CHAPTER 5 – FACILITY REQUIREMENTS

This chapter takes the information collected in Chapter 2, *Inventory of Existing Facilities*, considers the projected demand for the Airport identified in Chapter 4, *Forecasts of Aviation Demand and Capacity*, and provides a review of compliance with FAA design standards, other airport requirements, and user needs. FAA standards for airport design and Federal Aviation Regulation Part 77, Objects Affecting Navigable Airspace (FAR Part 77), are used to analyze facility conditions to identify needed improvements, replacement or expansion. Facility improvements may also be recommended to fill a demand for services, not just to meet design or safety standards.

5.1 AIRSIDE CAPACITY AND REQUIREMENTS

Airport facilities that aid in the movement of aircraft are considered to be airside facilities and include runways, taxiways, aprons, navigational aids, and airfield lighting systems. This section reviews the capacity and utility of the Airport's airside facilities and their compliance with FAA design standards. As discussed in Chapter 4, the critical design aircraft for the Chatham Municipal Airport is the Beech Baron B-58, which is categorized as a B-I aircraft. Discussions with Airport Management and analysis conducted in Chapter 4 indicate that these conditions are expected to remain through the duration of the 20-year planning period.

5.1.1 RUNWAY CAPACITY

Airfield capacity is defined as the number of airport operations that a particular runway and taxiway configuration is able to accommodate in a given period. This number is typically expressed as annual capacity (or annual service volume, ASV) and hourly capacity (or throughput). FAA AC 150/6050-5, *Airport Capacity and Delay*, utilizes computer models developed by the FAA to evaluate airport capacity and reduce aircraft delay. These models use an airport's ASV to approximate the capacity of the runway, while accounting for differences in runway configuration, fluctuations in aircraft fleet mix, touch and go activity levels, and weather conditions, among other factors.

The FAA models estimate the Airport's ASV capacity to be up to 230,000 operations per year. The Airport's annual operations volume in 2017 was 20,100, and forecasted annual operations are not expected to reach over 21,331 over the planning period. Therefore, runway capacity is not an existing problem, nor does it appear that it will be a problem during the planning period. Further, according to FAA requirements, the Airport's runway capacity will be considered adequate until operations reach 60% of its ASV (138,000 annual operations).

Finding: Runway capacity is currently meeting the needs of the Airport and is anticipated to do so for the duration of the planning period.

5.1.2 RUNWAY REQUIREMENTS

Runway dimensional requirements are based upon the runway's Airport Reference Code (ARC) during the planning period. The FAA has prescribed standards for the layout of airport facilities including runways, taxiways, approach surfaces, etc., based on the ARC. Runway dimensional requirements for Runway 6-24 and the Airport's current compliance status are presented in Table 5-1. These standards are discussed individually in the following sections.

Table 5-1: Runway 6-24 Dimensional Requirements

Facility	FAA Design Criteria (B-I Small)	Existing RW 6-24 (B-I Small)	RW 6-24 Compliance
Runway centerline to holdline	125'	125'	Complies
Runway centerline to parallel taxiway centerline	150'	150'	Complies
Runway centerline to edge of aircraft parking	125'	199'	Complies
Runway Protection Zone:			
Length	1,000'	1,000'	Complies
Inner width	250'	250'	Complies
Outer width	450'	450'	Complies
Runway pavement width	60'	100'	Complies*
Runway safety area width	120'	120'	Complies
Runway safety area length beyond runway end	240'	240'	Complies
Runway object-free area width	250'	250'	Complies
Runway object-free area length beyond runway end	240'	240'	Complies
Runway obstacle-free zone width	250'	250'	Complies
Runway obstacle-free zone length beyond runway end	200'	200'	Complies

**See Section 5.1.2.1, Runway Width and Crosswind Runway*
Source: AC 150/5300-13A

5.1.2.1 Runway Width and Crosswind Runway

The 2003 Master Plan included a review of the wind analysis performed for the 1984 Master Plan, which asserted that the existing alignment of Runway 6-24 provides 84.7 percent wind coverage with crosswinds at 12.0 knots. FAA AC 150/5300-13A recommends a crosswind runway when the primary runway orientation provides less than 95 percent wind coverage. The 1984 Master Plan investigated this issue at length, and readers are encouraged to reference that document for additional details. The report concluded that, due to airport property constraints that include surrounding land uses, terrain limitations, nearby water bodies, and financial costs, it was not practicable to pursue the construction of a crosswind runway at CQX. FAA approved this justification, and in 2009, Runway 6-24 was reconstructed at a width of 100 feet, as recommended, to maintain added safety measures in an effort to offset poor crosswind coverage.

The limitations associated with the construction of a crosswind runway were reviewed with the Airport Commission for the development of this Master Plan, and it was discovered that it remains unrealistic for the Airport to pursue the construction of a crosswind runway. Therefore, the Airport stands by its previous justification, supported by FAA, that Runway 6-24 should be maintained at a width of 100 feet due to poor crosswind coverage.

Recommendation: The Airport should complete a new wind analysis in advance of the next runway reconstruction project to determine if a runway wider than 60 feet is justified to offset crosswind coverage.

5.1.2.2 Runway Length Requirements

As previously discussed, runway dimensional requirements are predicated on the capacity and safety requirements of a family of aircraft or a specific aircraft using the runway. Chapter 4 confirmed that the Beech Baron B-58 remains representative of the most demanding aircraft regularly using the airport. The Beech Baron B-58 has an ARC of B-I (i.e. wingspans under 49 feet, tail heights under 20 feet, and approach speeds under 121 knots).

FAA AC 150/5325-4B, *Runway Length Requirements for Runway Design,* provides guidelines for calculating runway length. In accordance with the AC, the following factors were considered when determining the required runway length at CQX:

- The Beech Baron B-58 is categorized as a "small airplane" because its maximum certified takeoff weight is less than 12,500 pounds;
- The Beech Baron B-58 has an approach speed of 96 knots;
- The percentage of fleet at CQX is 95 percent[1] due to the medium size population with a diversity of usage;
- The mean daily maximum temperature of the hottest month of the year in Chatham is 80°F[2]; and
- The Airport elevation is 63.8[3] feet above mean sea level.

After comparing these factors against the chart contained in Figure 2-1, *Small Airplanes with Fewer than 10 Passenger Seats*, of AC 150-5325-4B, it was concluded that the adequate runway length for the Beech Baron B-58 at CQX is 3,000 feet. Based on this information, it is reasonable to conclude that the current length of Runway 6-24 will sufficiently serve the design aircraft for the duration of the planning period.

[1] "95 Percent of Fleet. This category applies to airports that are primarily intended to serve medium size population communities with a diversity of usage and a greater potential for increased aviation activities. Also included in this category are those airports that are primarily intended to serve low-activity locations, small population communities, and remote recreational areas. Their inclusion recognizes that these airports in many cases develop into airports with higher levels of aviation activities." FAA AC 150/5325-4B

[2] Chatham Municipal Airport 2003 AMPU

[3] www.airnav.com

Table 5-2 summarizes available runway lengths at the Airport.

Table 5-2: Available Runway Lengths at CQX

Runway End	Pavement Length (feet)	Threshold Displacement (feet)	Maximum Takeoff Length (feet)	Maximum Landing Length (feet)
6	3,001	None	3,001	3,001
24	3,001	None	3,001	3,001

Source: Gale Analysis

Recommendation: Per FAA AC 150/5325-4B, CQX's runway length of 3,001 feet is adequately meeting the needs of the critical design aircraft. Additionally, the Airport Manager and Airport Commission have confirmed that the runway length of 3,001 feet is sufficient. The Airport should continue to monitor operations and aircraft utilizing the Airport to ensure that the runway length is adequately meeting the needs of its users.

5.1.2.3 Runway Approach Requirements

This section reviews current runway approach types at CQX and provides an overview of the protected surfaces associated with each approach. Currently, Runway 6-24 has an NDB circling approach and an RNAV (GPS) approach. Runway 6-24 is supported by the following navigational/visual/communication aids:

- Runway lighting (MIRLS – Medium Intensity Runway Light System)
- Runway End Identifier Lights
- Precision Approach Path Indicator (PAPI)
- Airport Rotating Beacon
- Automated Surface Observing Station (ASOS)

FAA airport design guidance defines the following Standards for Instrument Approach Procedures:

Table 5-3: Standards for Instrument Approach Procedures

Visibility Minimums	*< ¾ statute mile*	*¾ to < 1 statue mile*	*≥ 1 statute mile non-precision*	*Circling*
Height Above Touchdown Zone	< 250’	≥ 250’	≥ 250’	≥ 350’
TERPS Chapter 3, Section 3	34:1 clear	20:1 clear	20:1 clear, or penetrations lighted for night minimums	
Precision Obstacle Free Zone	Required	Recommended		
Minimum Runway Length	4,200’ (paved)	3,200’ (paved)*		
Runway Markings	Precision	Non-Precision	Non-Precision	Visual (Basic)
Holding Position Sign & Markings	Precision	Non-Precision	Non-Precision	Visual (Basic)
Runway Edge Lights	HIRL/MIRL	HIRL/MIRL	MIRL/LIRL	MIRL/LIRL (for night minimums only)
Parallel Taxiway	Required	Required	Recommended	Recommended
Approach Lights	MALSR, SSALR, or ALSF	Recommended	Recommended	Not Required
Airport Layout Plan	Required	Required	Required	Recommended

Source: FAA AC 150/5300-13A, Table 3-4

**However, runways as short as 2,400 ft could support an instrument approach provided the lowest HATh is based on clearing any 200-ft obstacle within the final approach segment.*

Findings: Runway 6 and Runway 24 both meet the minimum criteria for circling approach procedures; however, according to Airport Management, this approach is not adequately meeting the needs of airport users. In the interest of public and airport user safety the Airport would like to publish a non-precision (straight-in, instrument) approach to Runway 6-24 with lower visibility minimums.

Recommendations: In an effort to maximize the utility of the airport, particularly in less than ideal weather conditions, the Airport should coordinate with FAA Flight Procedures to publish a non-precision (straight-in, instrument) approach to Runway 6-24. This process will involve, at a minimum, identifying obstructions to the Runway 6-24 approaches, conducting an Environmental Assessment for easement acquisitions and obstruction removal, acquiring avigation easements to obtain property rights for future tree clearing purposes, removing obstructions within newly-acquired easements, and conducting an FAA AC 150/5300-18B survey.

5.1.2.4 FAR Part 77

The airspace surrounding public use airports is governed by regulations found within 14 Code of Federal Regulations (CFR) Part 77. This regulation is known by its more common title as **14 CFR, Federal Aviation Regulation (FAR) Part 77- Objects Affecting Navigable Airspace** (Part 77), which was promulgated by the FAA, and includes areas around airports (sometimes called Imaginary or Protected Surfaces) that must be kept clear of penetrating objects, called "obstructions". By accepting FAA funding, an airport agrees to make all reasonable efforts to keep its Part 77 protected surfaces clear of obstructions. Part 77 also includes guidance for analysis and marking of penetrating objects in specific cases. Objects are defined by Part 77 as:

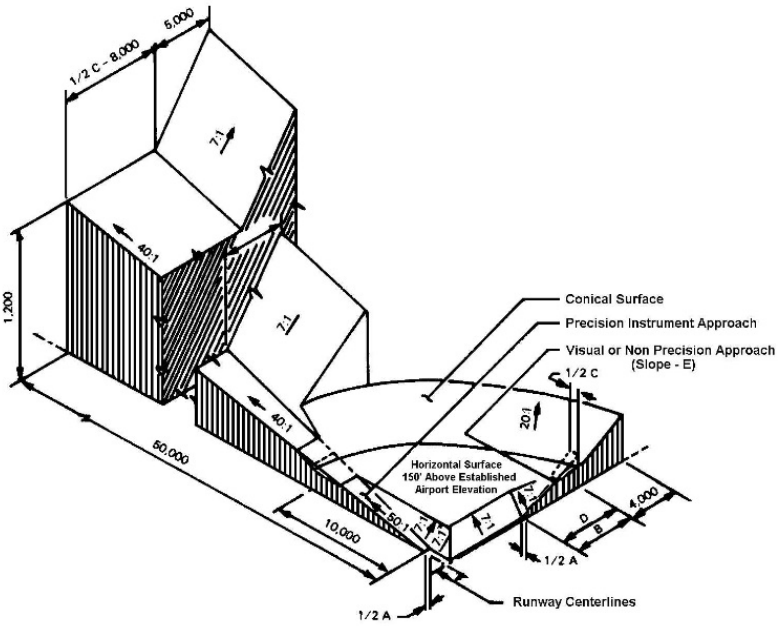


Figure 5-1 Part 77 Surfaces

"any object of natural growth, terrain, or permanent or temporary construction or alteration, including equipment and materials used therein, and apparatus of a permanent or temporary character; and alteration of any permanent or temporary existing structure by a change in its height (including appurtenances), or lateral dimensions, including equipment or materials used therein."

Part 77 specifies the dimensions of imaginary surfaces for each individual airport based on the type and size of aircraft using the facility, the runway surface treatment, as well as the type of navigation and approach aids available to pilots. The following five imaginary surfaces are identified and defined under Part 77:

- Primary Surface
- Approach Surface
- Transitional Surface
- Horizontal Surface
- Conical Surface

Figure 5-1 depicts the relationship of these surfaces to a typical runway. Dimensions for each of these surfaces are stipulated in Part 77. Depending upon the application of criteria outlined in the regulation, surface dimensions may vary from runway to runway. The surfaces are defined as follows:

- Primary Surface- A rectangular shaped surface longitudinally centered on the runway centerline with the same elevation as the nearest corresponding point on the runway centerline. The primary surface dimensions will vary depending on the runway approach type and the type of runway surface.

- Approach Surface- A trapezoidal shaped surface centered on the runway centerline and extending outward and upward from each end of the primary surface at a prescribed slope angle. Approach surface dimensions and slope angle will vary according to the runway approach type.
- Transitional Surface- This surface is an inclined plane running parallel to the runway centerline beginning at the edges of the primary and approach surfaces. They then extend upward and outward at a slope of seven feet horizontally for every one foot vertically (7:1) from the sides of the primary and approach surfaces to the horizontal surfaces (150' above the Airport elevation).
- Horizontal Surface- This surface is an oval shaped, horizontal plane established by Part 77 to be 150 feet above the Airport elevation. It is established by swinging arcs from the intersection of the extended runway centerline and primary surface at each end of the runway then closing each area with tangent lines. In areas where the primary, approach, and transitional surfaces may overlap, the surface with the lowest elevation is the controlling surface.
- Conical Surface- This surface extends upward and outward from the edge of the horizontal surface at a slope of twenty feet horizontally for every one foot vertically (20:1) for 4,000 horizontal feet from the edge of the horizontal surface.

5.1.2.5 Aerial Mapping

Aerial Mapping for this Master Plan was conducted in accordance with FAA AC 150/5300-17C and included a survey of the approach surfaces for Runway 6-24 using a 50-foot by 50-foot grid system. Data points were collected for the tallest object in the grid, and coordinates for each object, including the type of object (tree, building, pole, etc.), were provided. The results of this survey were then applied to CQX's existing Part 77 and TERPS approach surface dimensions, and the Part 77 and TERPS Non-Precision Instrument Runway dimensions. The results of the analysis highlight the number properties containing obstructions for each scenario, as detailed in the following sections. Due to utilization of the aforementioned grid system for reasons of cost, it is important to note the possibility that the analysis may not indicate the presence of lower but penetrating obstructions located within the grid but in close proximity to identified obstructions, as only the tallest obstructions in the grid are accounted for in the aerial mapping. Further, the aerial mapping did not include an analysis of the full extent of obstructions to the Airport's departure surfaces. However, information collected for the approach surfaces was utilized to identify centerline obstructions in accordance with FAA Airport Layout Plan (ALP) *Standard Operating Procedures* to the departure surfaces and is illustrated on Sheet 12 of the ALP.

5.1.2.6 Existing Part 77 Requirements

Existing Part 77 surface dimensions and their compliance status for Runway 6-24 at the Airport is shown in Table 5-4. As defined in Table 5-4, "clear" means that the surface is unobstructed by penetrating objects, or that penetrating objects are properly mitigated through FAA approved lighting or other means.

Table 5-4: Existing Runway 6-24 Part 77 Compliance

Protected Surfaces		*Dimensions (Circling RW 6)*	*Dimensions (Circling RW 24)*	*Compliance*[4]
Primary Surface	Width	250'	250'	Clear
	Length beyond R/W End	200'	200'	
Approach				Vegetative, Telephone Pole, and Chimney/ Smokestack Obstructions
	Width at Inner end	250'	250'	
	Width at Outer end	1,250'	1,250'	
	Length	5,000'	5,000'	
	Slope	20:1	20:1	
Transitional surface slope		7:1	7:1	Clear
Horizontal surface radius		5,000'	5,000'	Clear
Conical surface	Slope	20:1	20:1	Clear
	From Edge of Horizontal Surface	4,000'	4,000'	

Source: Federal Regulation Title 14, Part 77, Safe Efficient Use and Preservation of the Navigable Airspace

Findings: Per the obstruction analysis, the existing Part 77 Approach Surfaces for Runway 6-24 contain vegetative and man-made obstructions. Obstructions and near obstructions (within 10 feet of the approach surface) identified within the existing Part 77 approach surface are as follows:

- **Vegetative obstructions and near obstructions on Airport property in the Runway 6 approach.**
- **Pole obstruction and vegetative near obstructions on public roadways within the Runway 6 approach.**

[4] A full obstruction analysis of Part 77 surfaces was outside of the scope of this Master Plan; however, at the time of the 2003 Airport Master Plan, Runway 6-24 was in full compliance with Part 77 requirements. It is assumed that, with the exception of the approach surface, Runway 6-24 remains in compliance with Part 77.

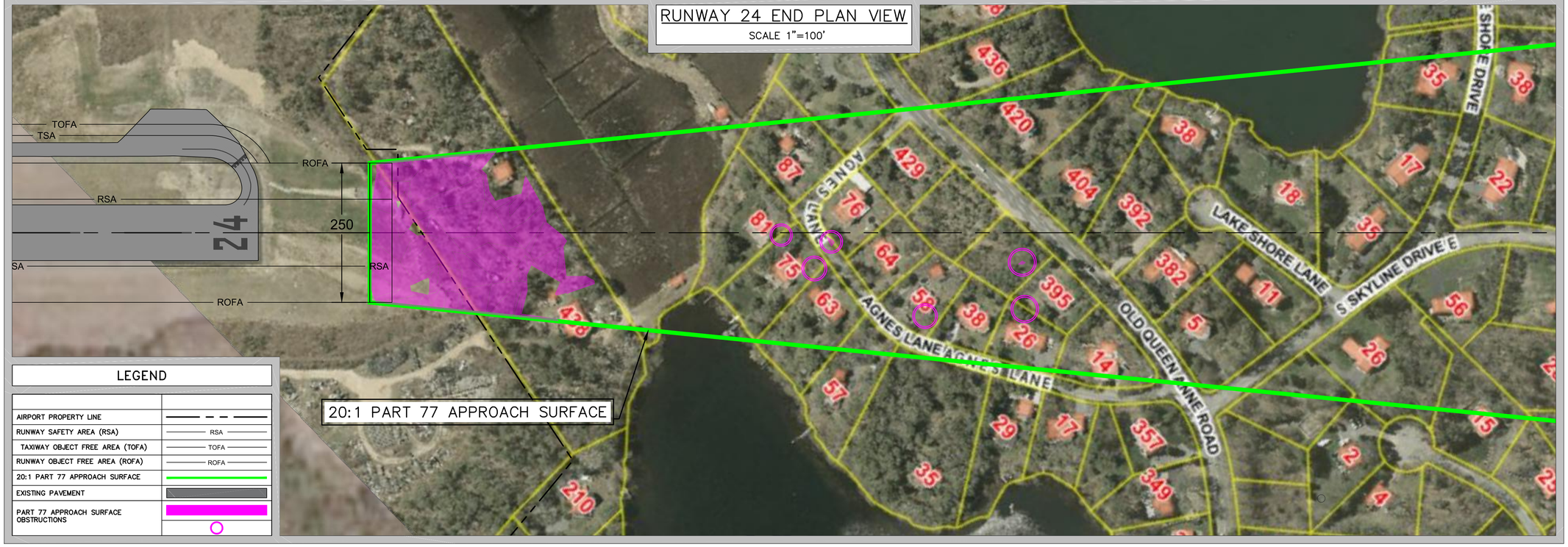
- **Obstructions and near obstructions on approximately 1 residential property within the Runway 6 approach, consisting of vegetation and 1 smokestack/ chimney.**
- **Vegetative obstructions and near obstructions on approximately 8 residential properties within the Runway 24 approach.**
- **Vegetative obstructions and near obstructions on approximately 6 commercial properties within the Runway 6 approach.**
- **Vegetative obstructions and near obstructions on Airport property in the Runway 24 approach.**
- **Vegetative near obstructions on approximately 1 vacant property within the Runway 24 approach.**
- **Vegetative near obstructions on public roadways within the Runway 24 approach.**

For a graphic representation of the obstructions referenced above, refer to Figure 5-2.

NON VEGETATIVE OBSTRUCTION TABLE		
	TYPE	STATUS
1	POLE OBSTRUCTION	(E)
2	SMOKESTACK/CHIMNEY OBSTRUCTION	(E)

RUNWAY 6 END PLAN VIEW
SCALE 1"=100'

RUNWAY 24 END PLAN VIEW
SCALE 1"=100'



LEGEND

AIRPORT PROPERTY LINE	
RUNWAY SAFETY AREA (RSA)	RSA
TAXIWAY OBJECT FREE AREA (TOFA)	TOFA
RUNWAY OBJECT FREE AREA (ROFA)	ROFA
20:1 PART 77 APPROACH SURFACE	
EXISTING PAVEMENT	
PART 77 APPROACH SURFACE OBSTRUCTIONS	

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AIP NO. 3-25-0015-23-2018

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DESIGNED BY	ID
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DATE	SEPT, 2018

GRAPHIC SCALE
0 100 200
SCALE: 1" = 100'

SHEET TITLE
EXISTING PART 77 APPROACH SURFACES FOR RUNWAY 6-24

DRAWING NO.
FIG. 5-2

5.1.2.7 Non-Precision Instrument Runway Part 77 Requirements

The FAA Part 77 dimensional standards for a Non-Precision Instrument Runway and their compliance status for Runway 6-24 at the Airport is shown in Table 5-5.

Table 5-5: Non-Precision Instrument Runway Part 77 Compliance

Protected Surfaces		*Dimensions (Non-precision RW 6)*	*Dimensions (Non-precision RW 24)*	*Compliance*[5]
Primary Surface	Width	500’	500’	Clear
	Length beyond R/W End	200’	200’	
Approach				Vegetative, Telephone Pole, and Chimney/ Smokestack Obstructions
	Width at Inner end	500’	500’	
	Width at Outer end	2,000’	2,000’	
	Length	5,000’	5,000’	
	Slope	20:1	20:1	
Transitional surface slope		7:1	7:1	Clear
Horizontal surface radius		5,000’	5,000’	Clear
Conical surface	Slope	20:1	20:1	Clear
	From Edge of Horizontal Surface	4,000’	4,000’	

Source: Federal Regulation Title 14, Part 77, Safe Efficient Use and Preservation of the Navigable Airspace

Findings: Per the obstruction analysis, the approach surface dimensions required of an FAA Part 77, Non-Precision (straight-in) Instrument approach contain vegetative and man-made obstructions. Obstructions and near obstructions (within 10 feet of the approach surface) identified within the approach surface dimensions for a Non-Precision (straight-in) Instrument approach are as follows:

- **Vegetative obstructions and near obstructions on Airport property in the Runway 6 and 24 approaches.**

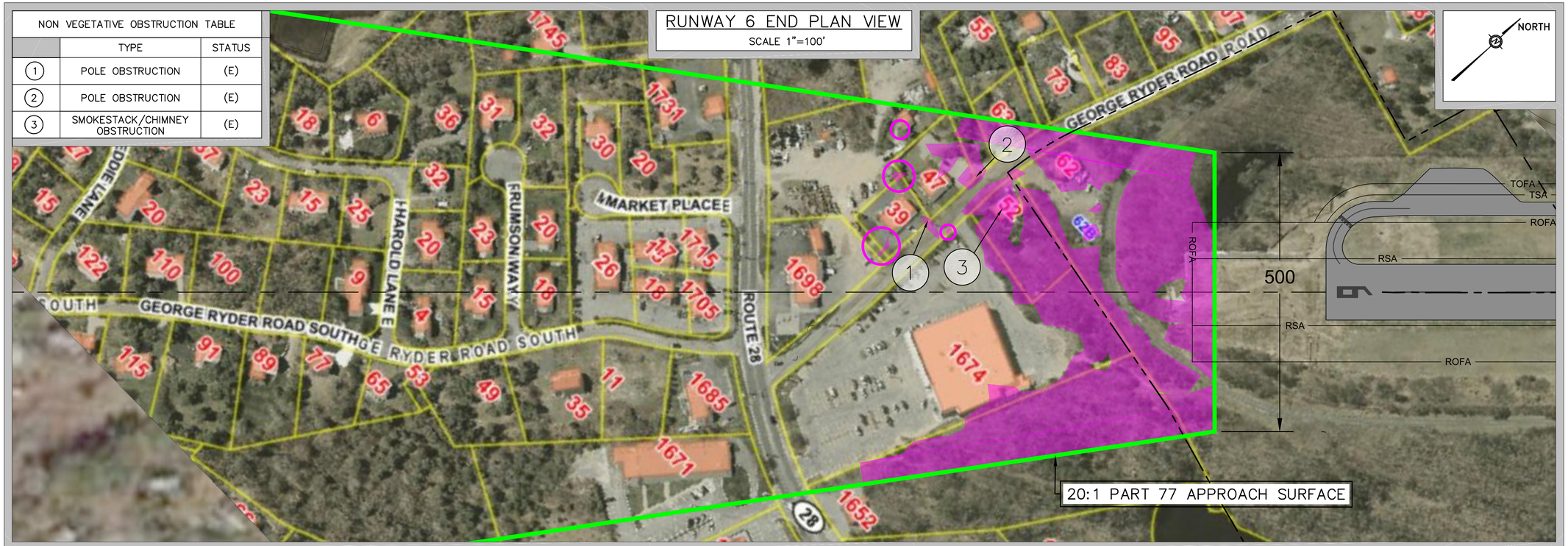
[5] A full obstruction analysis of Part 77 surfaces was outside of the scope of this Master Plan; however, at the time of the 2003 Airport Master Plan, Runway 6-24 was in full compliance with Part 77 requirements. It is assumed that, with the exception of the approach surface, Runway 6-24 remains in compliance with Part 77.

- **Pole obstruction and vegetative near obstructions on public roadways within the Runway 6 approach.**
- **Obstructions and near obstructions on approximately 3 residential properties within the Runway 6 approach, consisting of vegetation and 1 smokestack/ chimney.**
- **Vegetative obstructions and near obstructions on approximately 12 residential properties within the Runway 24 approach.**
- **Vegetative and pole obstructions and near obstructions on approximately 6 commercial properties within the Runway 6 approach.**
- **Vegetative obstructions and near obstructions on public roadways within the Runway 24 approach surface.**
- **Vegetative near obstructions on approximately 1 vacant property within the Runway 24 approach.**

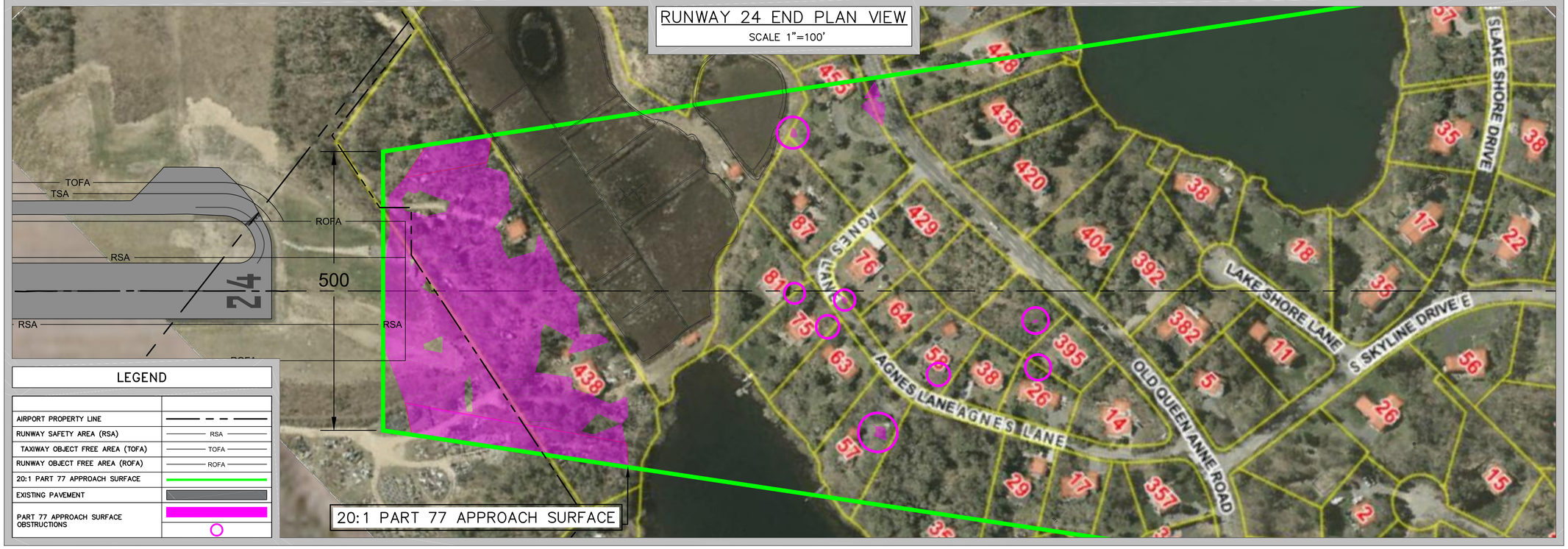
For a graphic representation of the obstructions referenced above, refer to Figure 5-3.

NON VEGETATIVE OBSTRUCTION TABLE		
	TYPE	STATUS
1	POLE OBSTRUCTION	(E)
2	POLE OBSTRUCTION	(E)
3	SMOKESTACK/CHIMNEY OBSTRUCTION	(E)

RUNWAY 6 END PLAN VIEW
SCALE 1"=100'



RUNWAY 24 END PLAN VIEW
SCALE 1"=100'



LEGEND	
AIRPORT PROPERTY LINE	
RUNWAY SAFETY AREA (RSA)	RSA
TAXIWAY OBJECT FREE AREA (TOFA)	TOFA
RUNWAY OBJECT FREE AREA (ROFA)	ROFA
20:1 PART 77 APPROACH SURFACE	
EXISTING PAVEMENT	
PART 77 APPROACH SURFACE OBSTRUCTIONS	

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GRAPHIC SCALE
0 100 200
SCALE: 1" = 100'

SHEET TITLE
PART 77 NON-PRECISION (STRAIGHT-IN) INSTRUMENT APPROACH SURFACES FOR RUNWAY 6-24

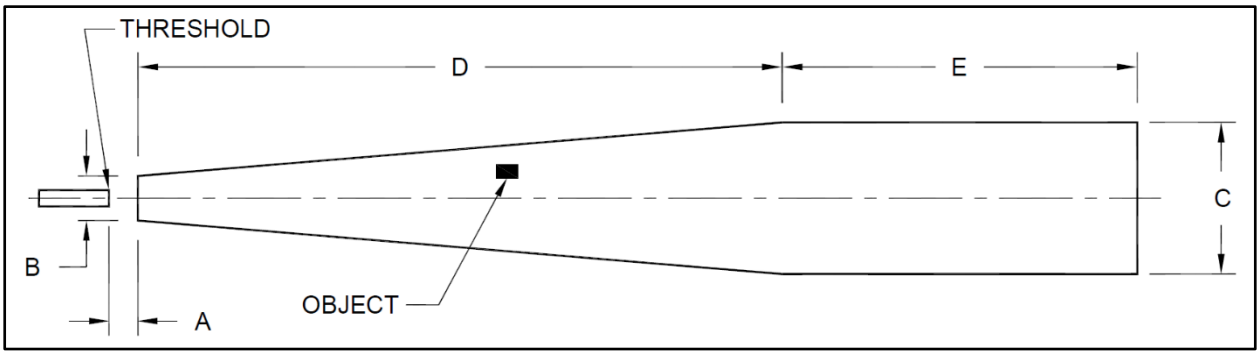
DRAWING NO.
FIG 5-3

5.1.2.8 Existing TERPS Approach Requirements

FAA Order 8260.3D, *United States Standards for Terminal Instrument Procedures (TERPS)*, contains the criteria used to formulate, review, approve, and publish procedures for instrument flight operations to and from civil and military airports. TERPS regulations recommend minimum obstacle clearances considered by the FAA to supply a satisfactory level of vertical protection to aircraft approaching the Airport. These are not requirements, but rather guidelines for enhancing aircraft safety. Table 5-6 shows the dimensional standards for the existing TERPS approach surfaces.

Table 5-6: Approach/Departure Standards Table for Type 2 Runways

		Dimensional Standards				
Runway Type 2		*Start of Surface (A)*	*Inner Width (B)*	*Outer Width (C)*	Length (D & E)	*Slope*
6-24	Approach end of runways expected to serve small airplanes with approach speeds of 50 knots or more. (Visual runways only, day/night).	Threshold	250’	700’	(D) 2,250’ (E) 2,750’	20:1



Source: AC 150/5300-13A, Table 3-2 Approach/Departure Standards Table & Figure 3-2 Threshold Siting Based on Approach Slope

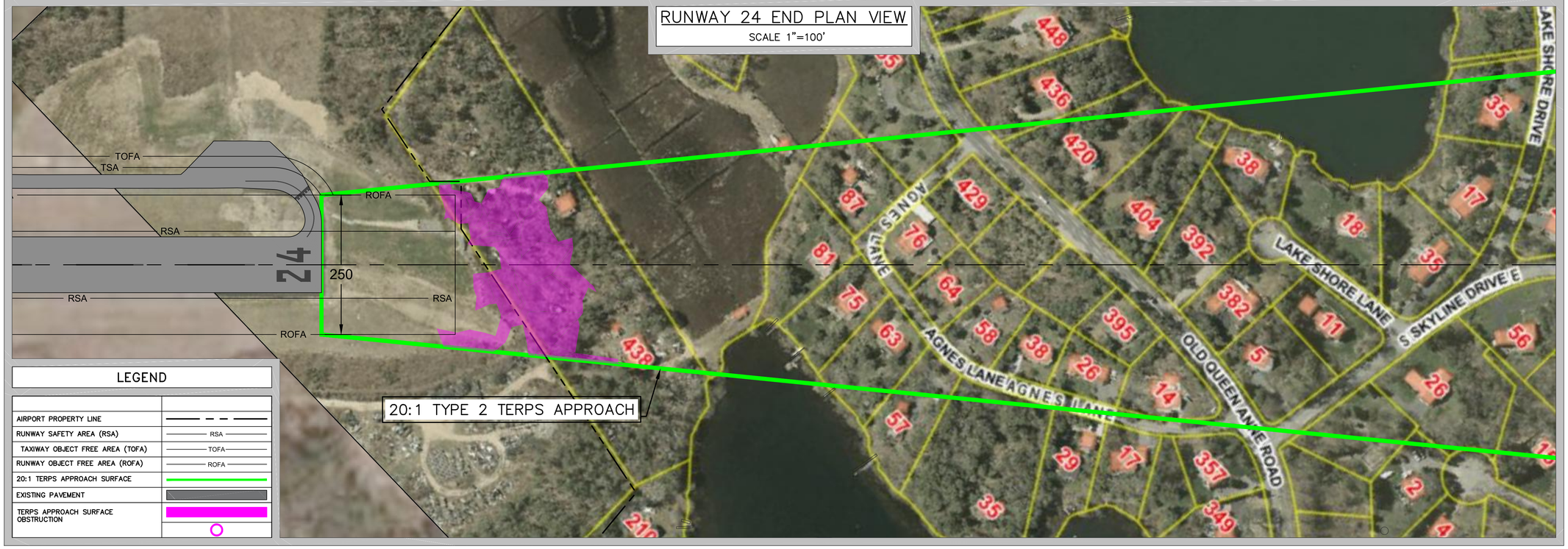
Findings: Per the obstruction analysis, the TERPS approach surface dimensions for Runway 6-24 contain vegetative and man-made obstructions. Obstructions and near obstructions (within 10 feet of the approach surface) identified within the dimension of the existing TERPS approach are as follows:

- **Vegetative obstructions and near obstructions on Airport property in the Runway 6 and 24 approaches.**
- **Vegetative obstructions and near obstructions on approximately 2 commercial properties within the Runway 6 approach.**
- **Vegetative obstructions and near obstructions on approximately 1 residential property within the Runway 6 approach and 1 residential property within the Runway 24 approach.**

For a graphic representation of the obstructions referenced above, refer to Figure 5-4.

RUNWAY 6 END PLAN VIEW
SCALE 1"=100'

RUNWAY 24 END PLAN VIEW
SCALE 1"=100'



LEGEND

AIRPORT PROPERTY LINE	
RUNWAY SAFETY AREA (RSA)	RSA
TAXIWAY OBJECT FREE AREA (TOFA)	TOFA
RUNWAY OBJECT FREE AREA (ROFA)	ROFA
20:1 TERPS APPROACH SURFACE	
EXISTING PAVEMENT	
TERPS APPROACH SURFACE OBSTRUCTION	

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0 100 200
SCALE: 1" = 100'

SHEET TITLE
EXISTING TERPS APPROACH SURFACES FOR RUNWAY 6-24

DRAWING NO.
FIG. 5-4

5.1.2.9 TERPS Approach Requirements for Instrument Night Operations (Category A and B Aircraft Only)

As discussed in Section 5.1.2.3, *Runway Approach Requirements*, the Airport wishes to publish a non-precision (straight-in, instrument) approach to Runway 6-24 for the purposes of reducing visibility minimums, enhancing public and airport safety, and maximizing the utility of the airport, particularly in less than ideal weather conditions. In order to achieve this, the Airport must, at a minimum, clear any obstructions identified within the TERPS approach surface (Type 4). As a part of this Master Plan, an Aeronautical Survey was conducted to identify obstructions to the TERPS approach surface (Type 4). Table 5-7 shows the dimensional standards for the TERPS surface required to publish a non-precision (straight-in, instrument) approach at CQX.

Table 5-7: Approach/Departure Standards Table for Type 4 Runways

		Dimensional Standards				
Runway Type 4		*Start of Surface (A)*	*Inner Width (B)*	*Outer Width (C)*	Length (D & E)	*Slope*
6-24	Approach end of runways expected to support instrument night operations, serving approach Category A and B aircraft only.	200’ from the Threshold	400’	3,400’	(D) 10,000’ (E) 0’	20:1

Source: AC 150/5300-13A, Table 3-2 Approach/Departure Standards Table

Findings: Per the obstruction analysis, the TERPS approach surface dimensions required to support instrument night operations, serving Category A and B aircraft contain vegetative and man-made obstructions. Obstructions and near obstructions (within 10 feet of the approach surface) identified within the TERPS (Type 4) approach are as follows:

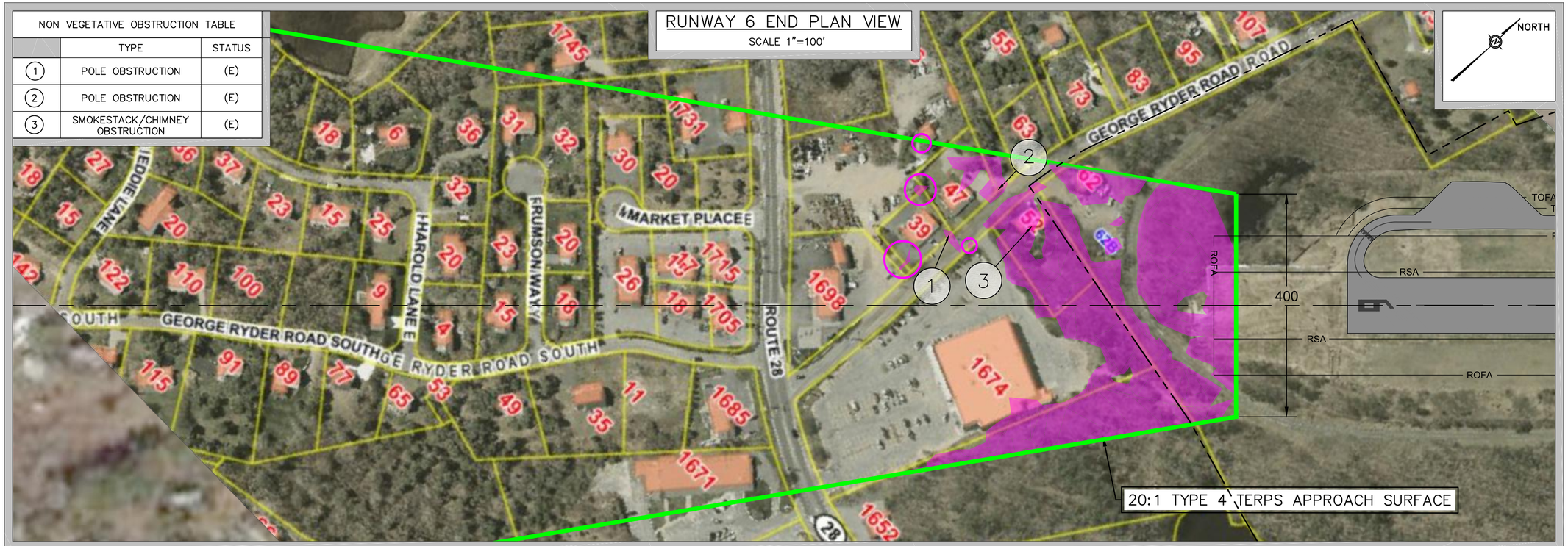
- **Vegetative obstructions and near obstructions on Airport property in the Runway 6 and 24 approaches.**
- **Pole obstruction and vegetative near obstructions on public roadways within the Runway 6 approach.**
- **Obstructions and near obstructions on approximately 2 residential properties within the Runway 6 approach, consisting of vegetation and 1 chimney/smokestack.**
- **Vegetative obstructions and near obstructions on approximately 12 residential properties within the Runway 24 approach.**
- **Vegetative obstructions and near obstructions on approximately 6 commercial properties within the Runway 6 approach.**

- **Vegetative obstructions and near obstructions on public roadways within the Runway 6 approach.**
- **Vegetative obstructions and near obstructions on public roadways within the Runway 24 approach.**
- **Vegetative near obstructions on approximately 1 vacant property within the Runway 24 approach.**

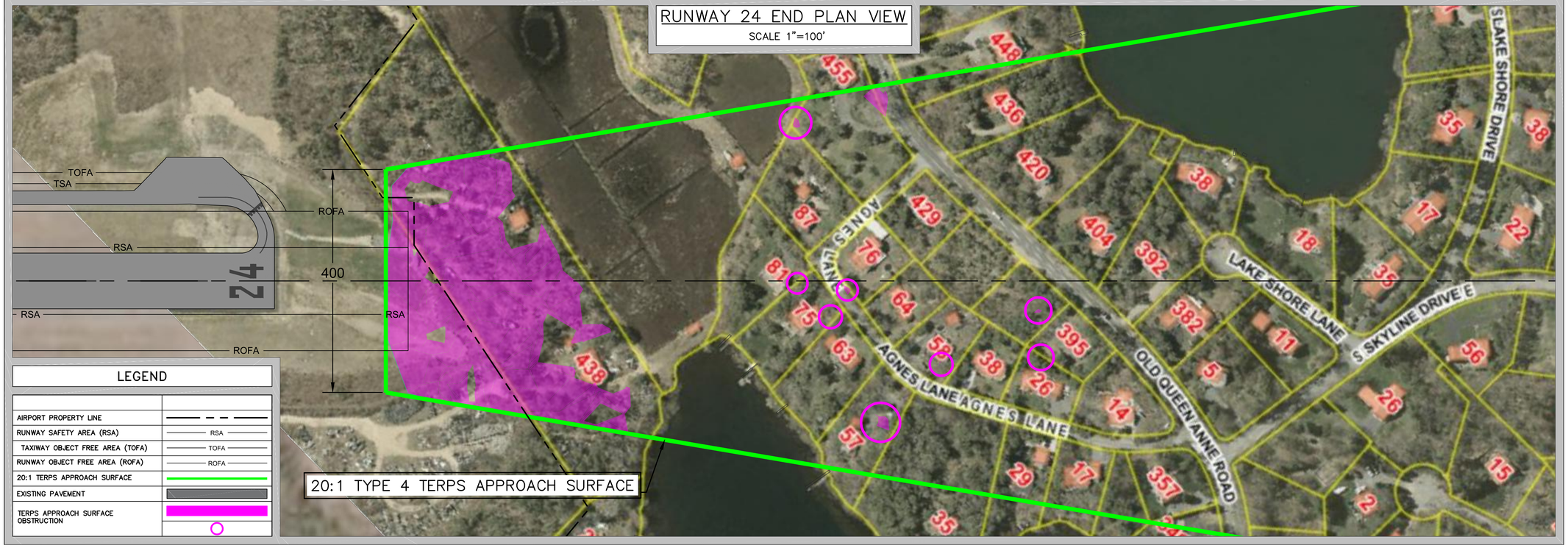
For a graphic representation of the obstructions referenced above, refer to Figure 5-5.

NON VEGETATIVE OBSTRUCTION TABLE		
	TYPE	STATUS
1	POLE OBSTRUCTION	(E)
2	POLE OBSTRUCTION	(E)
3	SMOKESTACK/CHIMNEY OBSTRUCTION	(E)

RUNWAY 6 END PLAN VIEW
SCALE 1"=100'



RUNWAY 24 END PLAN VIEW
SCALE 1"=100'



LEGEND	
AIRPORT PROPERTY LINE	
RUNWAY SAFETY AREA (RSA)	RSA
TAXIWAY OBJECT FREE AREA (TOFA)	TOFA
RUNWAY OBJECT FREE AREA (ROFA)	ROFA
20:1 TERPS APPROACH SURFACE	
EXISTING PAVEMENT	
TERPS APPROACH SURFACE OBSTRUCTION	

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PROJECT
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AIP NO. 3-25-0015-23-2018

OWNER
CHATHAM MUNICIPAL AIRPORT
TOWN OF CHATHAM, MASSACHUSETTS

NO.	DATE	DESCRIPTION	BY

PROJECT NO.	777064
DESIGNED BY	ID
DRAWN BY	ID
CHECKED BY	MPC
DATE	SEPT, 2018

GRAPHIC SCALE
0 100 200
SCALE: 1" = 100'

SHEET TITLE

TERPS APPROACH FOR INSTRUMENT NIGHT OPERATIONS SERVING A AND B AIRCRAFT FOR RUNWAY 6-24

DRAWING NO.

FIG. 5-5

5.1.2.10 Glideslope Qualification Surface

Clearing to TERPS approach Type 4 or Part 77 standards as outlined in Sections 5.1.2.7 and 5.1.2.9, respectively, would allow the Airport to pursue non-precision approaches without vertical path guidance. If the Airport wishes to establish non-precision approaches with vertical path guidance, clearing additional obstructions contained within the Glideslope Qualification Surface (GQS), as defined by AC 150/5300-13A, Table 3-2, Type 8, would be required. Table 5-8 defines the dimensional standards for the GQS.

Table 5-8: Approach/Departure Standards Table for Type 8 Runways

		Dimensional Standards				
Runway Type 8		*Start of Surface (A)*	*Inner Width (B)*	*Outer Width (C)*	Length (D & E)	*Slope*
6-24	Approach end of runways expected to accommodate approaches with vertical guidance (Glide Path Qualification Surface [GQS])	Threshold	Runway Width plus 200’	1,520’	(D) 10,000’ (E) 0’	30:1

Source: AC 150/5300-13A, Table 3-2 Approach/Departure Standards Table

Findings: Per the obstruction analysis, the TERPS approach surface dimensions required to support a non-precision approach with vertical path guidance contain vegetative and man-made obstructions. In addition to clearing obstructions contained within the Part 77 or TERPS Type 4 approach surface, the Airport must mitigate the following additional obstructions identified within the TERPS Type 8 (GQS) surface:

- **Vegetative obstructions on public roadways within the Runway 6 approach.**
- **Vegetative obstructions and near obstructions on 3 commercial properties within the Runway 6 approach.**
- **Vegetative obstructions and near obstructions on public roadways within the Runway 24 approach.**
- **Vegetative obstructions and near obstructions on 21 residential properties within the Runway 24 approach.**

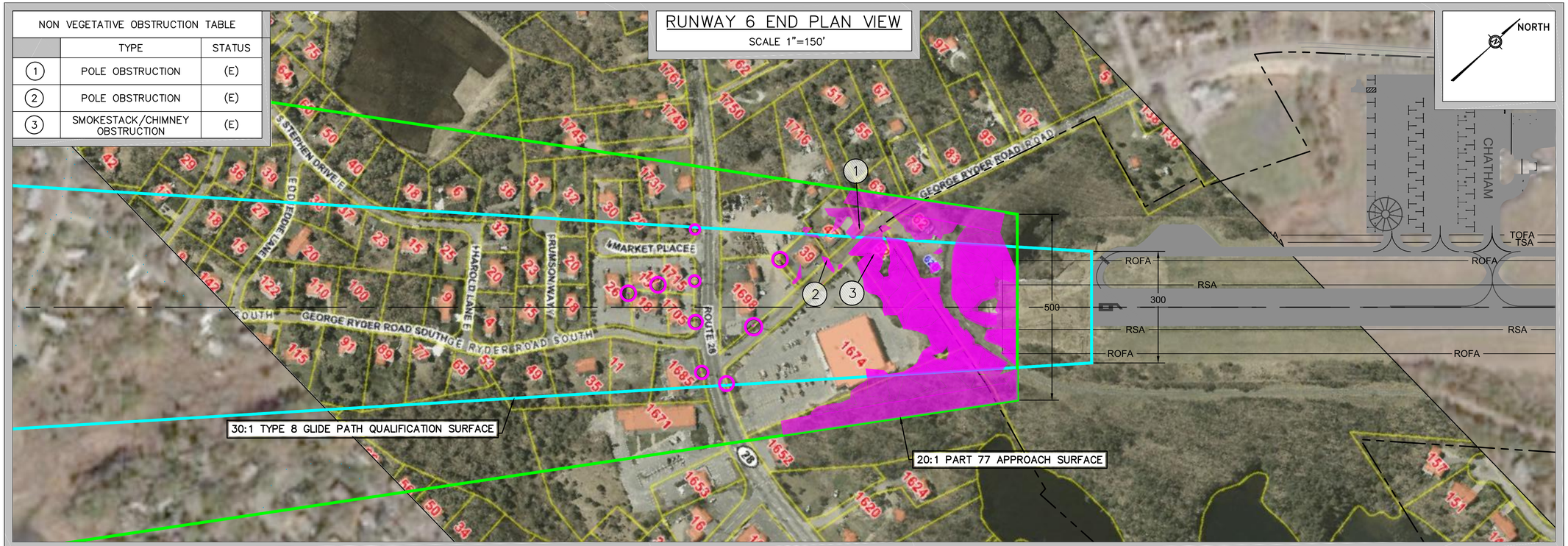
For a graphic representation of obstructions identified within the GQS and Part 77 approach surfaces, refer to Figure 5-6.

FAA AC 150/5300-13A provides guidance regarding minimum standards for publishing approach procedures with vertical guidance. In addition to clear approaches, as identified above, these standards require runways that:

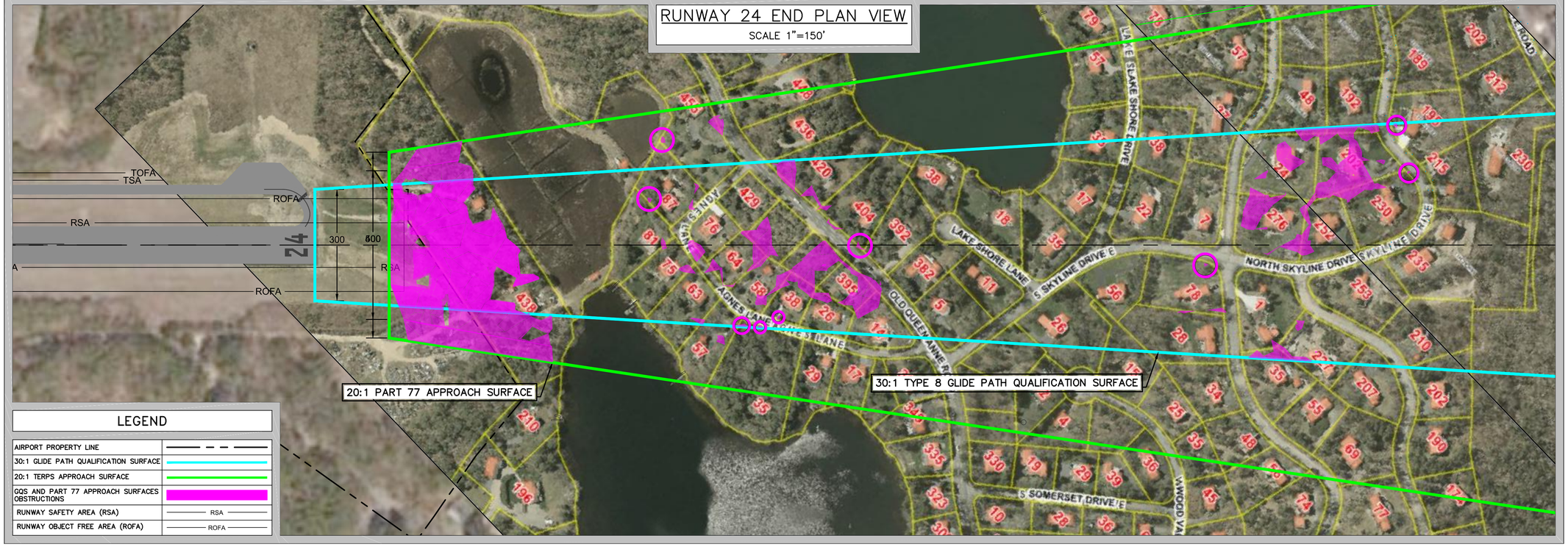
- **Are at least 3,200 feet in length**
- **Have at least MIRLS**
- **Have non-precision runway markings**

NON VEGETATIVE OBSTRUCTION TABLE		
	TYPE	STATUS
(1)	POLE OBSTRUCTION	(E)
(2)	POLE OBSTRUCTION	(E)
(3)	SMOKESTACK/CHIMNEY OBSTRUCTION	(E)

RUNWAY 6 END PLAN VIEW
SCALE 1"=150'



RUNWAY 24 END PLAN VIEW
SCALE 1"=150'



LEGEND	
AIRPORT PROPERTY LINE	
30:1 GLIDE PATH QUALIFICATION SURFACE	
20:1 TERPS APPROACH SURFACE	
GQS AND PART 77 APPROACH SURFACES OBSTRUCTIONS	
RUNWAY SAFETY AREA (RSA)	RSA
RUNWAY OBJECT FREE AREA (ROFA)	ROFA

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CHECKED BY	MPC
DATE	SEPT, 2018

GRAPHIC SCALE
0 150 300
SCALE: 1" = 150'

SHEET TITLE
GLIDESLOPE QUALIFICATION SURFACE (GQS) AND PART 77 NON-PRECISION INSTRUMENT APPROACH - RUNWAY 6-24

DRAWING NO.
FIG. 5-6

- OF 8

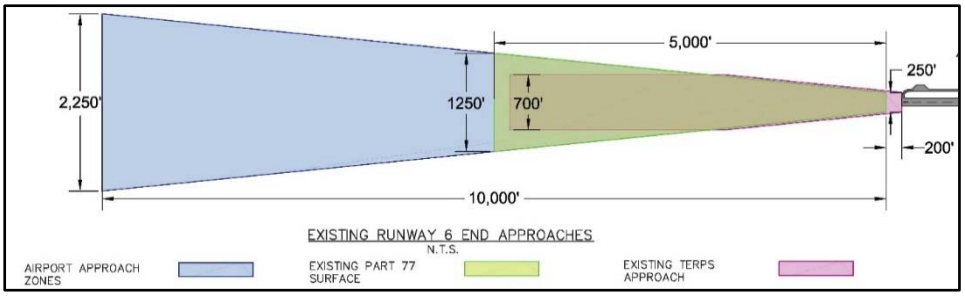
3/20/2019 4:00:30 PM U:\777064 COX AMPU_MPC\Obstruction Analysis\Obstruction Drawings\07-777064-COX-ALP-Proposed GQS and PART 77 approaches.dwg (ID)

5.1.2.11 Airport Approach Zones

Last updated in May 1997, the Town has Airport Approach Protection bylaws in place to regulate the allowable height of structures within the defined Airport Approach Zone, which is depicted in the Town's Map of Approach Zones, dated February 1958. The zones begin 200 feet from the end of each runway end at a width of 250 feet, expanding uniformly to a width of 2,250 feet for a distance of 10,000 feet. The allowable height within this zone is defined as "1/20 of the shortest horizontal distance from the structure or tree (or any part thereof) to a line 200 feet outward from and parallel to the end of the runway within the approach zone in which the structure or tree is located." (e.g. a tree located 200 feet from the beginning of the Airport Approach Zone may be no more than 10 feet tall). These bylaws prohibit any structure to be erected or tree permitted to grow at a height exceeding the elevation prescribed above and require that any structure or tree not conforming to these regulations be removed or lowered.

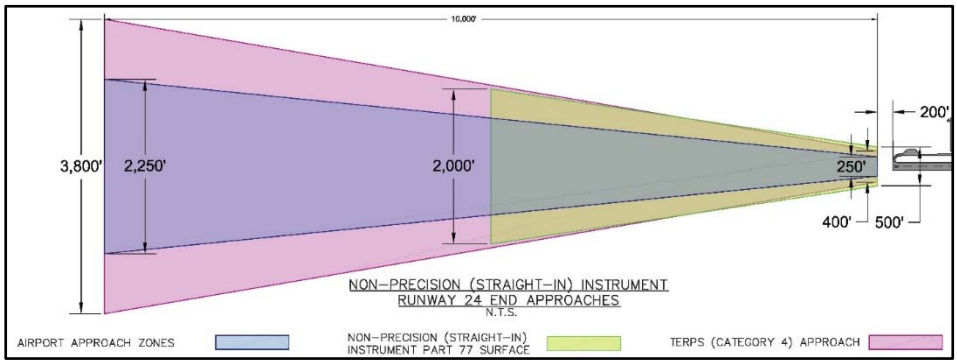
A comparison of the Town's Airport Approach Zone to existing Part 77 and TERPS surfaces requirements can be found in Figure 5-7 below. The Runway 6 end has been used as the example as the approach surfaces for both runway ends have the same dimensions. As shown in Figure 5-7, the existing TERPS surface requirements are more restrictive than the Town's Airport Approach Zone. However, the existing Part 77 surface requirements are contained within the Town's Airport Approach Zone.

Figure 5-7: Existing Runway 6 End Approaches



A comparison of the Town's Airport Approach Zone against the requirements necessary to satisfy a Non-Precision (straight-in) Instrument approach (either Part 77 or TERPS Type 4) is illustrated in Figure 5-8 below. The Runway 6 end has been used as the example as the approach surfaces for both runway ends have the same dimensions. As shown in Figure 5-8, both the TERPS Type 4 and Part 77 surface requirements to support a Non-Precision (straight-in) Instrument approach are far more restrictive than the Town's Airport Approach Zone.

Figure 5-8: Non-Precision (Straight-In) Instrument Runway 6 End Approaches[6]



5.1.2.12 Approach Recommendations

As discussed in *Section 5.1.2.4*, the airspace surrounding public use airports is governed by *14 CFR, Federal Regulation (FAR) Part 77- Objects Affecting Navigable Airspace* (Part 77), which defines imaginary protected surfaces. According to these regulations, airports accepting federal funding must make "all reasonable efforts" to keep Part 77 surfaces clear of obstructions. Additional regulations surrounding airport airspace can be found in *FAA Order 8260.3D, United States Standards for Terminal Instrument Procedures (TERPS)*, which specifies the minimum measure of obstacle clearance considered by FAA to supply a satisfactory level of vertical protection. Clearing to these standards allows airports to publish instrument approach procedures. Currently, the Airport has NDB and RNAV (GPS) circling approach procedures. In the interest of public and airport user safety and to maximize the utility of the airport, particularly in less than ideal weather conditions, it is the Airport's wish to publish a non-precision (straight-in, instrument) approach to Runway 6-24, with lower minimums.

Findings: Sections 5.1.2.6 through 5.1.2.11 of this Chapter identified the obstructions to various approach surfaces, which are illustrated in Table 5-9 below:

Table 5-9: Approach Obstruction Findings

	Existing Part 77	*Part 77 with a Non-Precision Approach*	Existing TERPS	TERPS with a Non-Precision Approach	Glideslope Qualification Surface (GQS)*
Private Parcels Containing Vegetative Obstructions (and near obstructions)	16	22	4	21	24*
Private Parcels Containing Man-Made Obstructions	1	1	0	1	0*
Public ROW Containing Obstructions	1	2	0	2	1*

[6] Per FAA Memorandum issued September 20, 2018, Approach and Departure Standards were updated and included a change to Type 4 Runway dimensions from an outer width of 3,800 feet to an outer width of 3,400 feet.

*In order to satisfy GQS requirements, the Airport must clear obstructions identified within the TERPS Non-Precision Approach **OR** Part 77 Non-Precision Approach **PLUS** obstructions identified within the GQS.

- **In addition to the obstructions listed in Table 5-9, all approach scenarios include vegetative obstructions and near obstructions on Airport property.**
- **Existing Airport Approach Zone dimensions contained within the Town's bylaws appear to be dated, as they do not conform with existing TERPS approach requirements, nor do they support the Part 77 and/or TERPS (Type 4) approach surface requirements necessary to support a non-precision (straight-in) instrument approach. They do, however, appear to satisfy the existing Part 77 dimensional requirements.**

Recommendation: Efforts to obtain approximately 22 avigation easements, including coordination of lighting and/or removing pole obstructions and mitigating one smokestack/chimney obstruction, required to clear the Airport's Part 77 approach surface will have a similar impact on the local community (including costs associated), as pursuing efforts necessary (approximately 21 easements) to clear to TERPS (Type 4) standards. Additionally, Part 77 standards are the most restrictive, and therefore provide the greatest level of protection to approaching aircraft.

It is recommended that the Airport work with FAA and MassDOT/AD to determine the best course of action for obtaining a non-precision (straight-in, instrument) approach to the Runway 6-24, while minimizing community disruption. Further, the Airport should coordinate with Town legal counsel to determine Airport Approach Zone clearing rights and propose any recommended Airport Approach Zone bylaw edits to Town Counsel to conform with future published approaches.

5.1.2.13 Runway Pavement Conditions

Runway 6-24 was last reconstructed in 2009 and included removal of 50 feet of pavement from the Runway 24 end, construction of an additional 50 feet of pavement at the Runway 6 end, removal and construction of the lead-in portions of Taxiway 'A' at both runway ends, and reconstruction of portions of stub taxiways to conform to new runway elevations. Runway 6-24 is eligible for reconstruction in 2029.

The Massachusetts Department of Transportation, Aeronautics Division (MassDOT/AD) conducts pavement inspections of public-use airports every three years to analyze pavement conditions and publish findings for pavement management planning purposes. These results are posted on MassDOT/AD's Airport Pavement Management System (APMS) website[7], which provides a pavement conditions rating for each segment of pavement at every public-use airport in Massachusetts. MassDOT/AD's APMS uses the rating scale contained in FAA AC 150/5380-7B, Airport Pavement Management Program (PMP), which is summarized in Table 5-10 below:

[7] https://www.appliedpavement.com/hosting/massachusetts/airport-details/airport-details.html

Table 5-10: MassDOT/AD Pavement Condition Management Program Rating Scale

Condition	*Rating Number*
Good	*100-86*
Satisfactory	*85-71*
Fair	*70-56*
Poor	*55-41*
Very Poor	*40-26*
Serious	*25-11*
Failed	*10-0*

Source: FAA AC 150/5380-7B, MassDOT/AD Pavement Management System

The results contained in MassDOT/AD's APMS are the basis for all pavement maintenance and rehabilitation recommendations made within this chapter (see Figure 5-9). The APMS evaluated Runway 6-24 at a rating of 76 (Satisfactory) in 2016 and projects deterioration of the Runway to a 65 (Fair) rating by 2022. According to the APMS, any runway with a PCI below 75 is considered to be below "critical PCI" and requires major rehabilitative actions, such as overlay or reconstruction.

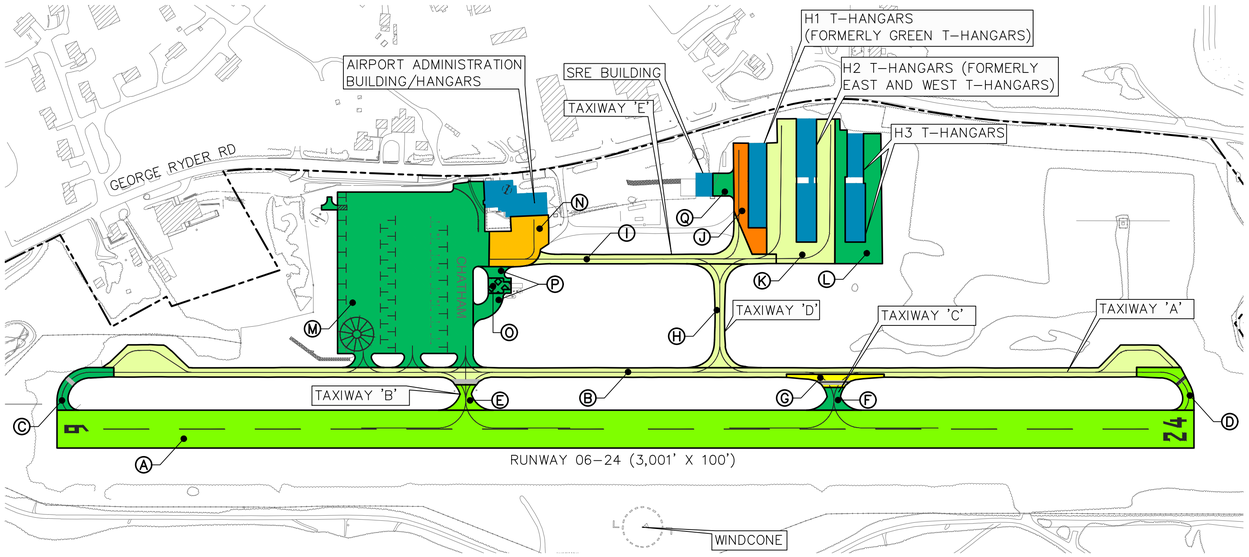
Recommendations: In an effort to prolong the useful life of Runway 6-24, the Airport should schedule maintenance and preservation treatments to extend the life of the pavement (e.g. preservative treatments, crack sealing, replacement of failed sealant, etc.). Further, the Airport should schedule the reconstruction of Runway 6-24 on its CIP when it becomes eligible for reconstruction.

5.1.3 TAXIWAY CAPACITY

Taxiway capacity calculations are typically computed only at airports where aircraft operational demand levels are very high and have taxiways that cross active runways where a capacity-limiting condition would exist. Since these situations aren't applicable at CQX, taxiway capacities are considered adequate through the planning period.

The Airport has a system of five taxiways ('A', 'B', 'C', 'D', and 'E'), plus three taxilanes (H1, H2, and H3), which are further described in the following sections. Taxiway design requirements are defined according to the guidelines contained in AC 150/5300-13A, which classifies taxiways into different Taxiway Design Groups (TDG), based on the dimensions of the airport's design aircraft. Design dimensions include cockpit to main gear length and main gear width. CQX uses dimensions from the Beech Baron B-58 (8.0 ft. cockpit to main gear and 9.58 ft. main gear width) to calculate its TDG[8]. Based on this information, CQX is categorized under TDG A1, and all taxiways at the Airport have been designed according to those standards, as outlined below.

[8] FAA AC 150/5300-13A, Figure 1-1, Taxiway Design Groups (TDGs)

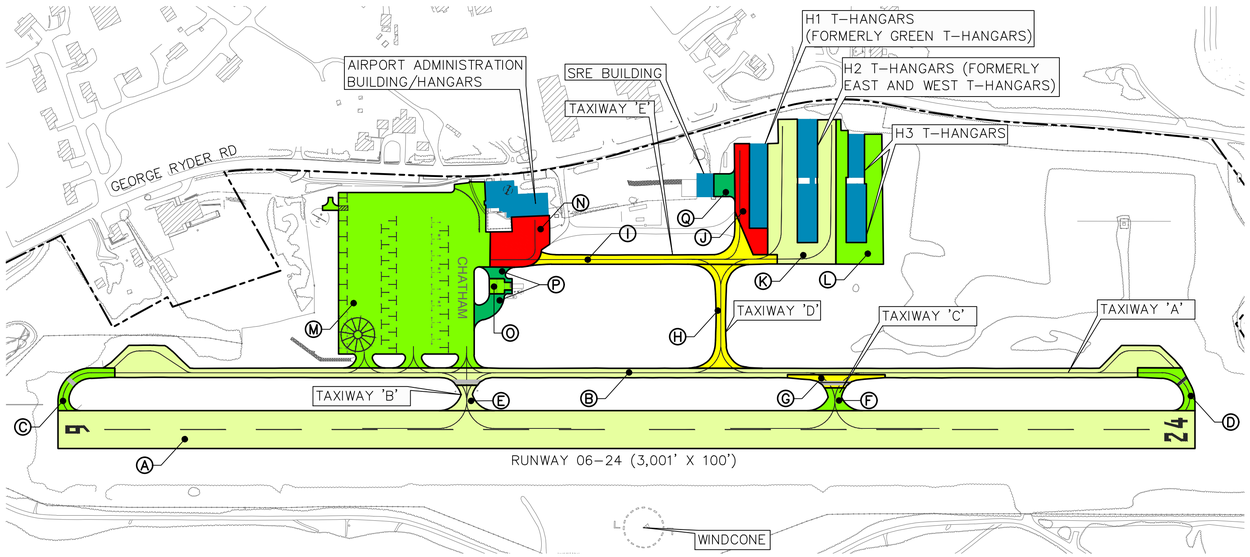


MASSDOT/AD PAVEMENT MANAGEMENT SYSTEM – PAVEMENT CONDITIONS 2016

SCALE: 1" = 200'

PCI PAVEMENT CONDITIONS – 2016:

- (A) **RUNWAY 06-24:** –THE PAVEMENT PCI IN 2016: 76
- (B) **TAXIWAY 'A' – PARALLEL SECTION:** –THE PAVEMENT PCI IN 2016: 66
- (C) **TAXIWAY 'A' – SOUTHWEST SECTION:** –THE PAVEMENT PCI IN 2016: 90
- (D) **TAXIWAY 'A' – NORTHEAST SECTION:** –THE PAVEMENT PCI IN 2016: 85
- (E) **TAXIWAY 'B':** –THE PAVEMENT PCI IN 2016: 73
- (F) **TAXIWAY 'C' – SOUTHEAST SECTION:** –THE PAVEMENT PCI IN 2016: 89
- (G) **TAXIWAY 'C' – NORTHWEST SECTION:** –THE PAVEMENT PCI IN 2016: 51
- (H) **TAXIWAY 'D':** –THE PAVEMENT PCI IN 2016: 59
- (I) **TAXIWAY 'E':** –THE PAVEMENT PCI IN 2016: 60
- (J) **TAXILANE WEST OF H1 T-HANGAR:** –THE PAVEMENT PCI IN 2016: 14
- (K) **TAXILANES AROUND H2 T-HANGAR:** –THE PAVEMENT PCI IN 2016: 70
- (L) **TAXILANES AROUND H3 T-HANGAR:** –THE PAVEMENT PCI IN 2016: 89
- (M) **MAIN APRON:** –THE PAVEMENT PCI IN 2016: 94
- (N) **TERMINAL APRON:** –THE PAVEMENT PCI IN 2016: 29
- (O) **FUEL APRON:** –THE PAVEMENT PCI IN 2016: 93
- (P) **ACCESS ROAD TO FUEL APRON:** –THE PAVEMENT PCI IN 2016: 98
- (Q) **SRE DRIVEWAY:** –THE PAVEMENT PCI IN 2016: 100



MASSDOT/AD PAVEMENT MANAGEMENT SYSTEM – PAVEMENT CONDITIONS 2022

SCALE: 1" = 200'

PCI PAVEMENT CONDITIONS – 2022:

- (A) **RUNWAY 06-24:** –PROJECTED PAVEMENT PCI IN 2022: 65
- (B) **TAXIWAY 'A' – PARALLEL SECTION:** –PROJECTED PAVEMENT PCI IN 2022: 56
- (C) **TAXIWAY 'A' – SOUTHWEST SECTION:** –PROJECTED PAVEMENT PCI IN 2022: 80
- (D) **TAXIWAY 'A' – NORTHEAST SECTION:** –PROJECTED PAVEMENT PCI IN 2022: 75
- (E) **TAXIWAY 'B':** –PROJECTED PAVEMENT PCI IN 2022: 63
- (F) **TAXIWAY 'C' – SOUTHEAST SECTION:** –PROJECTED PAVEMENT PCI IN 2022: 79
- (G) **TAXIWAY 'C' – NORTHWEST SECTION:** –PROJECTED PAVEMENT PCI IN 2022: 41
- (H) **TAXIWAY 'D':** –PROJECTED PAVEMENT PCI IN 2022: 49
- (I) **TAXIWAY 'E':** –PROJECTED PAVEMENT PCI IN 2022: 50
- (J) **TAXILANE WEST OF H1 T-HANGAR:** –PROJECTED PAVEMENT PCI IN 2022: 0
- (K) **TAXILANES AROUND H2 T-HANGAR:** –PROJECTED PAVEMENT PCI IN 2022: 58
- (L) **TAXILANES AROUND H3 T-HANGAR:** –PROJECTED PAVEMENT PCI IN 2022: 79
- (M) **MAIN APRON:** –PROJECTED PAVEMENT PCI IN 2022: 84
- (N) **TERMINAL APRON:** –PROJECTED PAVEMENT PCI IN 2022: 0
- (O) **FUEL APRON:** –PROJECTED PAVEMENT PCI IN 2022: 84
- (P) **ACCESS ROAD TO FUEL APRON:** –PROJECTED PAVEMENT PCI IN 2022: 90
- (Q) **SRE DRIVEWAY:** –PROJECTED PAVEMENT PCI IN 2022: 95

PCI LEGEND:

86–100	71–85	56–70	41–55	26–40	11–25	0–10

NOTES:

1. PCI NUMBERS TAKEN FROM STATEWIDE AIRPORT PAVEMENT MANAGEMENT SYSTEM SUMMARY WEBSITE "WWW.APPLIEDPAVEMENT.COM".

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TOWN OF CHATHAM, MASSACHUSETTS

NO.	DATE	DESCRIPTION	BY

PROJECT NO.	777064
DESIGNED BY	DCQ
DRAWN BY	DCQ
CHECKED BY	MPC
DATE	SEPT, 2018

GRAPHIC SCALE
0 100 200 400
SCALE: 1" = 200'

SHEET TITLE
MASSDOT/AD PAVEMENT MANAGEMENT SYSTEM – PAVEMENT CONDITIONS 2016 AND 2022

DRAWING NO.
FIG 5-9

5.1.3.1 Taxiway 'A' Requirements

Taxiway 'A' is the Airport's full-length parallel taxiway. Last reconstructed in 1988, Taxiway 'A' is programmed for reconstruction during FY-2019. The project will include complete reconstruction of the existing parallel taxiway in its current location, reconstruction and reconfiguration of Taxiway 'B' to meet current FAA design standards, and reconstruction of Taxiway 'C', Taxiway 'D', Taxiway 'E', the Terminal Apron, and taxilane H1. Table 5-11 presents the design criteria for TDG-1A and existing Taxiway 'A' dimensions.

Table 5-11: Taxiway 'A' Compliance

Facility	Design Criteria	Dimensions
Taxiway Width	25'	25'
Taxiway Edge Safety Margin	5'	5'
Taxiway Safety Area	49'	49'
Taxiway Shoulder Width	10'	10' turf shoulder
Taxiway Object-Free Area Width	89'	89'
Taxiway Centerline to Runway Centerline Width	150'	150'

Source: AC 150/5300-13A

5.1.3.2 Taxiway 'B' Requirements

Taxiway 'B' is the connecting taxiway between the Main Apron and Runway 6-24. In its existing configuration, Taxiway 'B' provides direct access from the Main Apron to Runway 6-24 without requiring a turn. Such configuration, as noted by the FAA, can lead to confusion when a pilot typically expects to encounter a parallel taxiway but instead accidentally enters a runway. As recommended in FAA AC 150/5300-13A, existing geometry should be improved when feasible, with emphasis on "hot spots". The existing Taxiway 'B' geometry is being addressed to comply with FAA standards as part of the FY-2019 Taxiway 'A' reconstruction project. Table 5-12 presents the design criteria for TDG-1A and current Taxiway 'B' dimensions.

Table 5-12: Taxiway 'B' Compliance

Facility	Design Criteria	Current Compliance
Taxiway Width	25'	Varies (minimum 30')
Taxiway Edge Safety Margin	5'	5'
Taxiway Safety Area	49'	49'
Taxiway Shoulder Width	10'	10' turf shoulder
Taxiway Object-Free Area Width	89'	89'

Source: AC 150/5300-13A

5.1.3.3 Taxiway 'C' Requirements

Taxiway 'C' is the connecting taxiway between Taxiway 'A' and Runway 6-24, located approximately 950 feet from the Runway 24 end. Table 5-13 presents the design criteria for TDG-1A and current Taxiway 'C' dimensions.

Table 5-13: Taxiway 'C' Compliance

Facility	Design Criteria	Current Compliance
Taxiway Width	25'	Varies (minimum 35')
Taxiway Edge Safety Margin	5'	5'
Taxiway Safety Area	49'	49'
Taxiway Shoulder Width	10'	10' turf shoulder
Taxiway Object-Free Area Width	89'	89'

Source: AC 150/5300-13A

5.1.3.4 Taxiway 'D' Requirements

Taxiway 'D' is the connecting taxiway between Taxiway 'A' and the T-Hangar development, located approximately 1,250 feet from the Runway 24 end. Table 5-14 presents the design criteria for TDG-1A and current Taxiway 'D' dimensions.

Table 5-14: Taxiway 'D' Compliance

Facility	Design Criteria	Current Compliance
Taxiway Width	25'	Varies (minimum 25')
Taxiway Edge Safety Margin	5'	5'
Taxiway Safety Area	49'	49'
Taxiway Shoulder Width	10'	10' turf shoulder
Taxiway Object-Free Area Width	89'	89'

Source: AC 150/5300-13A

5.1.3.5 Taxiway 'E' Requirements

Taxiway 'E' is the connecting taxiway between Taxiway 'D' and the Main Apron and runs parallel to Taxiway 'A'. Table 5-15 presents the design criteria for TDG-1A and current Taxiway 'E' dimensions.

Table 5-15: Taxiway 'E' Compliance

Facility	Design Criteria	Current Compliance
Taxiway Width	25'	Varies (minimum 25')
Taxiway Edge Safety Margin	5'	5'
Taxiway Safety Area	49'	49'
Taxiway Shoulder Width	10'	10' turf shoulder
Taxiway Object-Free Area Width	89'	89'

Source: AC 150/5300-13A

5.1.3.6 Taxiway and Taxilane Pavements

Table 5-16 below outlines the dimensions, type of pavement, and year of construction or most recent major rehabilitation of each taxiway and taxilane.

Table 5-16: Taxiway and Taxilane Pavements

Taxiway/Taxilane	Dimension	Type of Pavement	Year of Construction or Most Recent Major Rehab.
Taxiway 'A'	2,932 LF x 25 FT	Flexible	1988
Taxiway 'B'	150 LF x 35 FT	Flexible	1988
Taxiway 'C'	80 LF x 35 FT	Flexible	1988
Taxiway 'D'	275 LF x 25 FT	Flexible	1998
Taxiway 'E'	1,040 x 25 FT	Flexible	1998
H1 Taxilane	Approx. 11,500 SF	Flexible	1984
H2 Taxilane	Approx. 47,400 SF	Flexible	1999
H3 Taxilane	Approx. 31,500 SF	Flexible	2006

Source: Gale Associates Analysis 2017

According to the MassDOT/AD APMS, any taxiway with a PCI below 70 is considered to be below "critical PCI" and requires major rehabilitative actions. According to the MassDOT/AD, pavement ratings of the taxiways and taxilanes at CQX are as follows (see Figure 5-9):

- **Taxiway 'A':** The parallel segment of Taxiway 'A' (approximately 2,800 LF) was evaluated at a rating of 66 (Fair condition) in 2016 and is projected to deteriorate to a rating of 56 (Fair condition) by 2022. The Runway 6 end of Taxiway 'A' was evaluated at a rating of 90 (Good condition) in 2016 and is projected to deteriorate to a rating of 80 (Satisfactory condition) by 2022. The Runway 24 end of Taxiway 'A' was evaluated at a rating of 85 (Satisfactory condition) in 2016 and is projected to deteriorate to a rating of 75 (Satisfactory condition) by 2022.
- **Taxiway 'B':** Taxiway 'B' was evaluated at a rating of 73 (Satisfactory condition) in 2016 and is projected to deteriorate to a rating of 63 (Fair condition) by 2022.
- **Taxiway 'C':** The portion of Taxiway 'C' connecting to Runway 6-24 was evaluated at a rating of 89 (Good condition) in 2016 and is projected to deteriorate to a rating of 79 (Fair condition) by 2022. The portion of Taxiway 'C' connecting to Taxiway 'A' was evaluated at a rating of 51 (Poor condition) in 2016 and is projected to deteriorate to a rating of 41 (Poor condition) by 2022.
- **Taxiway 'D' :** Taxiway 'D' was evaluated at a rating of 59 (Fair condition) in 2016 and is projected to deteriorate to a rating of 49 (Poor condition) by 2022.
- **Taxiway 'E':** Taxiway 'E' was evaluated at a rating of 60 (Fair condition) in 2016 and is projected to deteriorate to a rating of 50 (Poor condition) by 2022.
- **H1 Taxilane:** The H1 Taxilane was evaluated at a rating of 14 (Serious condition) in 2016 and is projected to deteriorate to a rating of 0 (Failed condition) by 2022.
- **H2 Taxilane:** The H2 Taxilane was evaluated at a rating of 70 (Fair condition) in 2016 and is projected to deteriorate to a rating of 58 (Fair condition) by 2022.

- **H3 Taxilane:** The H3 Taxilane was evaluated at a rating of 89 (Good condition) in 2016 and is projected to deteriorate to a rating of 79 (Satisfactory condition) by 2022.

Findings: The Taxiway 'A' Reconstruction project, scheduled for FY-2019, will include reconstruction of Taxiway 'C', Taxiway 'D', Taxiway 'E', H1 taxilane, and the reconfiguration and reconstruction of Taxiway 'B' to meet FAA AC 150/5300-13A design requirements.

Recommendations: The Airport should monitor the conditions of taxilane pavements, perform crack sealing and other routine maintenance as necessary to prolong the useful life of pavements, and program the reconstruction of taxilanes on the Airport's CIP, as necessary.

5.1.4 APRON CAPACITY

The Airport has two aprons: The Main Apron and the Terminal Apron, which together can accommodate up to 42 aircraft. The Airport also has a turf tie-down area, which can accommodate 26 additional aircraft. In 2017, the Airport reported 40 based aircraft, of which two utilize tie-down spaces (5 percent). By 2038, at the end of the planning period, the fleet is expected to increase by 17.5 percent to 47 total based aircraft. Assuming that 5 percent of the based aircraft expected at the end of the planning period will require tie-down spaces, a total of 2 tie-down spaces will be needed to accommodate them.

Parking aprons are also utilized by transient aircraft. In 2038, CQX is projected to see 21,331 operations with 12,415 (58.2 percent) being performed by itinerant aircraft. The required number of parking spaces for potential transient aircraft was calculated using the formula below. This formula considered the number of operations per peak month (4,266 in August), which was then multiplied by the percentage of itinerant aircraft (58.2 percent), divided by the number of days in the month (31), multiplied by 100 percent, and then divided by 2, assuming that half of the itinerant operations will require apron space (see formula below).

{[4,266 x 58.2%}/31] x 100%}/2d = 40 transient aircraft parking spaces

40 transient aircraft parking spaces + 2 based aircraft parking spaces = 42 required parking spaces

Based on these calculations, a total of 42 tie-down spaces will be required by the end of the planning period. Since the Airport can accommodate 68 aircraft, the number of available tie-down spaces at CQX appears to be adequate through the planning period.

5.1.4.1 Apron Pavements

Table 5-17 outlines the dimensions, type of pavement, and year of construction or most recent major rehabilitation of each apron.

Table 5-17: Apron Pavements

Apron	*Dimensions*	*Type of Pavement*	*Year of Construction or Most Recent Major Rehab.*
Main Apron	150,000 SF	Flexible	2006
Terminal Apron	16,000 SF	Flexible	Unknown

Source: Airport Management, Gale Associates Analysis 2018

According to the MassDOT/AD APMS, any apron with a PCI below 65 is considered to be below "critical PCI" and requires major rehabilitative actions. Pavement ratings of the aprons at CQX are as follows (see Figure 5-9):

- **Main Apron:** The Main Apron was evaluated at 94 (Good condition) in 2016 and is projected to deteriorate to a rating of 84 (Satisfactory condition) by 2022.
- **Terminal Apron:** The Terminal Apron was evaluated at 29 (Very Poor condition) in 2016 and is projected to deteriorate to a rating of 0 (Failed condition) by 2022.

Findings: The Terminal Apron is planned for reconstruction as part of the FY-2019 Taxiway 'A' reconstruction project.

Recommendation: The Airport should consider applying a preservative treatment to the Main Apron to extend the useful life of the pavement.

5.1.4.2 Turf Tie-Down Area

As indicated in the 2003 AMPU, the Airport's existing turf tie-down area located between the Main Apron and Taxiway 'D' is unusable during wet conditions and lacks the structural integrity to accommodate twin-engine aircraft and many smaller, single-engine aircraft. According to Airport Management, the Airport wishes to reconstruct this area so that it will be structurally-sound and useable.

Findings: The turf tie-down area, including removal of unsuitable materials, proper grading, and installation of new tie-down hardware, is being reconstructed as a part of the Taxiway 'A' reconstruction project.

5.1.5 NAVIGATIONAL AND APPROACH AIDS

Navigational and approach aids provide pilots with information to assist in locating the Airport and horizontal and/or vertical guidance during landing operations. Additionally, navigational aids (NAVAIDs) are critical to accessing the Airport during poor weather conditions. Navigation guidance at the Airport is provided in the form of lighting instruments, precision approach path indicators (PAPIs), beacons, etc. This equipment is further described below.

5.1.5.1 Runway Lights

In 2009, a new medium intensity runway lighting system (MIRLS) was installed as part of the Runway 6-24 reconstruction project. According to Airport Management, the MIRLS are in fair condition.

Recommendation: Upgrade the runway lighting system to LED lights during the next runway reconstruction project.

5.1.5.2 Runway End Identifier Lights

In 2009, runway end identifier lights (REILS) were installed as part of the Runway 6-24 reconstruction project. According to Airport Management, the airport-owned REILS are in good condition.

Recommendation: Maintain the existing REILS and replace when conditions require.

5.1.5.3 Taxiway Lights

The majority of the Airport's taxiway system is not lit; however, taxiway edge lights are located at the intersections of Taxiway 'A' and Runway 6-24. According to Airport Management, the taxiway lights are in good condition.

Finding: The Airport is installing full-length parallel taxiway lighting as part of the FY-2019 Taxiway 'A' reconstruction project.

5.1.5.4 PAPIS

Originally installed in 1996 and upgraded in 2009 as part of the Runway 6-24 reconstruction project, the airport-owned PAPIs are in fair condition, according to Airport Management.

Recommendation: Maintain the existing PAPIs and replace when conditions require.

5.1.5.5 Windcone and Segmented Circle

The Airport's lighted windcone and segmented circle are in good condition, according to Airport Management.

Recommendation: None.

5.1.5.6 ASOS

The automated surface observing station (ASOS) at CQX is owned and maintained by the National Weather Service and is in good condition, according to Airport Management.

Recommendation: None.

5.1.5.7 Non-Directional Beacon

The non-directional beacon (NDB) at CQX was installed in 1992 and is owned and maintained by MassDOT. Most of the NDB units across the state of Massachusetts have been decommissioned. It is the wish of the Airport to maintain use of the NDB until a non-precision (straight-in, instrument) approach can be published.

Recommendation: Coordinate with MassDOT for the continued maintenance of the existing NDB until a non-precision (straight-in, instrument) approach can be published, which is anticipated to occur in FY-2022, according to the Airport's CIP.

5.1.5.8 Rotating Beacon

In 2009, the Airport's rotating beacon was replaced as part of the Runway 6-24 reconstruction project. In 2018, the structural portion of the rotating beacon was replaced with a new beacon pole. According to Airport Management, the rotating beacon is in good condition; however, the Airport has expressed a desire to connect the rotating beacon to generator power.

Recommendation: Connect the rotating beacon to generator power as target of opportunity, or a future beacon reconstruction project.

5.2 LANDSIDE CAPACITY AND REQUIREMENTS

Airport facilities that are not required for the movement of aircraft are referred to as landside facilities. These facilities usually consist of terminal and maintenance buildings, hangars, and automobile parking areas. This section will provide a review of the capacity and functionality of the Airport's landside facilities.

5.2.1 ADMINISTRATION BUILDING

The Airport's administration building (approximately 1,000 SF), originally constructed in the 1930s, is located between the two box hangar buildings and contains a popular restaurant. The condition of this building was explored as part of the 2003 AMPU. At that time, it was considered to be in poor condition due to a variety of issues including failure to meet building codes, failure to meet handicap access codes, offices being too small, lack of adequate storage, security needs, and conflicting building uses (i.e. aircraft maintenance activities directly next to public restaurant and offices). According to the Airport, these issues remain unresolved to date.

MassDOT/AD is currently administering a Statewide Airport Administration Building (SAAB) Program for the construction or renovation of administration buildings to "meet accessibility needs, build more airport management space, and better offer the public conference rooms, restaurant shells, and better views of the airfield."[9] This program is funded at 95 percent by MassDOT/AD, requiring a 5 percent local share. CQX's administration building is on the SAAB Program schedule for design in FY-2023 and construction in FY-2024.

Recommendation: The Airport should consider renovating the existing administration building or constructing a stand-alone administration building when MassDOT Aeronautics SAAB Program funding becomes available. Coordination with the Chatham Building Division will be required at the time of the project to comply with local building codes. Additionally, the Airport Commission should allocate Town funding to account for the 5% local share for this project.

5.2.2 HANGARS

Demand for aircraft hangars depends on a number of variables, including airport location, aircraft type, cost, and seasonal and climatic conditions. As described in Chapter 2, there are currently two box hangars and three rows of T-hangars on Airport property, with a combined capacity for 39 aircraft. These buildings are currently full, and demand for additional units is present. Potential based aircraft owners have expressed concern over salty weather conditions damaging aircraft stored outdoors, which is limiting the Airport's ability to grow its base. For these reasons, the Airport Commission has expressed interest in pursuing the private development of additional hangar units on Airport property.

Recommendation: The Airport should reserve areas for the construction of box and T-hangars on Airport property to accommodate anticipated demand.

[9] https://www.mass.gov/statewide-airport-administration-building-saab-program

5.2.3 AUTOMOBILE PARKING

Automobile parking is available in the paved, delineated spaces along George Ryder Road and in the Airport's gravel lot, adjacent to the SRE storage building. Currently, there are no designated automobile parking spaces inside the fence. The Airport's gravel parking lot was addressed as part of the 2003 AMPU, at which time it was determined that the lot should be reconstructed and paved to include 45 parking spaces in addition to the existing on-street parking spaces. The number of required spaces was evaluated as part of the 2003 AMPU based on the number of Airport and restaurant employees, restaurant patron capacity, and square footage of hangar buildings and the SRE building.

Recommendation: The Airport should consider constructing designated automobile parking areas inside the fence and reconstructing and paving the gravel parking lot. The number of required parking spaces should be reconsidered at the time of the project to comply with current zoning bylaws. Construction of designated parking areas increases safety by clearly differentiating automobile parking areas from aircraft movement areas.

5.2.4 FUEL FACILITIES

The Airport's existing fuel facilities consist of one (1) self-serve 10,000-gallon storage tank and dispensing system for 100-LL fuel (installed in 2008) and one (1) 3,000-gallon fuel truck for Jet-A fuel. The 100-LL system is in good condition, but according to Airport Management, the need for a fixed Jet-A fuel tank is present, for the following reasons:

- Cost: The Airport Manager purchases approximately 13,000 gallons of Jet-A fuel per year in small amounts (approximately 2,700 gallons), causing a delivery charge between $800 and $1,500 to be assessed per delivery, regardless of the number of gallons ordered. This means that the Airport Manager would be saving between $2,400 and $4,500 per year in delivery charges by upgrading to a 10,000-gallon Jet-A tank.
- Capacity: Due to the assessment of a delivery charge for each fuel delivery, Airport Management waits until the existing fuel tank gets low before placing an order to minimize delivery expenses. If the delivery is delayed, the Airport runs the risk of running out of fuel, which has occurred in the past. Upgrading to a 10,000-gallon Jet-A fuel tank would give the Airport adequate capacity and help to avoid running out of fuel.
- Demand: As discussed in Chapter 4, the Airport began offering Jet-A fuel in 2016, and since that time has seen an increase of approximately 56 percent in the number of gallons sold from 7,100 gallons in 2016 to 11,095 gallons in 2018.

Recommendation: The Airport should consider constructing a Jet-A fuel facility to meet user and capacity needs.

5.3 SUPPORT FACILITY CAPACITY AND REQUIREMENTS

Support facilities are amenities that assist the airport in maintaining efficient operations. Support facilities at CQX include snow removal equipment (SRE), the SRE storage building, and security fencing, which must be maintained and upgraded as needed to sustain efficient day-to-day operations.

5.3.1 SNOW REMOVAL EQUIPMENT

The Airport's existing SRE consists of one (1) 2000 Ford pickup truck with 8-foot Fisher plow and one (1) 2017 Caterpillar Front End Loader with rotary plow, ramp plow, and rotary broom. The loader and attachments are in new condition. The Airport received an Airport Safety and Maintenance Program (ASMP) Grant from MassDOT Aeronautics in FY-2019 for the purchase of a new airport pickup truck.

Recommendation: The Airport should maintain its existing SRE and program the replacement of SRE on the CIP when eligible and necessary.

5.3.2 SRE STORAGE BUILDING

The Airport's SRE storage facility consists of a 2,800 SF building with two bays, a maintenance area, break room, bathroom, and storage area. The building was installed in 2015 and is in good condition. According to Airport Management, the existing SRE building is meeting the needs of the Airport.

Recommendation: None.

5.3.3 PERIMETER FENCE

The Airport is supported by approximately 8,443 LF of 8-foot high, chain-link fencing around the perimeter of the airfield. The majority of perimeter fencing was constructed in 1996, while the portion of fence around the Main Apron was constructed in 2006. The majority of existing fencing is in fair condition; however, several sections of fence in the northeast quadrant of Airport property have been severely damaged by large trees falling on the fence. Repairs to these areas are planned for repair in early 2019.

Recommendation: The Airport should continue to maintain its existing fencing to the extent practicable to extend its useful life, and plan for replacement of deteriorating portions as programmed on the CIP for FY-2024.

5.3.4 AIRPORT SECURITY

The Airport's security system, installed in FY-2017using MassDOT/AD funding, consists of security cameras and a monitoring system. According to Airport Management, this system is in good condition. Further, the construction of an administration building, as referenced in Section 5.2.1, will provide an added layer of security by requiring visitors to travel through controlled access points prior to accessing airside facilities.

Findings: Three uncontrolled access points to airside facilities exist at the Airport. The first is the main pedestrian gate, Gate "A", along George Ryder Road, which requires visitors to walk adjacent to aircraft movement areas to enter the existing administration building and restaurant. The second is the "lobby gate" leading from the Main Apron to the restaurant seating area, and the third is the "rear hangar gate" leading from the restaurant's outdoor seating area to the terminal apron outside of the rear hangar.

Recommendation: The Airport should maintain its existing security system and repair, replace, and/or enhance as necessary. Added security measures such as controlled access points should be implemented in the short-term to address the uncontrolled access points noted in the *Findings*, and further addressed as part of the administration building construction or renovation.

5.4 CONCLUSION

The Airport is a quality facility offering a wide variety of General Aviation services to the region. Improvements to the facility are needed to meet basic safety requirements per the applicable FAA standards and to provide adequate facilities for the Airport's current and future aircraft fleet, as well as airport tenants and visitors. The following is a list of facility needs for the Airport through the planning period. It is possible that some of the long-term needs may not be required at all should adequate demand fail to materialize. Facility requirements needed immediately or in the mid-term should be actively pursued and properly scheduled on the Airport's CIP.

Facilities Exceeding Useful Life/Other Considerations

Short-Term (2019-2023) Improvement Requirements

- Reconstruct Taxiway 'A' (with full-length taxiway lighting) and Taxiways 'B', 'C', 'D', and 'E'; the Terminal Apron, and turf tie-down areas (scheduled for FY-2019).
- Acquire replacement vehicle for existing pickup truck with plow (scheduled as ASMP project in FY-2019).
- Coordinate with the FAA New England Region Flight Procedures Team to publish a non-precision (straight-in, instrument) approach to Runway 6-24. This will necessitate the following projects:
    - Acquisition of avigation easements over parcels with obstructions to the Runway 6 and Runway 24 approach surfaces.
    - Removal of obstructions from parcels within newly-acquired easements.
    - Conducting an FAA AC 150/5300-18B survey to verify a clear approach
    - Coordination with MassDOT/AD to maintain NDB until the non-precision (straight-in, instrument) approach is published.
    - Coordinate with Town legal counsel to update the Town's Airport Approach Zone bylaws to include newly-published approaches.
- Replace windcone and segmented circle[10] (eligible in FY-2010).
- Reconstruct H1 and H2 Taxilanes.
- Construct additional T-Hangar units.
- Design administration building using MassDOT Aeronautics SAAB Program Funding (FY-2023).
- Replace rotating beacon and connect to generator power (eligible in FY-2024).
- Reconfigure the existing fuel farm to include the addition of a 10,000-gallon Jet-A fuel facility.

[10] Windcone mast was replaced in 2010 using local funding. Last FAA-funded windcone replacement occurred in 1995.

Mid-Term (2024-2028) Improvement Requirements

- Schedule pavement maintenance activities as necessary.
- Reconstruct perimeter fencing (programmed for FY-2024)
- Pave the gravel automobile parking lot adjacent to the SRE building.
- Construct or rehabilitate administration building using MassDOT Aeronautics SAAB Program Funding (FY-2024).
- Construct designated vehicle parking inside the fence.
- Reconstruct H3 Taxilane (eligible in FY-2026).
- Reconstruct Main Apron (eligible in FY-2026).
- Acquire replacement vehicle for existing loader with attachments (eligible in FY-2027)

Long-Term (2029-2038) Improvement Requirements

- Reconstruct Runway 6-24 including associated components (REILS, PAPIs, etc.) and upgrade to LED runway lights (eligible in FY-2029).