking only accounts for marked aircraft parking positions.

Source: Coffman Associates analysis

Existing general aviation aircraft parking aprons at the airport currently total approximately 33,400 sy of space. As shown in the table, the apron area currently available is undersized, based on this analysis. Beginning in the short-term period, approximately 35,000 sy of apron pavement is projected to be needed. By the long-term period, 48,400 sy of apron pavement is estimated to be needed, which equates to an additional 15,000 sy of aircraft parking apron area which could be needed by the end of the planning period. The landside alternatives in the next chapter will evaluate different areas on the airfield for additional aircraft parking areas.

SUPPORT FACILITIES

Various other landside facilities that play a supporting role in overall airport operations have also been identified. These support facilities include:

- Aviation Fuel Storage
- Perimeter Fencing and Gates

Aviation Fuel Storage

The airport FBO, which is managed by the City of Mesquite, is the airport's public fuel service provider. Existing storage capacity for 100LL and Jet A fuels total 12,000 gallons each. It should be noted that the FBO also provides full service fueling and contracts three fuel trucks through Titan Aviation Fuels, which contribute to the total fuel storage capacity; however, only the fixed fuel storage tanks that are available to the public are considered for this analysis.

Fuel flowage from the FBO averaged approximately 270,900 gallons of Jet A fuel over a three-year period from 2021 to 2023. Over the same period, 100LL fuel flowage averaged approximately 116,000 gallons. Utilizing the FAA's TFMSC, turbine operations for 2023 totaled 1,862 at HQZ. Considering the base year operations for this master plan – 109,617 total operations – 107,755 of these were conducted by piston-powered aircraft. As such, it is estimated that 145.5 gallons of Jet A were pumped per turbine operation, while approximately 1.08 gallons of 100LL were pumped per piston operation.

Maintaining a 14-day fuel supply would allow the airport to limit the impact of a disruption of fuel delivery. Currently, the airport has enough static fuel storage to meet the 14-day supply criteria for 100LL fuel through the long-term horizon. The forecasted fuel storage requirements summarized in **Table 3M** show a need for additional Jet A fuel storage capacity by the long-term horizon.

TABLE 3M | FBO Fuel Storage Requirements

	Capacity	Current	PLANNING HORIZON		
			Short-Term	Intermediate-Term	Long-Term
Jet A					
Daily Usage (gal.)		742	861	995	1,317
14-Day Supply (gal.)	12,000	10,388	12,047	13,927	18,439
Annual Usage (gal.)		270,900	314,095	363,110	480,733
AvGas (100LL)					
Daily Usage (gal.)		318	342	370	443
14-Day Supply (gal.)	12,000	4,452	4,783	5,174	6,206
Annual Usage (gal.)		116,000	124,700	134,900	161,800

Sources: Historical fuel flowage data provided by airport administration; fuel supply projections prepared by Coffman Associates

Fuel storage requirements are typically based on keeping a two-week supply of fuel during an average month; however, more frequent deliveries can reduce the fuel storage capacity requirements. If demand warrants, the airport could begin ordering fuel on a weekly basis to meet demand until additional fuel storage capacity can be added. Generally, fuel tanks should be of adequate capacity to accept a full refueling tanker – which is approximately 8,000 gallons – while maintaining a reasonable level of fuel in the storage tank. Future aircraft demand experienced by the FBO will determine the need for additional fuel storage capacity. It is important that airport personnel work with the FBO to plan for adequate levels of fuel storage capacity through the long-term planning period of this study.

Perimeter Fencing and Gates

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

- Gives notice of legal boundary of the outermost limits of the 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 the aircraft operations areas on the airport;
- Creates a psychological deterrent;
- Demonstrates a corporate concern for facilities; and
- Limits inadvertent access to the aircraft operations area by wildlife.

At HQZ, the perimeter of the airport is completely enclosed with six-foot chain link security fencing. There are four gates with padlock entry and three electronic gates located at various points on the airfield. Additionally, signs prohibiting unauthorized entry are displayed on the electronic gates and in other prominent locations to prevent unauthorized entry to the airfield.

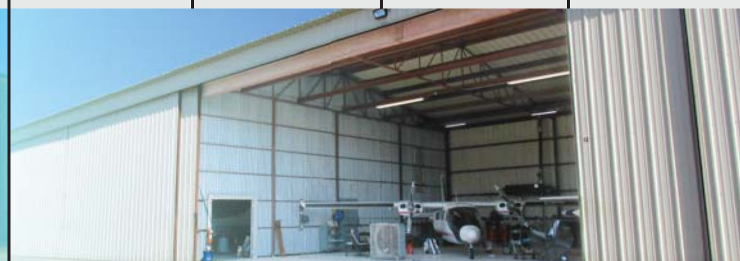
A summary of the overall general aviation landside facilities is presented on **Exhibit 3E**.

SUMMARY

This chapter has outlined the safety design standards and facilities required to meet potential aviation demand projected at HQZ for the next 20 years. To provide a more flexible master plan, the yearly forecasts from Chapter Two have been converted to planning horizon levels. The short term roughly corresponds to a five-year timeframe, the intermediate term is approximately 10 years, and the long term is 20 years. By utilizing planning horizons, airport management can focus on demand indicators for initiating projects and grant requests, rather than on specific dates in the future.

In Chapter Four, potential improvements to the airside and landside systems will be examined through a series of airport development alternatives. Most of the alternatives discussion will focus on those capital improvements that would be eligible for federal and state grant funds. Other projects of local concern will also be presented. Ultimately, an overall airport development plan that presents a vision beyond the 20-year scope of this master plan will be developed for HQZ.

	Available	Short Term	Intermediate Term	Long-Term
Aircraft Storage Hangar Requirements				
Total Based Aircraft	181	195	208	243
Aircraft to be Hangared	166	185	198	231
T-Hangar Area (sf)	194,700	240,300	258,300	301,400
Executive/Conventional Hangar Area (sf)	147,900	166,900	202,900	249,900
Total Hangar Storage Area (sf)	342,600	417,200	471,200	561,300

	Available	Short Term	Intermediate Term	Long-Term
Aircraft Parking Apron				
Aircraft Parking Positions	42	44	48	58
Total Public Apron Area (sy)	33,400	35,000	39,400	48,400

	Available	Short Term	Intermediate Term	Long-Term
General Aviation Terminal Facilities and Parking				
Building Space (sf)	6,000	3,100	4,300	6,300
Total GA Parking Spaces	109	128	143	177


	Available	Short Term	Intermediate Term	Long-Term
Fuel Storage Requirements				
Jet A 14-Day Supply (gal.)	12,000	12,047	13,927	18,439
100LL 14-Day Supply (gal.)	12,000	4,783	5,174	6,206

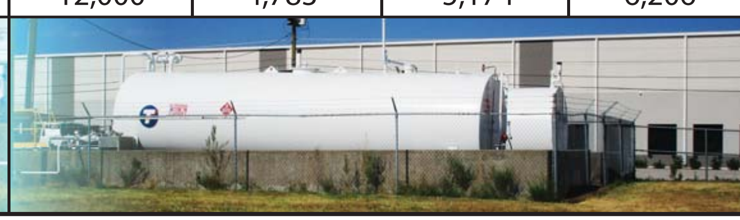



Exhibit 3E
LANDSIDE FACILITY REQUIREMENTS