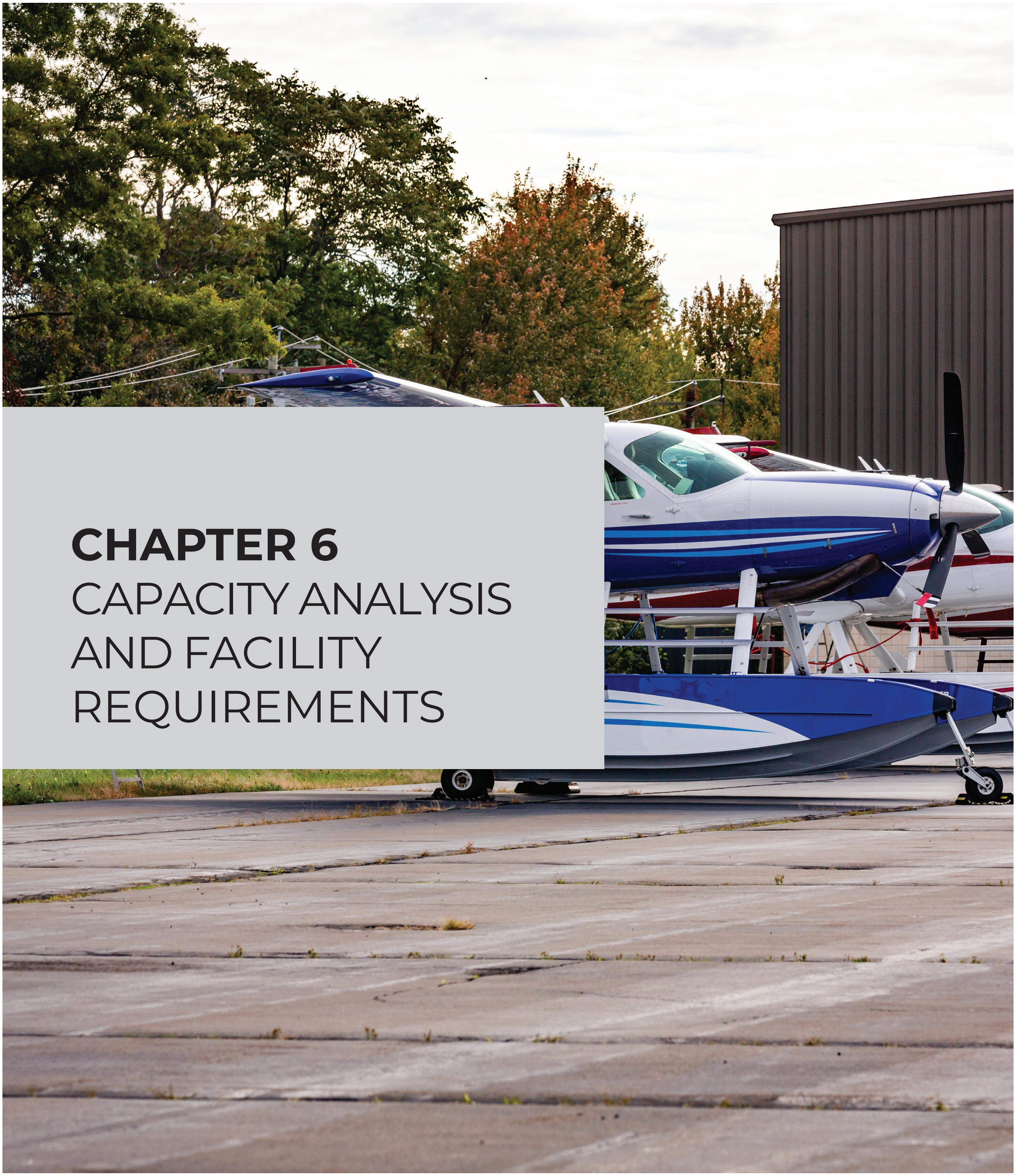


CHAPTER 6
CAPACITY ANALYSIS AND FACILITY REQUIREMENTS

6. Capacity Analysis and Facility Requirements

This chapter presents a capacity analysis, as well as the airside and landside facility requirements necessary to accommodate existing and forecasted demand at Tweed-New Haven Airport (HVN or the Airport) in accordance with Federal Aviation Administration (FAA) design criteria and safety standards. The capacity analysis is based upon FAA Advisory Circular (AC) 150/5060-5, *Airport Capacity and Delay.* The facility requirements are based upon several sources, including the aviation demand forecasts presented in Chapter 4, *Forecasts*; FAA AC 150/5300-13A (Change 1), *Airport Design;* and 14 Code of Federal Regulations (CFR) Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace.* The findings of this chapter serve as the basis for the formulation of Airport alternatives and development recommendations. The major components of this chapter are listed below:

- Airfield Capacity Analysis
- Airfield Facility Requirements
- Passenger Terminal Facility Requirements
- Parking and Roadway Access Facility Requirements
- General Aviation and Landside Facility Requirements
- Utilities and Support Facility Requirements

6.1. AIRFIELD CAPACITY ANALYSIS

Airfield capacity refers to the ability of an airport to safely accommodate a given level of aviation activity. This report will use the methodologies described in FAA AC 150/5060-5, *Airport Capacity and Delay*.

Capacity is described using three metrics: annual service volume (ASV), visual flight rules (VFR) hourly capacity, and instrument flight rules (IFR) hourly capacity. The ASV is a reasonable estimate of the annual capacity, or the maximum annual level of aircraft operations, that can be accommodated at an airfield. It should be noted that airports could, and often do, exceed their stated ASV. However, delays begin to increase rapidly once the ASV has been exceeded. For prudent planning purposes, once airport operational levels reach 60 percent of the ASV, planning for capacity-increasing measures should take place. Once an airport reaches 80 percent ASV, construction of capacity-increasing measures should begin, or demand strategies be put in place.

The VFR and IFR hourly capacities are the maximum number of aircraft operations that can take place on the runway system in one hour under VFR or IFR conditions, respectively. When hourly demand approaches or exceeds the hourly capacity, delays may force traffic into the succeeding hours or cause aircraft to divert to other airports.

6.1.1. Factors Affecting Capacity

A range of factors can affect the ability of an airport to meet demand. Once these factors are identified and their effect on the processing of demand is understood, efficiencies can be evaluated. These factors include:

- Meteorological Conditions - As weather conditions change, airfield capacity can be reduced by low ceilings and visibility. Runway usage will change as the wind speed and direction change, also impacting the capacity of the airfield.

- Runway/Taxiway Use Configurations - The configuration of the runway system refers to the number, location, and orientation of the active runway(s), the type and direction of operations and the flight rules in effect at a particular time. HVN has one runway: Runway 2-20. As identified in Section 6.2.4 of this chapter, Runway 14-32 is not eligible for FAA funding and is not anticipated to reopen.

- Aircraft Fleet Mix - The capacity of a runway is also dependent upon type and size of aircraft that use it. FAA AC 150/5060-5 places aircraft into one of four weight classes (A through D) when conducting capacity analysis. These weight classes are based on the amount of wake vortex turbulence created when the aircraft passes through the air. Class A aircraft are small (less than 12,500 pounds); Class B aircraft are also less than 12,500 pounds but with multiple engines; Class C aircraft are greater than 12,500 pounds, but less than 300,000 pounds; and Class D aircraft are greater than 300,000 pounds. The formula for finding the mix index is %(C + 3*D). At airports with only Class A and B aircraft, the separation distance required for air traffic is lower than at airports with use by aircraft in Class C or D, as small aircraft departing behind larger aircraft must hold longer for wake turbulence separation. The greater the separation distance required, the lower the airfield's capacity. Using this formula, the existing and future aircraft mix index will be 31 percent and 33 percent, respectively.

- Percent Arriving Aircraft - The capacity of a runway is also influenced by the percentage of aircraft arriving at an airport during the peak hour. Arriving aircraft are typically given priority over departing aircraft; however, arriving aircraft generally require more time to land than departing aircraft need to takeoff. Therefore, the higher the percentage of aircraft arrivals during peak periods of operations, the lower the ASV. The percent arriving aircraft for HVN is 50 percent.

- Percent Touch-and-Go Operations - A touch-and-go operation refers to an aircraft maneuver in which the aircraft performs a normal landing touchdown followed by an immediate takeoff, without stopping or taxiing clear of the runway. A touch-and-go is counted as two operations. These operations are normally associated with training and are included in the local operations. The touch and go factor for HVN is 41 percent for 2019 and is expected to remain between 41 and 50 percent of operations throughout the planning period.

- Exit Taxiway Locations - A final factor in analyzing the capacity of a runway system is the ability of an aircraft to exit the runway as quickly and safely as possible. The location, design, and number of exit taxiways affect the occupancy time of an aircraft on the runway system. The longer an aircraft remains on the runway, the lower the capacity of that runway. The list below shows the four taxiways to Runway 2-20 that are not at the runway ends and what percentage of aircraft can exit at each per FAA AC 150/5300-13A under wet conditions:

  - **Taxiway J** is a right-angle taxiway, 872 feet from the Runway 2 threshold and can accommodate approximately 3.5 percent of Class A aircraft. It is also 4,391 feet from the Runway 20 threshold and can accommodate all Class A aircraft, 95 percent of Class B aircraft, and four percent of Class C aircraft.
  - **Taxiway E** is an acute-angled taxiway, 2,373 feet from the Runway 2 threshold. It can accommodate approximately 78 percent of Class A aircraft and less than one percent of Class B aircraft. It is 2,889 feet from the Runway 20 threshold and can accommodate 92 percent of Class A aircraft and 10 percent of Class B aircraft.
  - **Taxiway C** is an acute-angled taxiway, 3,829 feet from the Runway 2 threshold. It can accommodate 100 percent of Class A aircraft, approximately 67 percent of Class B aircraft, and less than one percent of Class C aircraft. It is 1,434 feet from the Runway 20 threshold and can accommodate 22 percent of Class A aircraft.
  - **Taxiway F** is a right-angled taxiway, 4,977 feet from the Runway 2 threshold. It can accommodate all Class A and B aircraft, and approximately 12 percent of Class C aircraft. It is 286 feet from the Runway 20 threshold and cannot accommodate aircraft landing on Runway 20.
  - Total runway length can accommodate all Class A and B aircraft, and approximately 24 percent of Class C aircraft in wet conditions.

- **Peaking Characteristics** - Peak periods of aviation activity are defined in terms of peak month and peak hour operations, with a focus on the number of aircraft operations accommodated by the runway at any given time. In Chapter 4, *Forecasts*, the peak hour operations were determined to be 10 in 2020 and 11 in 2040.

6.1.2. Capacity Calculations

FAA AC 150/5060-5 offers guidance used to calculate airfield capacity and provides planning estimates for hourly airfield capacity under both VFR and IFR conditions, which are the theoretical maximum number of aircraft operations (takeoffs and landings) that can take place on the runway system in one hour under VFR or IFR conditions. The various capacity elements are then consolidated into a single ASV for the Airport.

VFR/IFR Hourly Capacities

Table 6-1 summarizes the airfield capacity calculations for HVN showing the current and forecast level of activity. These figures indicate that the Airport is currently operating at 19 percent of capacity on an annual basis. The utilization of the airfield is expected to climb to approximately 21 percent of ASV by 2040.

Table 6-1: Annual Operations Capacity Forecast

Year	Demand		Capacity			Peak Hour		ASV
	Annual	Peak Hour	ASV	Hourly VFR	Hourly IFR	VFR	IFR	
2019	25,219	10	134,658	77	53	13%	19%	19%
2025	25,923	10	134,658	77	53	13%	19%	19%
2030	26,476	11	134,658	77	53	14%	21%	20%
2040	27,631	11	134,658	77	53	14%	21%	21%

Sources: FAA AC 150/5060-5 and McFarland Johnson analysis, 2020.

Recommendation: Present and future airfield capacity at the Airport does not appear to be constrained.

6.2. AIRFIELD FACILITY REQUIREMENTS

Airfield facility requirements address the items that are directly related to the arrival and departure of aircraft, primarily runways and taxiways and their associated safety areas. To assure that all runway and taxiway systems are correctly designed, the FAA has established criteria for use in the planning and design of airfield facilities. The selection of appropriate FAA design standards for the development of airfield facilities is based on the characteristics of the most demanding aircraft expected to use an airport or a particular runway and supporting taxiway at an airport on a regular basis (500 operations per year). This will establish the physical dimensions of facilities and the separation distances between facilities that will impact airport development for years to come. Use of appropriate standards will ensure that facilities can safely accommodate aircraft using the Airport today, as well as aircraft that are projected to use the Airport in the future.

6.2.1. Critical Aircraft/Runway Design Code

Airport design standards are described in FAA AC 150-5300-13A, which provides criteria for grouping of aircraft into runway design codes (RDCs). The RDC consists of a letter representing an aircraft approach category (AAC) based on approach speed, a number representing an airplane design group (ADG) based on tail height and/or wingspan, and a number representing the visibility minimums associated with the runway based on corresponding runway visual range (RVR) values in feet. These groupings are presented in **Table 6-2**. The RDC of a runway defines which specific dimensions apply for safety areas, protection zones, runway and taxiway widths and separations, and other planning and safety factors.

Chapter 4, *Forecasts*, indicates that the existing critical aircraft for the Airport is a composite of the Canadair Regional Jet 700 (CRJ7)/Embraer Regional Jet-175 (E175)/Gulfstream 550 (GLF5), which is an AAC-ADG C/D-III aircraft, while the future critical aircraft is the Airbus A319 (A319)/Airbus A320 (A320)/Gulfstream 650 (GLF6), which is also an AAC-ADG C/D-III aircraft.

AIRPORT DESIGN STANDARDS

While the airport is designated a C-III airport, design standards are the same for C/D/E-III. Should the design aircraft change to a different aircraft (ex. B737-800, a D-III aircraft), the analysis in this Master Plan would still be current.

It is anticipated an interim critical aircraft may be the Airbus A220, which is also an AAC-ADG C-III aircraft.

Airfield facility requirements are covered in this section as follows:

- Runway Length
- Runway Strength
- Runway Orientation
- Runway Width
- Runway Safety Areas
- Runway Object Free Areas
- Runway Protection Zones
- Instrument Approach Procedures
- Runway Pavement Markings
- Taxiways
- Taxilanes
- Airfield Lighting and Signage
- Visual Approach Aids
- Airfield Facility Requirements Summary

Table 6-2: **Runway Design Code Characteristics**

Aircraft Approach Category (AAC)	
Category	**Approach Speed**
A	Approach speed less than 91 knots
B	Approach speed 91 knots or more but less than 121 knots
C	Approach speed 121 knots or more but less than 141 knots
D	Approach speed 141 knots or more but less than 166 knots
E	Approach speed 166 knots or more

Airplane Design Group (ADG)		
Group	**Tail Height**	**Wingspan**
I	< 20′	< 49′
II	20′ - < 30′	49′ - < 79′
III	30′ - < 45′	79′ - < 118′
IV	45′ - < 60′	118′ - < 171′
V	60′ - < 66′	171′ - < 214′
VI	66′ - < 80′	214′ - < 262′

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

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

6.2.2. Runway Length

A wide variety of aircraft use HVN on a daily basis. Depending upon their size, these aircraft have different runway requirements. In some cases, smaller or older aircraft may require more runway length than larger or more efficient aircraft. A significant number of factors go into determining the runway performance of an aircraft such as airport elevation, aircraft weight, temperature, humidity, density altitude, flap settings, payload, or runway condition (wet/dry), which then impacts the runway length that must be met for an aircraft to utilize that runway safely.

The FAA has published FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*, to assist in the determination of the recommended runway length. The recommendations for runways are based on the performance of a specific aircraft or a family of similar aircraft and assume unobstructed runway ends.

For aircraft over 60,000 pounds maximum takeoff weight (MTOW), FAA AC 150/5325-4B recommends determining runway length using the runway length requirement of the most demanding aircraft regularly utilizing the airport. The runway length for maximum performance of a specific aircraft can be found in the aircraft planning manual of the critical aircraft. As previously noted, the existing critical aircraft is a composite comprised of the CRJ7, the E175, and the GLF5 which constitute an AAC-ADG of C/D-III. Per FAA AC 150/5325-4B, runway lengths should be identified for MTOW and maximum landing weight (MLW) at the mean daily maximum temperature of the hottest month. It should be noted American Airlines currently regularly operates the Embraer 175 AR model which has a MTOW nearly 3,500 pounds more than the ER counterpart, and as such requires additional runway length. These numbers are shown in **Table 6-3**. Airport planning manual charts are shown in **Appendix D.**

Table 6-3: Runway Lengths for Existing and Future Critical Aircraft

Aircraft	Takeoff Length (MTOW)	Landing Length (MLW and Wet)
	Existing	
Existing Runway Length Available	5,600’	5,248’ (RWY 20); 5,600’ (RWY 2)
E175 STD	6,061’ – 7,261’	4,945’ – 5,405’
E175 LR	7,361’ – 7,861’	4,945’ – 5,405’
E175 AR	8,061’ – 9,061’	4,945’ – 5,405’
CRJ7	5,861’	5,865’
GLF5	5,971’	3,186’
	Interim	
A220	6,961’ – 9,311’	5,693’
	Future	
A319	7,561’	5,175’ – 5,290’
A320	7,661’	5,520’ – 5,750’
GLF6	6,360’	4,034’

Source: Embraer, Bombardier, Airbus, and Gulfstream airport planning manuals; McFarland Johnson analysis, 2020.

Since existing and proposed routes do not necessarily use MTOW and MLW, the following is a more HVN specific analysis of runway length needs. While airlines can and do operate aircraft below maximum payload or passengers, the following runway lengths are based on maximum payload to protect for full passenger, luggage, and cargo load.

Canadair Regional Jet 700 – The CRJ7 served the HVN-PHL market in 2019 with average 81% load factors. Even though the CRJ7 is smaller than the E175, the CRJ7's landing length on contaminated runway conditions (more than 25 percent of the runway is covered by frost, ice, snow, slush, or water) is longer than the E175's (see **Table 6-4**) and longer than the existing runway length at HVN, which resulted in increased delays and cancellations. This was the primary reason for the change to the E175.

Embraer 175 – Aircraft performance for an E175 varies depending on the weight variant used. For the existing flight to CLT at maximum payload, runway length should be in the 5,400 to 7,200-foot range as shown in **Appendix D**. When the aircraft is just carrying passengers and luggage, that range is approximately 4,900 to 6,500 feet. The HVN to CLT route is the existing E175 route. During runway contamination, strong crosswinds, and other factors, the E175 may not be able to operate carrying the full passenger load. It is anticipated that longer stage lengths may occur within the planning period. Runway length requirements for those are shown in **Table 6-4**.

Table 6-4: **Comparison of Aircraft Routes**

Commercial[2]	Takeoff (feet)	Landing – Wet Runway (feet)
CRJ-700 – ex. Philadelphia (136 NM)	4,661	**5,865**
CRJ-700 – ex. Charlotte (525 NM)	**5,861**	**5,865**
Embraer 175 – ex. Philadelphia (136 NM)	4,861	5,290
Embraer 175 – ex. Charlotte (525 NM)	**7,100**	5,290
Embraer 175 – ex. Chicago (674 NM)	**8,161**	5,290
Airbus A220 – ex. Ft. Lauderdale (976 NM)	**6,436**	**5,578**
Airbus A319 – ex. Orlando, FL (855 NM)	**7,561**	5,290
Airbus A320 – ex. Punta Gorda (971 NM)	**7,561**	**5,635**
General Aviation		
Gulfstream IV[1]	5,341	3,865
Gulfstream G550[1]	**5,971**	3,186
Global 5000[1]	**5,601**	2,538
Global Express[1]	**5,881**	2,519
Dassault Falcon 900EX[1]	5,274	2,772
Gulfstream G650[1]	**6,360**	4,034

[1] Distances shown at maximum takeoff weight, sea level, and International Standard Atmosphere (ISA). These are adjusted for runway elevation, slope, and wet/contaminated runways.
[2] These numbers do not account for the 60% rule per CFR Part 135.385.
Sources: CRJ-700 Planning Manual, Embraer 175 Planning Manual, Embraer 190 Planning Manual, Airbus A220 Planning Manual, Dassault Falcon 900 Planning Manual, Jet Advisors (accessed May 14, 2020), McFarland Johnson analysis, 2020.

Airbus A319/A320 – As shown in **Appendix B**, there is interest in additional service of A319/A320 aircraft operations at HVN. HVN has been served by multiple airlines and has consistently been an airport of interest for air carriers for A319/A320 service. Additionally, considering the current pandemic, aircraft fleets are changing sooner than originally planned. It is prudent that the Airport protects for A319/A320 service. Aircraft performance for an Airbus A319/A320 varies depending on weight variant used, but at a minimum a runway would need to have at least 6,000 feet landing length to accommodate A319/A320 aircraft. A sample of runway lengths by route is shown in **Table 6-4**. As previously mentioned, an interim service step may be the A220.

FAMILIES OF AIRCRAFT

For planning purposes, the Boeing 737 and A320 aircraft are very similar both for passenger capacity and runway performance.

Gulfstream G550/G650 – The G550 is the existing representative GA critical aircraft and the G650 the future GA critical aircraft. Aircraft performance for a Gulfstream 550/650 varies depending on the weight variant used. As shown in **Table 6-3**, longer stage lengths would need 6,000 feet or longer runways for take-off.

As shown in **Table 6-4**, it is anticipated that the existing runway length will need to increase to improve reliability for the existing route to Charlotte. The future critical aircraft also show the need for additional runway length.

Based on interest expressed by airlines currently utilizing the Airport, and other airlines interested in utilizing the Airport, if the runway length were increased, growth to the A319/A320 is expected throughout the planning period.

Recommendation: It is recommended the Airport pursue a runway extension of up to 2,000 feet for a finished runway length of 7,600 feet. The existing runway demand is at least 6,000 feet and the future 7,600 feet.

6.2.3. Runway Strength

Runway 2-20 has a pavement classification number (PCN) of 57/F/C/X/T. The PCN includes a numerical value of 57 (which correlates to an allowable aircraft classification number or ACN, "F" for flexible or bituminous asphalt, "C" for subgrade strength category (HVN's subgrade strength is low), "X" for an allowable tire pressure of high (limited to 1.75 megapascals), and "T" for the method of PCN determination which stands for technical. The runway could safely handle heavier aircraft on most days, but repeated use would result in premature pavement failure.

According to the Airport's FAA 5010 Form, *Airport Master Record*, Runway 2-20 is listed in, "excellent" condition. The runway strength of Runway 2-20 is sufficient to accommodate all existing and proposed operations. The applicable ACNs and PCNs can be seen in **Table 6-5**.

Recommendation: Runway strengthening should be assessed based on operational conditions with the next overlay or repaving project, with strengthening to be completed if necessary and justified. Based on the forecasts of this Master Plan, it is not anticipated that runway strengthening is needed within the 20-year planning period. Regular maintenance of the runway should be conducted.

Table 6-5: Applicable ACNs and PCN

Critical Aircraft	ACN	Runway 2-20 PCN	Deficiency
CRJ7	11-23	57 /F/C/X/T	None
E175	10-19	57 /F/C/X/T	None
A220	19-41	57 /F/C/X/T	None
A319	17-50	57 /F/C/X/T	None
A320	19-42	57 /F/C/X/T	None
GLF5	12-31	57 /F/C/X/T	None
GLF6	13-32	57 /F/C/X/T	None

Source: FAA Form 5010 HVN, 9/10/2020; relevant aircraft maintenance and airport planning manuals; McFarland Johnson analysis, 2020.

6.2.4. Runway Orientation

A significant factor in evaluating runway orientation is the direction and velocity of the prevailing winds. Ideally, all aircraft take off and land into the wind. A runway alignment that precludes a direct headwind creates what is known as a crosswind component (i.e., winds at an angle to the runway in use), which makes it increasingly difficult for a pilot to keep the airplane centered on the runway centerline. The commonly used measure of degree to which a runway is aligned with the prevailing wind conditions is the wind coverage percentage, which is the percent of time crosswind components are below an acceptable velocity. This measure indicates the percentage of time aircraft within a particular design group will be able to safely use the runway. Current FAA standards recommend that airfields provide 95 percent wind coverage.

If 95 percent wind coverage cannot be met, a crosswind runway is eligible for FAA funding. Runway 14-32 has been permanently closed due to obstructions and failed pavement conditions.

As noted in Chapter 2, *Inventory*, wind data was obtained from the National Climactic Data Center (NCDC) for Tweed-New Haven Airport for a 10-year period from 2009 through 2018. The wind coverage shown in **Table 6-6** show the percentage of time winds at the Airport originated from different directions at various velocities.

According to the runway wind analysis, the current runway alignment for Runway 2-20 meets the minimum recommended 95 percent coverage for all crosswind components. As such, Runway 14-32 is not eligible for FAA funding and, if restored to operable condition, would have to be done so without Airport Improvement program (AIP) funds.

Recommendation: There are no recommendations with respect to runway orientation. The orientation of Runway 2-20 is appropriate to provide a wind coverage factor that exceeds the recommended minimum.

6.2.5. Runway Width

FAA AC 150/5200-13A shows a standard runway width of 100 feet for aircraft with an MTOW of 150,000 pounds or less, which is the case for the E175, CRJ7, and GLF5 (and GLF6). For aircraft with an MTOW of greater than 150,000 pounds, like the A220, A319, and A320 which are the future critical aircraft, the recommended runway width is 150 feet.

Table 6-6: Runway Wind Coverage Analysis

	All Weather Wind Coverage[1]		
	10.5 Knot	13 Knot	16 Knot
Runway 2-20	96.28%	98.10%	99.53%
Runway 2	56.96%	61.05%	61.82%
Runway 20	55.33%	56.06%	56.72%
	VFR Wind Coverage[2]		
	10.5 Knot	13 Knot	16 Knot
Runway 2-20	96.52%	98.36%	99.71%
Runway 2	59.67%	60.81%	61.57%
Runway 20	54.92%	55.61%	56.21%
	IFR Wind Coverage[3]		
	10.5 Knot	13 Knot	16 Knot
Runway 2-20	95.37%	97.08%	98.83%
Runway 2	61.13%	61.99%	62.81%
Runway 20	56.64%	57.49%	54.43%

[1] All Weather Conditions: all ceiling and visibility conditions.
[2] VFR Weather Conditions: Ceilings greater than or equal to 1,000 feet and visibility greater than or equal to three statute miles.
[3] IFR Weather Conditions: ceiling less than 1,000 feet and visibility below three statue miles but greater than or equal to 200 feet and one statute mile.
Source: National Climactic Data Center 2009-2018 (725045).

Runway 2-20 is 150 feet wide, which meets FAA standards for C/D-III runway width. Future runway rehabilitations or runway extensions should plan to meet the existing width.

Recommendation: It is recommended the existing runway width be maintained through the planning period at HVN.

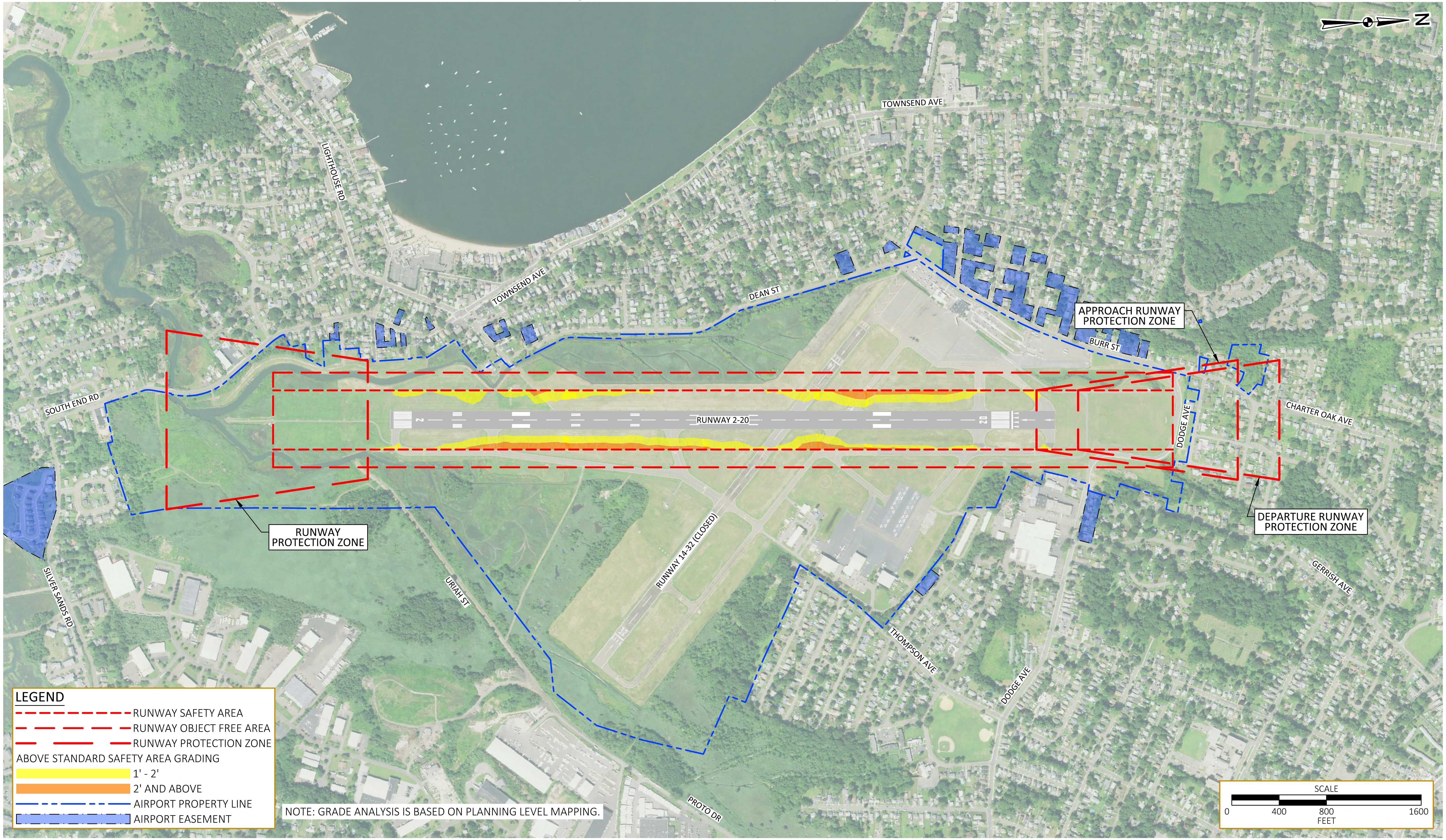
6.2.6. Runway Safety Areas

Runway safety areas (RSAs) are defined by the FAA as surfaces surrounding a runway that are prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway. RSAs consist of a relatively flat graded area free of objects and vegetation that could damage aircraft. Per FAA guidance, the RSA should be capable, under dry conditions, of supporting rescue and firefighting equipment and the occasional passage of aircraft, without causing structural damage to the aircraft.

The FAA design standards for RSAs surrounding runways serving C/D-III aircraft is a width of 500 feet and a length that begins 600 feet prior to each threshold and extends 1,000 feet beyond each threshold. Existing and proposed RSAs are shown in **Figure 6-1**.

At the approach end of Runway 20, the Airport perimeter fence, and Dodge Avenue are located within the northernmost portion of the RSA. On the west edge, the RSA is a full 1,000 feet, but tapers to only approximately 940 feet due to the presence of the perimeter fence and Dodge Ave.

Figure 6-1: Tweed-New Haven Airport Safety Areas



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The FAA has approved an RSA Determination deeming this a safe condition. If changes to the Runway 20 end are made, alternatives should review if a full dimensional RSA is feasible.

Preliminary analysis shows potential non-standard lateral grading in portions of the RSA may be present. Lateral grade compliance should be confirmed through more precise survey methods during design of the next runway reconstruction.

Recommendation: It is recommended that the RSA be clear of objects. If a full dimensional RSA cannot be achieved, the Airport should seek an RSA Determination from the FAA. Lateral grade compliance should be confirmed during design of the next runway reconstruction.

6.2.7. Runway Object Free Areas

In addition to the RSA, a runway object free area (ROFA) is also defined around runways to enhance the safety of aircraft operations. The FAA defines ROFAs as areas cleared of all objects except navigational aids (NAVAIDS) that are fixed-by-function, and those used for aircraft ground maneuvering. However, unlike the RSA, there is no physical component to the ROFA. Thus, there is no requirement to support an aircraft or emergency response vehicles.

FAA design standards for ROFAs surrounding runways serving AAC-ADG C/D-III aircraft are a width of 800 feet, a length that extends 600 feet prior to the landing threshold, and a length that extends 1,000 feet beyond the runway end. Like the RSA, the Airport perimeter fence, and a portion of Dodge Avenue are located within the ROFA. Also, small structures that house equipment that powers and controls the Runway 2 glideslope and localizer are sited within the ROFA. These NAVAIDS and their associated structures are owned and maintained by the FAA at HVN. Also, a portion of Dodge Ave is located within the ROFA.

Recommendation: It is recommended that the ROFA be clear of objects or the Airport pursue a modification of standards (MOS) for the presence of objects in the ROFA. The Airport should preserve space outside the ROFA for NAVAID structures. Dodge Ave should be relocated outside of the ROFA.

6.2.8. Runway Protection Zones

Runway protection zones (RPZs) are large trapezoidal areas at ground elevation off each runway end that are within aircraft approach and departure paths. The RPZ begins 200 feet beyond the end of the runway. The dimensions of the RPZ for each runway end are dependent on the type of aircraft and the approach visibility minimums associated with operations on that runway.

The RPZ is intended to enhance the protection of people and property on the ground. Many land uses (i.e., residential, places of public assembly, fuel storage) are prohibited by FAA guidelines within these areas. However, these limitations are only enforceable if the RPZ is owned or controlled by the airport sponsor. Airport control of these areas is strongly recommended and is primarily achieved through property acquisition but can also occur through easements or zoning to control development and land use activities.

The existing straight-in approach visibility minimums of Runway 2 are ¾ mile and 1½ miles for Runway 20. Existing RPZ dimensions are shown in **Figure 6-1**. Portions of both Runway 2 and 20 RPZs are off Airport property, and contain structures, roads, and other non-standard conditions.

Non-standard conditions do not need to be addressed unless RPZs change in location or size. RPZ dimensions are shown in **Table 6-7** and while the AAC-ADG for Runway 2 remains the same throughout the planning period, the RDC is expected to change with a lowering of the visibility minimums from ¾ statute mile (SM) to ½ SM. As such, the RPZ for Runway 2 is expected to expand, and the RPZ for Runway 20 is expected to remain the same throughout the planning period.

Table 6-7: Existing and Future RPZ Dimensions Per Runway End

Runway	Minimums	Length	Inner Width	Outer Width	Acreage
Runway 2 - Existing	¾ mile	1,700 ft.	1,000 ft.	1,510 ft.	48.978
Runway 2 - Future	½ mile	2,500 ft.	1,000 ft.	1,750 ft.	78.914
Runway 20 – Existing and Future	1 SM	1,700 ft.	500 ft.	1,010 ft.	29.465

Source: FAA AC 150/5300-13A.

Recommendation: Consideration should be taken to assess the acquisition of land within the existing and future RPZs in fee simple ownership, or an avigation easement that prevents the future development of incompatible land uses.

6.2.9. Instrument Approach Procedures

Runway 2 is equipped with an instrument landing system (ILS), as well as an area navigation (RNAV) Global Positioning System (GPS) approach. Runway 20 is also equipped with an RNAV GPS approach. The approach to Runway 20 provides horizontal guidance only. Information on existing approaches at the Airport is shown in **Table 6-8**.

Table 6-8: HVN Approach Procedures

Runway End (approach)	Type of Approach	Approach Minima (Ceiling (MSL)-Visibility)			
	Approach Category	A	B	C	D
Runway 2 (ILS or LOC)	ILS	293' – 4,000'			
	LOC only	400' – 4,000'		400' – 4,500'	
	Circling	720' – 1 SM		780' – 2 ¼ SM	880' – 2 ¾ SM
Runway 2 (RNAV (GPS))	LPV	293' – 4,000'			
	LNAV/VNAV	309' – 4,000'			
	LNAV MDA	400' – 4,000'		400' – 4,500'	
	Circling	720' – 1 SM		780' – 2 ¼ SM	880' – 2 ¾ SM
Runway 20 (RNAV (GPS))	LP	540' – 1 SM		540' – 1 ½ SM	
	LNAV	580' – 1 SM		580' – 1 ⅝ SM	
	Circling	720' – 1 SM		780' – 2 ¼ SM	880' – 2 ¾ SM

LNAV is lateral navigation; LOC is a localizer only approach; LP is localizer performance; LPV is localizer performance with vertical guidance; MSL is above mean sea level; VNAV is vertical navigation.

Source: FAA Instrument Approach Procedures, HVN effective date, September 10 to October 8, 2020.

Further details on these approach types are provided in Chapter 2, *Inventory*. The Airport has filed for a new LPV approach for the undisplaced Runway 20 threshold.

Recommendation: It is recommended the Airport explore the possibility of lower minimums for approaches to Runway 2 and vertical guidance to Runway 20.

6.2.10. Runway Pavement Markings

Runway 2 has precision instrument approach runway markings and Runway 20 has non-precision instrument approach runway markings. All runway markings are noted to be in good condition according to FAA Form 5010-1 dated July 16, 2020. The most recent 14 CFR Part 139 inspection recommended shoulder markings for Runway 2-20 at the intersection with former Runway 14-32.

Runway designations on Runway 2-20 are based on the magnetic heading of the runway. A shifting earth magnetic field requires a prudent examination of the runway designations to ensure they are within 10 degrees of the current and future magnetic heading given magnetic declination.

The magnetic azimuth is determined by correcting the runway's true bearing for magnetic declination. To accomplish this calculation, westerly magnetic declination values are added to a runway's true bearing, while easterly magnetic declination values are subtracted.

According to the National Oceanic and Atmospheric Administration (NOAA), the current magnetic declination at HVN is 13° 21' W and is changing by 0° 3' E per year. Since the magnetic declination is westerly, the magnetic azimuths associated with the runways at the Airport are determined by adding the declination value to the true bearing values.

The true bearing information, shown in **Table 6-9** for Runway 2-20, is obtained from actual survey data, and taken from the most recent Airport Layout Plan (ALP).

As seen in **Table 6-9**, the existing and future runway designations are within 10 degrees of the existing and future magnetic bearings and as such, there is no need to change the runway designation markings.

Table 6-9: **Magnetic Declination Calculations**

Factor	Value
Runway 2-20 True Runway Bearing	02.91°
Magnetic Declination	13° 21' = 13.35°
Existing Runway Magnetic Bearing	02.91° + 13.35° = 16.26°
20-Year Declination Change	3' E per year = -3/60*20 = -1
Future Runway 2-20	02.91° - 1° = 01.91°

Source: AVN Datasheet, 2018; NOAA, McFarland Johnson analysis, 2020.

Recommendation: It is recommended Runway 2-20 shoulder markings be added at the intersection with the closed Runway 14-32 per FAA recommendations.

6.2.11. Taxiways

Planning standards for taxiways include taxiway width, taxiway safety areas, taxiway object free areas, taxiway shoulders, taxiway gradient, and for parallel taxiways, the distance between the runway and taxiway centerlines. The dimensions of each standard vary based on the identified

ADG and taxiway design group (TDG) for each taxiway. The ADG is based on the wingspan and tail height of an aircraft, while the TDG is based on the distance between an aircraft's cockpit to main gear, as well as the width of the main gear. There are six ADG groups and seven TDG groups. Details regarding the various dimensions as they apply to the Airport are shown in **Table 6-10** and **Table 6-11**. The existing taxiway configuration can be seen in **Figure 6-2**.

The existing and future composite critical aircraft are categorized as TDG 3.

Table 6-10: Taxiway Requirements – Airplane Design Group

Design Standard	ADG I	ADG II	ADG III	ADG IV	ADG V	ADG VI
Taxiway Safety Area	49'	79'	118'	171'	214'	262'
Taxiway Object Free Area	89'	131'	186'	259'	320'	386'
Runway/Taxiway Separation	225' – 400'*	240' – 400'*	400'	400'	400'	500'*

* Runway/taxiway separation vary based on approach visibility minimums
Source: FAA AC 150/5300-13A.

Table 6-11: Taxiway Requirements – Taxiway Design Group

Design Standard	TDG 1	TDG 2	TDG 3	TDG 4	TDG 5	TDG 6	TDG 7
Taxiway Width	25	35	50	50	75	75	82
Taxiway Shoulder Width	10	10	20	20	25	35	40

Source: FAA AC 150/5300-13A.

Taxiway A

Taxiway A is an entrance/exit, partial parallel taxiway providing access to the approach end of Runway 20 and is 50 feet wide. The taxiway centerline is located 275 feet from the Runway 2-20 centerline, which does not meet ADG III runway-taxiway separation standards of 400 feet. A multi-phase project is in the planning stages to partially address the non-standard separation.

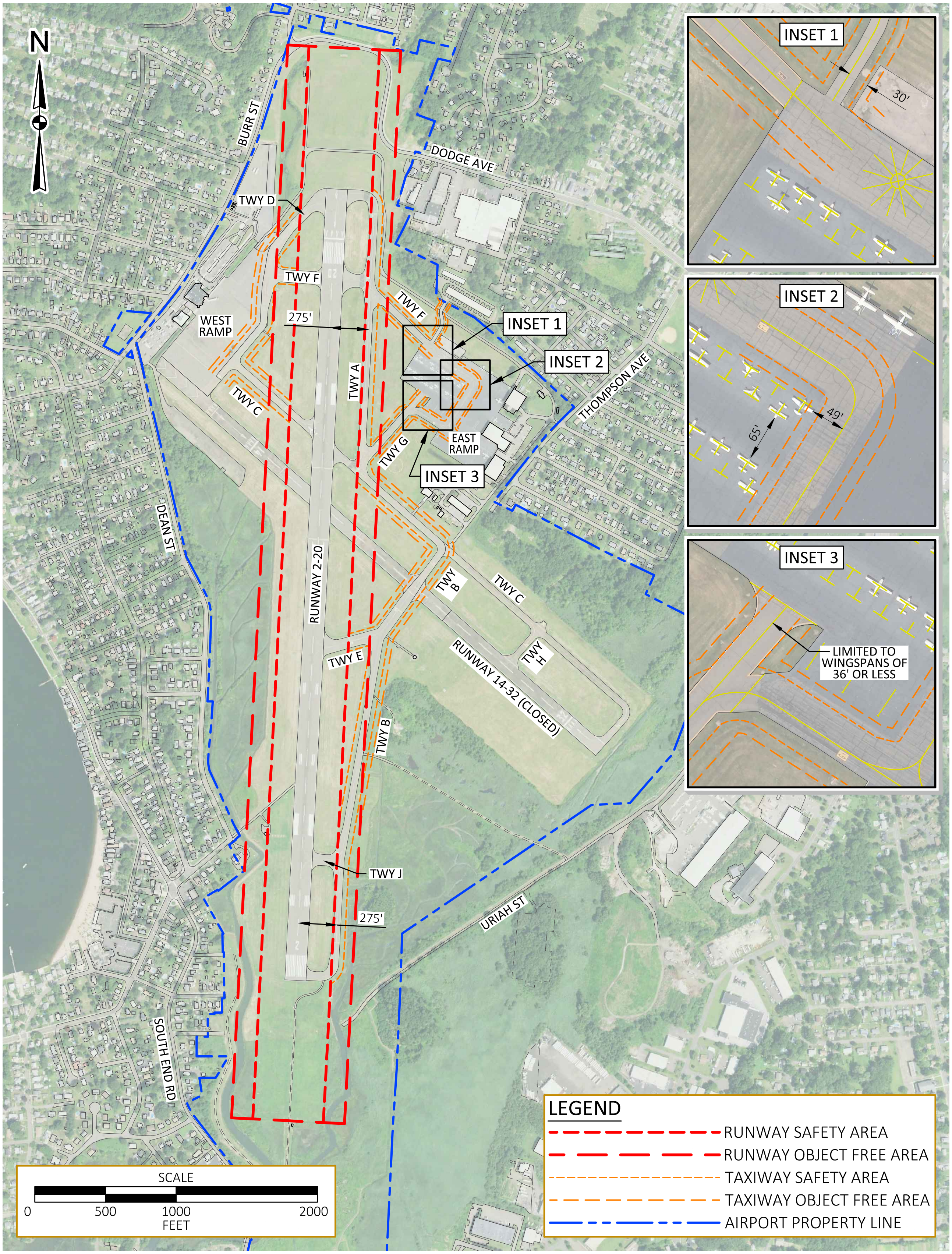
Taxiway B

Taxiway B is an entrance/exit, partial parallel taxiway providing access to the approach end of Runway 2. It crosses closed Runway 14-32, is 50 feet wide, and terminates at Taxiway C. Taxiway B is located between approximately 470 and 275 feet from the Runway 2-20 centerline, which does not meet ADG III runway-taxiway separation standards of 400 feet. From approximately Taxiway E south to the approach end of Runway 2, it is closer than 400 feet to the runway centerline.

Taxiway C

Taxiway C was formerly a full-length parallel taxiway for Runway 14-32. It is 50 feet wide and terminates at the West Ramp on the northwest end, and the approach end of Runway 32 on the southeast end. As a parallel taxiway to closed Runway 14-32, it is an acute-angled taxiway to Runway 2-20, or one that forms less than a 90-degree angle from the runway centerline. Parallel taxiways to crosswind runways are critical for airport operations, therefore it is generally accepted

Figure 6-2: HVN Taxiways and Taxilanes



K:\Tweed New Haven\T-18534.00 HVN MPU 2019\Draw\Drawings\Figures\TAXIWAY PROTECTION.dwg that they cross other runways at a non-perpendicular angle. Since Runway 14-32 is permanently closed and not anticipated to reopen, the non-perpendicular intersection with Runway 2-20 should be reviewed in the alternatives. Taxiway C is closed south of Taxiway B.

Taxiway D

Taxiway D is an entrance/exit taxiway and an apron taxiway along the southern edge of the West Ramp and providing access to the terminal building for air carrier aircraft. It is 50 feet wide and terminates at the approach end of Runway 20. Taxiway D is an acute-angled taxiway.

Taxiway E

Taxiway E is an entrance/exit stub taxiway which provides access from Runway 2-20 to Taxiway B. Taxiway E is 80 feet wide and is an acute-angled taxiway.

Taxiway F

Taxiway F is a crossover taxiway that crosses Taxiway A and Runway 2-20 and connects the East Ramp to the West Ramp. It is 50 feet wide, except between Taxiways A and D, where it is 90 feet wide.

Taxiway G

Taxiway G is 50 feet wide and connects the East Ramp to Taxiway C. In the FAA Chart Supplement for the Airport, it is reported there is standing water at intersection of Taxiway G and the East Ramp after heavy rains. Additionally, Taxiway G between the East Ramp apron taxilane leading to Taxiway F and the tie-down area is limited to aircraft with wingspans no greater than 36 feet.

Taxiway H

Taxiway H is an entrance taxiway connecting Runway 14-32 to Taxiway C. It is 50 feet wide. This taxiway is currently not in use as Taxiway C is closed south of Taxiway B.

Taxiway J

Taxiway J is an entrance taxiway approximately 870 feet north of the approach end of Runway 2. It is 75 feet wide.

Problematic and Non-Standard Taxiway Geometry

In 2018, the FAA published DOT/FAA/TC-18/2, *Problematic Taxiway Geometry Summary Report.* The report outlined several taxiway geometries and configurations that have been known to lead to pilot confusion, and subsequent deviations from ATCT instruction and runway incursions.

Problematic and non-standard taxiway and taxilane geometries can be seen in **Figure 6-2**. In reviewing the entire airfield geometry, the following non-standard taxiway geometries were identified:

Unexpected Hold Position Markings: Unexpected hold position markings on a parallel taxiway are not expected by pilots and can easily be missed. The hold position marking on Taxiway B at Runway 2 and on Taxiway A at Runway 20 are located on the parallel portions of the taxiways due to the non-standard runway-taxiway centerline separation and the runway centerline to taxiway hold position requirements.

Avoid "High Energy" Intersections: These intersections are in the middle third of runways, where a pilot's ability to maneuver to avoid a collision is diminished. Taxiway C is located within the middle third of Runway 2-20.

Direct Access: Taxiways leading directly from an apron to a runway without requiring a turn can lead to confusion when a pilot typically expects to encounter a parallel taxiway but instead accidentally enters a runway. Taxiways C and F both provide direct access to Runway 2-20.

Taxiway Intersecting Runway at Other Than a Right Angle: Right (perpendicular) intersection angles between taxiways and runways provide the best visibility to the left and right for a pilot. A right angle at the end of a parallel taxiway is a clear indication of approaching a runway. Taxiways C, D, and E are all at acute angles to Runway 2-20.

Recommendation: Problematic and non-standard taxiway geometries should be addressed. Additionally, any pavement condition in failed, serious, very poor, and poor condition should be reconstructed in the short-term. Pavement assessed as fair should be rehabilitated within the planning period. Pavement drainage issues should also be addressed in the short term. Aircraft parking positions that locate aircraft within a TOFA should be removed and relocated.

If any changes to the taxiways occur, Engineering Brief No. 89, *Taxiway Nomenclature Convention*, dated March 29, 2012 should be used to ensure clear taxiway nomenclature.

6.2.12. Taxilanes

Similar to taxiways, taxilanes are defined by the FAA as those designed for low speed and precise taxiing. Typically located outside of movement areas, taxilanes provide access from taxiways to apron and terminal areas. At HVN, taxilanes provide aircraft access in and around the T-hangars, and on the East Ramp. The taxilane object free area (OFA) for ADG I aircraft is 79 feet wide and the taxilane OFA for ADG II aircraft is 115 feet wide.

On the East Ramp, some tie-downs, if occupied, would place portions of the parked aircraft within the taxilane OFA. This review was only conducted on Airport property.

Recommendation: Taxilane OFAs and wingtip clearances should remain clear of objects.

6.2.13. Airfield Lighting and Signage

Runway and Taxiway Lighting

Runway 2-20 is equipped with high intensity runway edge lights (HIRLs). The HIRLs can be activated by airport traffic control tower (ATCT) personnel when the tower is open, or by using the common traffic advisory frequency (CTAF) when the ATCT is closed. There are still runway edge lights on the former Runway 14-32 and FAA has recommended they be removed.

All taxiways are equipped with medium intensity taxiway edge lights (MITLs), except for the intersection of Taxiways B and C (where Taxiway C is closed), and at the run-up pad on former Runway 14-32 where there are taxiway edge reflectors.

Recommendation: It is recommended that all of the edge lights from the former Runway 14-32 be removed. As runways and taxiways are rehabilitated, any airfield lighting electrical cable that is direct burial should be replaced with cable in conduit.

Airport Signage

Airport signage appears to meet FAA standards per the most recent Federal Aviation Regulations (FAR) Part 139 inspection.

Recommendation: There are no recommendations with respect to Airport signage.

6.2.14. Visual Approach Aids

Visual approach aids for Runway 2 at HVN include a four-box precision approach path indicator (PAPI) on the left-hand side for approaching pilots, as well as a medium intensity approach light system with sequenced flashers (MALSF). As of August 2020, a four-box PAPI is being installed for Runway 20. The Airport has filed for a new LPV approach for the undisplaced Runway 20 threshold.

Runway 2 would benefit from an upgrade to a MALS with runway alignment indicator lights (MALSR). The upgrade to MALSR would allow for the consideration of a light credit to reduce the visibility minimums from ¾ statute mile (SM) to ½ SM. Runway 20 would benefit from the addition of runway end identifier lights (REILs), to better inform pilots of the location of the end of the runway. REILs serve as rapid, positive identification of a particular runway or displaced landing threshold, especially for runways with non-precision approaches and without approach lights (such as Runway 20).

Recommendation: It is recommended that REILs be installed at the approach end of Runway 20 and MALSR be considered for the Runway 2 end.

6.2.15. Airfield Facility Requirements Summary

Several requirements for airside facilities have been discussed throughout this section. A summary of the key requirements identified can be found in **Table 6-12**.

Table 6-12: **Summary of Airside Facility Requirements**

Item/Facility	Existing Facility or Capacity (Runway)	Ultimate Requirement	Deficit
Runway Length	5,600’	7,600’	2,000’
Runway Width	150’	150’	None
Runway Safety Areas	Small corner outside of RSA on the north end; Lateral edges not to standard grade	Standard or RSA determination	Meet standards or RSA determination

Item/Facility	Existing Facility or Capacity (Runway)	Ultimate Requirement	Deficit
Runway Object Free Area	Portion of Airport perimeter fence and Dodge Ave in ROFA	Standard or MOS	Meet standards or request MOS
Runway Protection Zone	Portions off Airport property	Under airport control through ownership or avigation easements	Acquire off-airport portions of RPZs in fee simple or easements
Runway Lighting	HIRL	HIRL	Update cabling from direct burial to cable in conduit; Remove lighting from former Runway 14-32
Runway Visual Aids	PAPI/MALSF (2) PAPI (20)	PAPI/MALSR (2) PAPI/REIL (20)	Install MALSR (2) Install REILs (20)
Instrument Approaches	Runway 2 – ILS/GPS Runway 20 – GPS	Runway 2 – ILS/GPS Runway 20 – GPS	Lower minimums for Runway 2 Provide Vertical Guidance for Runway 20
Taxiways	Some non-standard taxiway geometries Objects within TOFA and taxilane OFA	Standard taxiway geometries and OFAs clear of obstacles	Meet TOFA/taxilane OFA standards or MOS; Address non-standard taxiway geometries
Taxiway Lighting	MITL	MITL	None

Sources: FAA Form 5010-1; McFarland Johnson analysis, 2020.

6.3. PASSENGER TERMINAL FACILITY REQUIREMENTS

This section addresses the methodology, assumptions, and general planning-level factors used to analyze facility requirements for key functional areas of the HVN passenger terminal. Requirements were analyzed based on a multitude of factors and compared to growth triggers identified in Chapter 4, *Forecasts*. The primary tool used to model various terminal space requirements was ACRP Report 25, *Airport Passenger Terminal Planning and Design, Volume 2: Spreadsheet Models and User's Guide (the Model)*. Additionally, guidelines published in the following publications were included:

- International Air Transport Association's (IATA) *Airport Development Reference Manual* (ADRM, 10th Edition);
- FAA AC 150/5360-13A, *Airport Terminal Planning*; and
- FAA AC 150/5300-13A (Change 1), *Airport Design*.

6.3.1. Existing Passenger Terminal

The Airport's original terminal building and ATCT opened in 1931 and sits just southwest of the current terminal building. The current terminal building is a two-story structure originally constructed in 1930 as the Airport's first conventional hangar. It was extensively renovated in 1995 and again in 2005.

The first floor encompasses approximately 12,000 square feet (SF) and provides secure and non-secure areas for passengers. Secure areas and sterile areas are areas that authorized Airport personnel and passengers may enter after having been processed through the security screening checkpoint overseen by the Transportation Security Administration (TSA).

The second floor is approximately 2,800 SF and is comprised entirely of sterile space, including concessions (vending) and the passenger holdroom associated with the passenger boarding bridge. The second floor, including the passenger boarding bridge, was renovated between 2018 and 2019 to improve passenger experience and increase the lifespan of the bridge.

6.3.2. Methodology

Utilizing the Model and FAA and industry standards guidance listed above, the following passenger processing functions were examined:

- Terminal Curb Length
- Passenger Check-In and Ticketing
- Outbound Baggage Screening and Make-Up
- Passenger Security Screening Checkpoint
- Passenger Holdrooms
- Concessions
- Inbound Baggage Handling and Claim
- Other Terminal Support Functions

Analyzing the terminal throughput on a peak month or peak day basis does not accurately capture the demands of a facility that experiences peak demand during a single flight operation. To best inform potential future needs, the terminal building analysis was performed under four scenarios:

- 100 Peak Hour Passengers
- 150 Peak Hour Passengers
- 200 Peak Hour Passengers
- 250 Peak Hour Passengers

Application of the Model under these scenarios is presented in the following sections.

Application of the ACRP Model

The Model is designed to determine terminal requirements by functional area based on historical and forecasted annual enplanements, departures, and gates. The Model uses these inputs (along with a variety of assumptions) to identify peak hour activity. From this point, the Model relies on peak hour activity levels to produce space requirements that can accommodate demand as it grows. In this way, the Model serves as "top down" analysis, starting with annual demand to estimate peak activity demand. Facility requirements at HVN were determined using the four planning activity levels of 100, 150, 200 and 250 peak hour passengers.

6.3.3. Assumptions

This section summarizes the assumptions utilized for the assessment of the existing Airport terminal building.

Percentage of Originated Passengers

For purposes of analyzing passenger terminal space requirements, it is assumed that 100 percent of enplaned passengers are originating at HVN. The originating passenger percentage is used to determine the number of passengers to be processed through check-in/ticketing and security screening, along with associated demands on outbound baggage functions, holdroom usage, and gate/boarding area egress.

Vehicle Demand at Terminal Curb

Vehicle demand is measured based on the range of vehicle types used by passengers as ground transport to an airport for departing flights. These include everything from private automobiles typically carrying one to three passengers to tour buses carrying large groups of passengers. While some hotel shuttles and busses may drop off and pick up passengers, they are infrequent in nature and also not overly common at other similar sized airports; therefore, the focus is placed on the use and operation of personal vehicles and/or those that share the size and characteristics of such.

The estimated passenger breakdown by landside mode is as follows:

- Parking lots: 40 percent
- Pick-up/drop-off: 25 percent
- Taxis and transportation network companies (TNCs): 25 percent
- Rental cars: 10 percent

In addition to this breakdown, the analysis also assumes an average party size of 1.25 people for parked vehicles and those involved in personal pick-ups and drop offs. Rental cars, taxis, and TNCs (Uber, Lift, etc.) all assume one passenger per transaction. With the introduction of more leisure-oriented service, the average party size may increase; however, the lower party size is a more conservative estimate in facility planning (meaning the requirement will be greater) and facility needs should be reevaluated with a focus on party size should the service offering at the Airport change to more of a leisure mix.

The estimated curb requirements for the terminal curb are in linear feet (LF). The existing curb length is approximately 150 LF along the terminal curb front. Of this, about 100 LF is adjacent to the terminal ticketing lobby and 50 LF runs perpendicular between the roadway and aircraft apron along the fence and is not ideally configured to achieve maximum utilization. Additionally, there is approximately 235 feet in two separate lanes behind the terminal building in front of the Airport administration building. These lanes are marked as taxi staging. TNCs are known to stage in the neighborhood roads and in the same terminal curb as meeters and greeters.

Table 6-13 illustrates the assumed breakdown of existing peak vehicle demand at the curb, dwell time assumptions, and passenger per vehicle assumptions, all of which are integral to the calculation of terminal curb requirements. It is assumed that 50 percent of the peak hour demand will occur during the peak 20 minutes, representative of the peak conditions that occur before or after a flight. Curb front and landside elements should be planned for the peak 20-minute period. Not all landside passengers will utilize the curb, such as parked vehicles and rental cars; however, the total peak 20-minute numbers can also be used when planning traffic and roadway improvements associated with the terminal operation.

Table 6-13: Peak Hour Vehicle Assumptions

	100 Peak Hour Passengers		150 Peak Hour Passengers		200 Peak Hour Passengers		250 Peak Hour Passengers	
	Cars	Curb (LF)	Cars	Curb (LF)	Cars	Curb (LF)	Cars	Curb (LF)
Parking Lot								
Parking Lot	32		48		64		80	
Parking Lot Peak 20 min.	16		24		32		40	
Curb Length								
Pick-up/ Drop-off Peak Hour	20	120	30	180	40	240	50	300
Pick-up/ Drop-off Peak 20 min.	10	60	15	90	20	120	25	150
Taxi/TNC's Peak Hour	25	150	38	225	50	300	63	375
Taxi/TNC's Peak 20 min.	13	75	19	113	25	150	31	188
Rental Car Peak Hour	10		15		20		25	
Rental Car Peak 20 min.	5		8		10		13	
Total Curb Peak Hour	45	270	68	405	90	540	113	675
Total Curb Peak 20 min.	**23**	**135**	**34**	**203**	**45**	**270**	**56**	**338**
Exit Traffic								
Total Exit Peak Hour	87		131		174		218	
Total Exit Peak 20 min.	44		65		87		109	

Source: McFarland Johnson analysis, 2020.

As seen in **Table 6-13,** the long-term peak 20-minute need for the length of a vehicle curb at HVN is between 135 and 338 feet compared to the existing useful curb length of 100 feet.

Recommendation: It is recommended the Airport terminal curb be expanded to a minimum of 135 feet to meet existing demands and more depending on future demand.

Passenger Check-in /Ticketing

Passenger check-in/ticketing includes the functions of full-service staffed airline counter positions, self-serve kiosks, active check-in area, passenger queue area, airline ticket office areas, circulation area, and public restrooms accessible from the ticketing lobby. Assumptions for these areas include the following:

- 60 percent of peak hour passengers could be experienced in the peak 30-minute period.
- 75 percent of passengers use check-in and ticketing facilities.
- 50 percent will use self-service check-in and 50 percent will use staffed positions.
- Average passenger processing time at the counter or kiosk is three minutes.

Industry trends favor an increase in self-service check-in practices. While there is presently no self-tagging/checked baggage drop at HVN, this is a provision that should be planned for in the future. Staffed check-in positions in the traditional form are likely to be minimal by the end of the planning period and replaced with more kiosks or mobile supporting technology that occurs away from the traditional ticket counters.

Outbound Baggage Make-Up and Screening

Outbound baggage screening and make-up functions includes operations by TSA to screen checked baggage and airline staff to collect and disperse bags to carts and the appropriate aircraft prior to departure. Assumptions for these areas include the following:

- 65 percent of passengers will check a bag
- Average of one bag per passenger
- TSA surge factor of 50 percent for peak processing
- 20 percent alarm rate (level 2 OSR), 95 percent clear rate, 5 percent requiring level 3, explosives trace detection (ETD)

In terms of explosive detection system (EDS), on-screen resolution (OSR), and ETD equipment requirements, the analysis assumed a Level 1 EDS screening rate of 220 bags per hour, with an alarm rate of 20 percent. Level 2 OSR processing ration was set at 60 bags per hour. For Level 3 ETD screening, the TSA suggests 24 bags per hour per operator.

Baggage screening space requirements contained in the Model were utilized here, and are as follows:

- Level 1 Area: 500 SF per EDS unit
- Level 2 Area: 40 SF per OSR station
- Level 3 Area: 100 SF per ETD station

An additional 35 percent of space is added for circulation area and 15 percent to allow for future equipment changes and any required reconfiguration or renovations.

Passenger Security Screening Checkpoint

This section discusses the assumptions utilized to analyze the future demand for security screening of departing passengers. The assumed processing rate for the analysis is 120 persons per hour for a single lane screening module and 175 persons per hour for a two-lane screening module configuration. The constrained configuration of HVN means 120 peak hour passengers is an optimistic case.

Although TSA recommends 2,800 SF of space for a two-lane screening module, HVN currently accommodates a single lane within roughly 2,000 SF. As such, this ratio was maintained for future facility needs.

The percentage of assumed non-passenger traffic, such as employees and crew, represents ten percent of the throughput, which was added to the design peak hour passenger screening demand and is based on recent experience at other airports.

As with other functional areas, allowances were also included for future equipment changes (ten percent) or reconfigurations and TSA support space (12 percent).

Passenger Lounges/Holdrooms (Secure)

Holdroom space typically accounts for seating a certain percentage of passengers, with the remaining passengers either not in the holdroom area or standing. The analysis assumed 15 SF per seated passenger and 10 SF per standing passenger. The Model also includes some flexibility to account for amenities (e.g., children's play area, telephones, work areas, charging stations, etc.), and high utilization and holdroom sharing, when the holdroom is utilized for passengers waiting for more than one flight or is shared between gates. Other assumptions include:

- 80 percent of passengers are seated
- 20 percent of passengers are standing
- No sharing of holdroom space with adjacent gates (there is only one hold room under existing conditions)

Allowances for amenities, circulation, and restrooms are assumed to be 5 percent, 35 percent, and 15 percent, respectively.

Inbound Baggage Handling & Baggage Claim

Inbound baggage handling includes the unloading of baggage from aircraft and transferring them to the baggage claim unit for circulation to the baggage claim hall. The Model calculates baggage claim requirements assuming that a certain percentage of passengers will deplane in a peak 30-minute period. As previously noted, it is also assumed that 65 percent of passengers will check one bag. Additionally, the following assumptions are made:

- An additional 10 percent is applied to the number of passengers checking bags to account for meeters and greeters
- 1.3 LF of claim is required for each person in the claim lobby
- Baggage claim area is increased by 15 percent to provide for baggage services office
- Baggage claim area is increased by 15 percent to provide for meet and greet area
- Baggage claim area is increased by 20 percent to provide for circulation space
- Baggage claim area is increased by 10 percent to provide for restroom facilities

To account for inbound baggage handling area the following assumptions are made:

- Take off belts require 850 SF of space each
- Baggage train circulation requires 1,275 SF of per take off belt
- 255 SF per take off belt is provided to account for conveyor belts equipment and other miscellaneous equipment

Some of these areas supporting the inbound baggage delivery do not necessarily need to be within the building envelope.

Concessions

Terminal concessions include both non-secure and secure area retail establishments to service departing and arriving passengers. For this assessment, it is assumed that 10 percent of peak hour passengers will utilize pre-secure concessions and 90 percent of peak hour passengers will patronize post-secure area concessions. The Model makes the following assumptions to calculate spatial requirements:

- Food and beverage-based concessions require seven SF per peak hour passenger
- Retail based concessions requires 3.5 SF per peak hour passenger
- Service based concessions require 0.5 SF per peak hour passenger
- A multiplier of 20-30 percent is used to account for support space for food, beverage, and retail concessions
- Internal circulation area allowance of 15 percent is also included for terminal building concession areas

While the primary concession at HVN is currently vending, the output of this analysis should be used to inform the terminal development alternatives so that more traditional concessions can be accommodated as passenger activity increases.

Other Terminal Support Facilities

The final consideration of passenger terminal functional areas includes allowances for the various support areas.

A provision of five percent of the total departure/arrival areas is provided for the following:

- Airline operations
- Ground handling services
- Airport operations and maintenance
- Facilities support and services

A provision of ten percent of the total departure/arrival areas is provided for the following:

- Building structure
- Vertical circulation
- Mechanical/electrical/utility
- Allowance for other tenants/configurations

Concourse Gates, Passenger Board Bridges, and Terminal Apron

The existing terminal building has four gates for two aircraft parking positions, one of which is a ground level boarding gate and the other has a passenger boarding bridge (PBB). To determine the required number of concourse gates, and subsequently passenger boarding bridges and terminal apron requirements, the Model employs a passengers per gate approach and a departure per gate approach. The resulting average of these two approaches is a total of two gates. It is recommended that one of the two gates have a minimum sizing capability for servicing an Embraer 175, with a standard AAC-ADG C-III sizing to accommodate an Airbus A320 being ideal for operational flexibility in the future.

6.3.4. Results of Analysis

The results of the terminal capacity assessment are summarized in **Table 6-14**.

Table 6-14: **Terminal Requirements Summary**

Terminal Functional Area (in SF)	Existing Provision	100 Peak Hour Passengers	150 Peak Hour Passengers	200 Peak Hour Passengers	250 Peak Hour Passengers
Check-In /Ticketing	1,648	949	1,446	1,897	2,394
Outbound Baggage Screening & Makeup	751	3,115	3,240	3,240	3,240
Passenger Security Screening Checkpoint	1,356	4,883	4,981	6,366	8,854
Secure Holdrooms	1,865 /1,511	5,780	6,878	9,072	12,364
Baggage Claim and Inbound Baggage Handling	769	5,566	4,292	8,820	12,265
Concessions	1,090	2,078	3,117	4,156	5,194
Other Functions/Tenants	5,810	12,286	15,644	17,871	23,689
Total	14,800	34,657	39,598	51,422	68,000
Passenger Terminal Requirement Range		**30,000-35,000**	**35,000-40,000**	**50,000-55,000**	**65,000-70,000**

Sources: ACRP Model and McFarland Johnson analysis, 2020.

Recommendation: It is recommended the Airport pursue a terminal building of at least 30,000 SF to meet existing demand and up to 70,000 SF to meet demand at 250 peak-hour passengers. The existing terminal building could be expanded or a new facility could be built elsewhere on the Airport.

6.3.5. Terminal Apron

The existing terminal apron is approximately 30,500 SY. This area incorporates the portion of the terminal apron up to the non-movement line but does not include the portion of the apron from the non-movement line to the Taxiway D edge. The total apron area, up to the Taxiway D edge, is depicted on the ALP. There is also a deice pad southeast of the terminal building between Taxiway D and the terminal apron. There are two parking positions at the existing terminal building. One parking position is at the sole PBB and the other is a ground boarding gate to the southwest of the PBB. The existing terminal apron is sized appropriately to accommodate both an E175 and an A320 simultaneously with enough room for maneuvering and ground support equipment.

Recommendation: If the terminal building is relocated, the terminal apron should be able to support the activities of an E175 and an A320 simultaneously, with adequate room for maneuvering and staging of airline support equipment.

6.4. PARKING AND ROADWAY ACCESS FACILITY REQUIREMENTS

6.4.1. Passenger Parking

The number of passenger parking spots required will vary with the type of service being offered at the Airport. Shorter haul flights to business destinations will necessitate less parking as business travelers typically travel for shorter durations of three to five days. Longer flights to vacation spots by low-cost carriers will generally require more parking as families leave their cars for a week or more. Despite the disparities, some assumptions can be made to plan for adequate passenger parking. For the anticipated type of service at HVN, a standard planning factor of 0.25 was chosen as standard peak hour planning factor, or in other words, 25 percent of the daily passenger activities occur during the peak hour.

Departing passengers park their vehicle in one of three lots which have a total of 585 parking spots. Using the peak hour passenger numbers previously discussed of 100, 150, 200, and 250, and assuming that 40 percent of passengers will park cars, the need for passenger parking will be a minimum of 640 spaces for 100 peak hour passengers. If the Airport reaches 250 peak hour passengers, the need for passenger parking will increase to 1,600 spaces. For planning purposes, a standard 325 SF will be used per parking space, to factor for vehicle ingress, egress, travel lanes, and maneuvering. The results of the calculations can be seen in **Table 6-15**.

Table 6-15: **Vehicle Parking Needs**

	100 Peak Hour Passengers	150 Peak Hour Passengers	200 Peak Hour Passengers	250 peak Hour Passengers
Passenger Parking	640 Spaces 208,000 SF	960 Spaces 312,000 SF	1,280 Spaces 416,000 SF	1,600 Spaces 520,000 SF
Rental Car Parking	40 Spaces 13,000 SF	60 Spaces 19,500 SF	80 Spaces 26,000 SF	100 Spaces 32,500 SF
Total	**680 Spaces 221,000 SF**	**1,020 Spaces 331,500 SF**	**1,360 Spaces 442,000 SF**	**1,700 Spaces 552,500 SF**

Source: McFarland Johnson analysis, 2020.

Recommendation: It is recommended the Airport plan for a minimum of 208,000 SF and up to 520,000 SF of vehicle parking space for passengers within the planning period.

6.4.2. Rental Car Parking

Using the peak hour passenger numbers previously discussed, it can be assumed the average daily demand for rental cars spaces will be between 40 and up to 100. Although there are currently 87 rental car parking spaces the rental car companies should be able to operationally manage by bringing in rental cars as they get rented. Rental car data is also included in **Table 6-15**.

Recommendation: It is recommended the Airport plan for a minimum of 13,000 SF and up to 32,500 SF of vehicle parking space for rental cars within the planning period.

6.4.3. Employee Parking

A final metric for determining the number of vehicle parking spaces is the number of employee parking spots. Employees at the Airport include TSA/law enforcement, airline staff, concessions workers, and Airport personnel. It is estimated the need for employee parking will total approximately 30 people per day, per shift. With two shifts per day, the need for employee parking can be as much as 60 spaces. It is assumed the employees could park in a designated portion of the rental car lot, or if necessary, spill over into any available passenger parking spots.

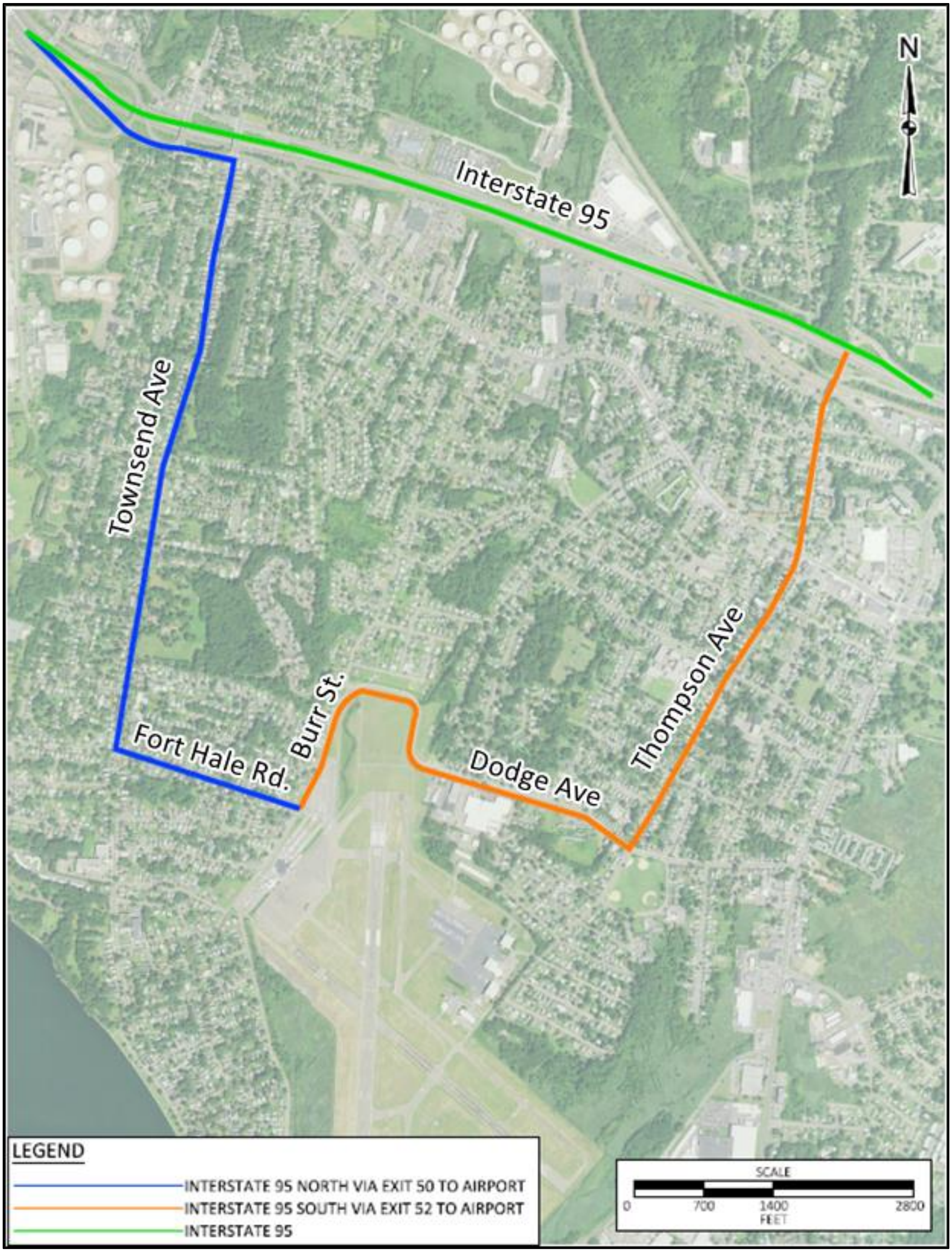
6.4.4. Roadway Access to the Airport

Roadway access to the terminal building for departing passengers and meeters and greeters for arriving passengers is done through residential neighborhoods as can be seen in **Figure 6-3**. Access from Exit 50 of I-95 runs along Townsend Avenue and Fort Hale Road has five stops (three traffic lights, two stop signs) and speed limits range from 25 to 30 miles per hour. Access from Exit 52 on I-95 runs along Thompson and Dodge Avenues and Burr Street has six stops (two traffic lights, four stop signs) and similar low speed limits. Most of both paths run solely through single-lane residential areas. Neither of these routes are optimal airport access paths and signage directing arriving passengers and meeters and greeters is sparse and can contribute to driver confusion.

Additionally, taxis and TNC vehicles have no place to stage and wait for arriving passengers and are forced to park or drive around in residential neighborhoods as they wait for potential passengers from arriving flights. This impacts and sometimes concerns local residents as TNC vehicles block the road for through traffic both residential and to/from the Airport.

Recommendation: Airport access improvements should be considered either in the existing location or a different route to the Airport. Improved signage would help Airport users navigate the parking areas and terminal curb front. The Airport should plan for additional passenger parking of at least 55 spaces to meet the minimum need, and up to 1,015 spaces during the planning period. Lastly, the Airport should consider the addition of a cell phone lot for meeters and greeters and TNCs to stage as they wait for arriving passengers.

Figure 6-3: HVN Access



Source: McFarland Johnson, 2020.

6.5. GENERAL AVIATION AND LANDSIDE FACILITY REQUIREMENTS

The existing general aviation (GA) area is located east of Runway 2-20. This section discusses the requirements for each of the GA elements. Requirements for GA facilities at HVN were calculated based on data collected during the inventory, forecasts, consultation with Airport staff, as well as FAA standards. The following facilities were examined:

- Aircraft Hangars
- Aircraft Parking Aprons
- General Aviation Auto Parking
- Airport Administrative/Operations Offices
- Other Airfield Considerations
- Summary of General Aviation and Landside Facility Requirements

6.5.1. Aircraft Hangars

There are five hangars currently at the Airport. Three are conventional box hangars and two are T-hangars. There are 28,500 SF of aircraft storage in the conventional hangars and 20 individual units in the T-hangars.

Requirements are calculated based on the size and quantity of aircraft based at the Airport. While each aircraft will vary in size, the following planning factors were used to calculate the approximate hangar space requirements for aircraft based at HVN:

- 1,200 SF for Single Engine and Rotor Aircraft
- 1,600 SF for Multi Engine Aircraft
- 3,200 SF for Jet Aircraft

The forecast for based aircraft uses a 0.54 percent average annual growth rate. Existing and future hangar demand is shown in **Table 6-16** which includes fixed base operator (FBO) demand.

Recommendation: It is recommended the Airport construct additional hangars to meet demand. Hangars could be built by the Airport or through private development.

Table 6-16: Existing and Future Hangar Demand

	Existing	2040 Demand	Deficit
Individual T-Hangars	20 Units	22 Units	2 units
Conventional Hangars*	28,500 SF	70,700 SF	42,200 SF

* Based aircraft storage only

Sources: Airport management and McFarland Johnson analysis, 2020.

6.5.2. Aircraft Parking Aprons

Based Aircraft Parking

The Airport currently has 50 based aircraft and is predicted to grow to 56 based aircraft by 2040. Assuming 50 percent of single engine, multi-engine, and helicopter based aircraft will be stored in hangars and the remainder stored on tie-downs, the Airport will need 23 based aircraft tie-downs today, and 24 tie-downs by 2040. There are currently 45 tie-downs on the East Ramp.

Recommendation: There are no recommendations with respect to based aircraft parking; however, pavement in poor or failed condition should be reconstructed during the planning period.

Transient Aircraft Parking

Chapter 4, *Forecasts,* identifies peak hour operations in 2040 to be 11 aircraft. The Airport should plan to have 11 transient aircraft parking spaces available. With 45 tie-downs and 24 of them forecast to be utilized by based aircraft, 21 tie-downs should be available for transient aircraft. This meets the demand and includes having tie-downs available for transient aircraft staying overnight.

Recommendation: There appears to be adequate transient aircraft throughout the planning period. Any pavement in poor or failed condition should be reconstructed during the planning period.

6.5.3. General Aviation Auto Parking

There are 87 vehicle parking spots adjacent to the FBO hangars at the East Ramp and eight vehicle parking spots for the Airport administration building.

The methodology used below is based on the ACRP Report 103: *Guidebook on General Aviation Facility Planning*[1]*.* The existing and future GA vehicle parking needs, as well as Airport administration parking needs are calculated as follows:

- One space per 1,000 SF of hangar floor space
- One space per 200 SF of office floor space
- One space per 750 SF of maintenance/shop space (five minimum)
- One half space for each T-hangar
- 2.5 spaces per peak-hour operations
- One half space for each based aircraft tie-down space

Based on this methodology, a total need of 249 parking spaces are identified for based and transient GA operations at HVN through 2040. The current parking lots have inadequate capacity throughout the planning period. Automobile parking requirements for GA operations at the Airport are displayed in **Table 6-17**.

Recommendations: Additional GA vehicle parking should be constructed during the planning period to meet existing and forecast demand.

6.5.4. Airport Administration/Operations Office

The existing Airport administration and operations offices are housed in the original terminal building, just southwest of the existing terminal building, and comprise approximately 6,400 SF.

[1] National Academies of Sciences, Engineering, and Medicine 2014. *Guidebook on General Aviation Facility Planning*. Washington, DC: The National Academies Press. https://doi.org/10.17226/22300.

The building opened in 1931 and was renovated in 1995. The size of the building is adequate, but aging.

Table 6-17: **Automobile Parking Requirements**

	Existing Auto Parking Spaces	Existing Auto Parking Requirement	Existing Deficit	Future Auto Parking Requirement	Future Deficit
Conventional Hangars	87	104	17	133	46
T-Hangars and Apron	0	58	58	51	51
Admin. Building	8	32	24	32	24
Total	**95**	**194**	**99**	**216**	**121**

Source: McFarland-Johnson analysis, 2020.

Recommendation: The existing administrative and operations offices are adequate but aging. Space for administration and operations should be Included in a new terminal building or the existing building should be updated.

6.5.5. Other Airfield Considerations

Wildlife Hazard Management

The Airport has a Wildlife Hazard Management Plan (WHMP) which was implemented in July 2019. The WHMP is a comprehensive plan which encourages participation from Airport management, Airport maintenance, Airport operations, and tenants to work toward reducing the presence of wildlife on the Airport.

Recommendation: There are no recommendations with respect to wildlife hazard management.

Other Aeronautical/Non-Aeronautical Development

The Airport is constrained on all sides by wetlands and residential areas. With the closure of Runway 14-32, there are approximately 45 acres on the southeast quadrant of the Airport that would be suitable for aeronautical development. This parcel would not be suitable for non-aeronautical development as it is surrounded by wetlands and difficult to access unless accessed through the Airport. The northwest portion of the former Runway 14-32 is also bordered by wetlands and has no available road frontage so non-aeronautical development would be difficult. This latter portion has and would be best used for additional vehicle parking, if necessary. Land suitable for non-aeronautical development is extremely limited.

Recommendation: The Airport should plan for additional aeronautical development on the southeast portion of former Runway 14-32. Additionally, the area formerly occupied by the northwest portion of Runway 14-32 should be utilized for additional vehicle parking if necessary.

Electric Aircraft Parking

Cape Air, operating as Shoreline Aviation Services, LLC, operates seasonal scheduled commercial seaplane flights to the New York Skyports Seaplane Base in the East River of New York City. Cape Air has announced that it plans to be the first commercial operator of an all-electric commercial aircraft and could conceivably base and operate out of HVN. Cape Air has multiple Eviation Alice aircraft on order, which are all electric aircraft.

Recommendation: The Airport should plan to implement electric aircraft parking and charging within the planning period.

Resiliency

HVN lies in a coastal setting, surrounded by wetlands and low-lying areas. As such, the Airport is susceptible to tidal flooding and sea level rise flooding. Using the NOAA Sea Level Rise Viewer, it can be seen if the sea level rises two feet or more, the majority of the Airport south of Runway 2-20 will be underwater. Images taken from the NOAA Sea Level Rise Viewer can be seen in **Appendix E**.

Morris Creek lies to the south of the Airport and drains into Long Island Sound. Tide gates have been installed adjacent to Airport property to protect against coastal flooding. Airport employees are trained in the proper operation of the tide gates to ensure the storm protection function of the tide gates be maintained at all times. As such, a memorandum of understanding (MOU) is in place between the City of New Haven and the Airport wherein Airport staff are responsible for the electronic operation of the tide gates, regular inspections, and initial emergency response in the event of an indicated failure. The City, in turn, is responsible for ensuring unobstructed water flow through the tide gates, as well as ongoing maintenance.

Recommendation: The Airport should work with the City of New Haven and the Town of East Haven to develop a resiliency plan that includes mitigation measures for sea level rise and conduct a drainage study.

6.5.6. Summary of General Aviation and Landside Facility Requirements

The facility requirements recommended for the GA and landside areas of the Airport are summarized in **Table 6-18**.

Table 6-18: **Summary of GA and Landside Facility Requirements**

Item/Facility	Existing Provision	Ultimate Requirement	Deficit
Conventional Hangars	28,500 SF	70,700 SF	42,200 SF
T-Hangars	20 Units	22 Units	2 Units
Based Aircraft Parking	24 Tie-downs	24 Tie-downs	None
Transient Aircraft Parking	21 Tie-downs	11 Tie-downs	None
GA Vehicle Parking	95 Spaces	216 Spaces	121 Spaces

Source: McFarland Johnson analysis, 2020.

6.6. UTILITIES AND SUPPORT FACILITY REQUIREMENTS

This section addresses the facility requirements associated with facilities that fulfill support functions at the Airport. These support functions include the following:

- Utilities
- Airport Traffic Control Tower (ATCT)
- Aircraft Rescue and Fire Fighting (ARFF)
- Airfield Maintenance Facility and Equipment
- Fuel Facilities
- Summary of Support Facility Requirements

6.6.1. Utilities

Airport management has indicated some of the airfield lighting is run through conduit, while some is direct burial.

The passenger boarding bridge has no pre-conditioned air or ground power unit due to the power load of the terminal. This should be reviewed and addressed at the next terminal upgrade.

Recommendation: As runways and taxiways are rehabilitated, any airfield lighting electrical cable that is direct burial should be replaced with cable in conduit.

6.6.2. Airport Traffic Control Tower (ATCT)

The current ATCT was constructed in 1983. The ATCT has full power restoration capability in the event of a commercial power outage through the use of a back-up generator. In 2016, the ATCT received a Standard Terminal Automation Replacement System (STARS). Using a radar feed from the nearby FAA New York approach control facility in Islip, NY, STARS gives HVN controllers a complete, precise picture of the airspace, enabling them to manage aircraft they are tracking with radar or the satellite-based ADS-B.

Recommendation: The ATCT will reach 50 years of age within the Master Plan planning period. Upgrades to the building or technology should be reviewed.

6.6.3. Aircraft Rescue and Fire Fighting (ARFF)

FAA requires FAR Part 139 certificated airports to provide, or have ready access to, firefighting equipment commensurate with the longest aircraft regularly using the airport. Regular use is defined as five or more average daily departures. The current critical aircraft (E175) has an ARFF Index of B; however, it does not conduct five or more average daily departures. As such, the Airport currently has an ARFF Index of A; the existing Rosenbauer ARFF truck meets the requirements of ARFF Index B.

> Should a larger aircraft than Index B conduct 5 or more average daily departures, the ARFF Index will increase and larger equipment and storage will be needed.

Should operations by the E175 or the future critical aircraft of the A319/320 meet or exceed five average daily departures, the Airport would be designated Index B and will still have sufficient

ARFF coverage.

The combination operations/ARFF facility was constructed in 2002 and is in good working order. It is approximately 4,500 SF and has a single bay for an ARFF vehicle. The Airport is eligible for an ARFF facility with an additional approximately 2,000 SF bay for ARFF vehicle maintenance and washing, and as such, should plan for an expanded ARFF facility.

Recommendation: The Airport should plan for an ARFF facility of approximately 6,500 SF to house all ARFF equipment.

6.6.4. Airfield Maintenance Facility and Equipment

Equipment Storage

The existing snow removal equipment (SRE) storage building was constructed in 1980 and is aging. It spans approximately 9,500 SF and can store less than half of the existing SRE fleet.

With approximately 840,000 SF of paved runway, per FAA AC 150/5220-18A, *Buildings for Storage and Maintenance of Airport Snow and Ice Control Equipment and Materials*, HVN can be classified as a large airport, or one with between 700,000 and 1,000,000 SF of paved runway. As a large airport, HVN would be eligible for an SRE building of approximately 22,000 SF.

While maintenance equipment other then SRE is not eligible to be purchased with FAA AIP funds, the Airport should plan for a facility that can store the entire Airport fleet of equipment. This may require alternate funding sources for portions of the storage and maintenance facility that are not eligible for AIP funds.

Recommendation: The Airport should plan for and construct a new building of approximately 22,000 SF to house maintenance equipment/SRE.

Equipment Eligibility

SRE and other maintenance equipment is stored in the maintenance/SRE building which is approximately 9,500 SF. Much of the SRE and maintenance equipment is stored outdoors.

Per FAA AC 150/5220-20A, *Airport Snow and Ice Control Equipment*, HVN is eligible for:

- ne high-speed rotary plow (snow blower),
- two displacement plows,
- three material spreaders, and
- three pavement brooms.

The Airport currently has one high-speed rotary plow, six plow trucks, one pavement broom, and two material spreaders. **Table 6-19** below details the SRE the Airport currently has and the SRE the Airport is eligible for.

Table 6-19: SRE Eligibility

Vehicles	Over 10 years old	Eligible for Replacement
High-Speed Rotary Plow	Yes	Yes
Displacement Plow 1	Yes	Yes
Displacement Plow 2	No	In 2025
Displacement Plow 3	Yes	No
Displacement Plow 4	Yes	No
Displacement Plow 5	Yes	No
Displacement Plow 6	Yes	No
Material Spreader 1	Yes	Yes
Material Spreader 2	No	In 2028
Material Spreader 3	N/A	Eligible for Material Spreader 3
Pavement Broom 1	No	In 2025
Pavement Broom 2	N/A	Eligible for Pavement Broom 2
Pavement Broom 3	N/A	Eligible for Pavement Broom 3

Source: HVN Airport management and McFarland Johnson analysis, 2020.

Recommendation: Within the planning period, the Airport should acquire SRE and maintenance equipment as needed and as eligible for under FAA guidelines.

6.6.5. Fuel Facilities

There are three fuel storage tanks at the Airport, all of which have 12,000-gallon capacity. Two of the tanks are dedicated to Jet-A and the third is for Avgas. In 2019, the Airport pumped more than 1.1 million gallons of Jet-A and more than 98,000 gallons of Avgas. Similar to peak hour operations, it is anticipated that the peak month fuel flowage represents ten percent of annual fuel flowage. **Table 6-20** details existing and future anticipated fuel storage capacity.

Table 6-20: Fuel Calculations

	Jet-A (gallons)	Avgas (gallons)
Existing Storage Supply	24,000	12,000
2019 Peak 7-day Demand	28,600	2,450
2019 14-day Demand	57,200	4,900
Existing Deficit	4,600 – 33,200	None
2040 7-day Demand	37,700	2,600
2040 14-day Demand	75,400	5,200
Future Deficit	13,700 – 51,400	None

Source: HVN and McFarland Johnson analysis, 2020.

HVN is close to the New Haven Harbor, the source from which Bradley International Airport (BDL) fuel needs are served via an underground pipeline. If HVN could arrange an agreement with BDL, it is possible the Airport's fuel needs could also be served by the same, nearby infrastructure.

Recommendation: Existing conditions could warrant the need for an additional 20,000-gallon Jet-A fuel tank. Additional tanks may be warranted in the future. It is not anticipated that additional Avgas tanks will be needed within the planning period.

6.6.6. Summary of Support Facility Requirements

Table 6-21 below summarizes the support facility requirements.

Table 6-21: Summary of Support Facility Requirements

Item/Facility	Existing	Ultimate Requirement	Deficit
Utilities	Terminal power load is inadequate Some cable is direct burial	Increase Terminal power load Cable in conduit	Review/improve power load coming into the Terminal Future lighting projects should be constructed cable in conduit
ARFF	ARFF Index A	ARFF Index B	Increase building size to house all ARFF equipment
SRE (<10 years old)	1 displacement plow 1 material spreader 1 pavement broom	1 high-speed plow 2 displacement plows 3 material spreaders 3 pavement brooms	1 high-speed plow 1 displacement plow 2 material spreaders 2 pavement brooms Replacement vehicles
SRE Building	9,500 SF	22,000 SF	12,500 SF
Fuel Facilities	24,000 gallons Jet-A 12,000 gallons Avgas	75,400 gallons Jet-A 5,200 gallons Avgas	Jet-A tank(s)

Source: McFarland Johnson analysis, 2020.