Michael Baker International, Inc.
3900 C Street
Suite 900
Anchorage, AK 99503
919-481-5722

Airport Master Plan Update
Unalaska Airport

FINAL DRAFT WORKING PAPER #2

Capacity Assessment/Facility Requirements

December 8, 2020

Table of Contents

Figures

Tables

5 Airport Capacity Assessment and Facility Requirements

5.1 Introduction

The purpose of the airport capacity assessment and identification of facility needs is to evaluate the single runway airfield system and supporting landside facilities to accommodate existing and future projected aviation activity at Unalaska Airport (DUT).

The airport capacity assessment serves to identify annual service volume and hourly capacity, as well as aircraft operational delay for future airport operations planning. Airfield design standards were also reviewed to identify current design standards and future needs. Facility requirements for current and future aviation demand were evaluated.

5.2 Runway Capacity

5.2.1 Approach and Methodology

Airfield capacity analysis provides a numerical metric measure of the airfield's ability to accommodate the safe and efficient movement of aircraft activities. The capacity of the airfield is primarily affected by several factors that include the physical layout of the airfield, local prevailing meteorological conditions, aircraft fleet mix, runway utilization rates, percent of aircraft arrivals to each runway, relative level of aircraft touch-and-go activity on one or more of an airport's runways, and the location of exit taxiways relative to the approach end of the runway. An airport's airfield capacity is expressed in terms of Annual Service Volume (ASV) and represents a reasonable estimate of the maximum level of aircraft operations that can be accommodated in a year without induced aircraft operational delay.

5.2.2 Annual Service Volume and Hourly Capacity

The ability of the airport's single runway system to accommodate existing and future levels of operational demand was determined using published FAA guidelines as detailed in FAA AC 150/5060-5, *Airport Capacity and Delay.* The aircraft fleet mix for DUT during the airport Master Plan's Base Year 2019 was determined using aircraft information provided by the FAA's TFMSC data base and the BTS information presented in Chapter 4 of this technical report. For purposes of this airfield capacity analysis, the aircraft mix discussed in this section is the relative percentage of operations conducted by each of four classes of aircraft shown in Table 5-1, based upon maximum certified takeoff weight and wake turbulence classification. These classes should not be confused with aircraft approach categories referenced later in this chapter.

Based on the data and review of the FAA's TFMSC count of activity at DUT during 2019, it is estimated that Class A and Class B aircraft (12,500 pounds or less) comprise 20.4 percent of aircraft operations, and Class C aircraft (12,500 to 300,000 pounds) comprise 79.6 percent of aircraft operations.

Table 5-1: Aircraft Classifications			
Aircraft Class	**Maximum Certified Takeoff Weight (pounds)**	**Number Engines**	**Wake Turbulence Classification**
A	12,500 or less	Single	Small
B		Multi	
C	12,500 - 300,000	Multi	Large
D	Over 300,000	Multi	Heavy

Source: FAA Advisory Circular 150/5060-5

The FAA's handbook methodology uses the term "Mix Index" to describe an airport's fleet mix. The FAA defines the Mix Index as the percentage of Class C operations plus three times the percentage of Class D operations. By applying this calculation to the fleet mix percentages for the airport, a Mix Index of 79.6 percent is obtained per the following equation:

Class C Operations (79.6%) + (3 * Class D Operations (0.00%)) = Mix Index (79.6%)

The ASV is a reasonable estimate of an airport's annual capacity. ASV considers differences in runway use, aircraft mix, weather conditions, and other factors that would be encountered over a year. For DUT, the ASV is 205,000 operations per year. DUT has an hourly capacity of 63 VFR operations per hour and 56 IFR operations per hour.

5.2.3 Aircraft Operational Delay

Aircraft operational delay is the difference in time between a constrained and an unconstrained aircraft operation. As the level of aircraft operations increase as a relative proportion of the calculated ASV value, aircraft operational delay increases. The level of aircraft operations at DUT for the year 2019 represented approximately 2.94 percent of the calculated ASV (6,030/205,000), thus indicating virtually no associated aircraft operational delay. At the end of the 20-year forecasting period (2039), this relative percentage will be approximately 1.84 percent (3,782/205,000), continuing to reflect little or no associated aircraft operational delay.

The aircraft operations forecast for DUT indicates that projected aircraft operations (3,782 operations annually in 2039) through the 20-year planning period are not expected to exceed the ASV (205,000 operations annually). The capacity of the airfield system will not be exceeded and will be able to fully satisfy existing and projected future aircraft operational demand for the forecast period without induced adverse effects to aircraft operations and associated aircraft operational delay.

5.3 Runway Orientation and Wind Coverage

As previously discussed in Section 3.11.3 and listed in **Table 3-10**, the runway's orientation does not provide the required minimum 95 percent wind coverage needed to safely accommodate existing B-II RDC. However, the existing orientation exceeds the required minimum 95 percent wind coverage required to accommodate (B-III RDC) critical aircraft operations without the need for an additional crosswind runway. According to the critical aircraft analysis discussed in Section 4, B-III aircraft operations account for approximately 37.41 percent of DUT's annual operations in 2019.

5.4 Protection of Navigable Airspace

5.4.1 CFR Part 77 Civil Airport Imaginary Surfaces

As previously discussed in Section 3.10, DOT&PF has elected to establish the protection of navigable airspace to accommodate future development and implementation of published instrument approach procedures to one or both runway ends. Future development of instrument approach procedures to each runway end and instrument departures from each runway end are to be protected to the extent necessary to meet CFR part 77 Civil Airport Precision Instrument Approach and Approach and Departure Standards.

Current FAA Form 5010-1 Master records do not indicate any penetrations to the Civil Airport Imaginary Surface along the respective extended runway centerline for each runway. However, as part of this analysis it was determined that a ship located at the fuel dock could be considered a penetration to the Runway 31 20:1 Visual Approach Surface depending upon the size of the vessel.

5.4.2 Runway 13-31 End Siting Requirements

When establishing each runway end (i.e., approach and departure end), the requirements of FAA Order 8260.3E, the TERPS-defined approach and departure surfaces listed in AC 150/5300-13A, Change 1, Table 3-2, Approach/Departure Standards, and Table 3-4, Standards for Instrument Approach Procedures, must be considered, as well as other surfaces associated with electronic and visual NAVAIDs, such as a Visual Glideslope Indicator (VGSI) kept clear of penetration by natural and/or man-made objects. The approach surfaces defined in this paragraph are not the approach surfaces defined in CFR Part 77.

The existing DUT Obstacle Clearance Surfaces (OCS) established for each runway end were evaluated. It was determined that a ship located at the fuel dock could be considered a penetration to the existing OCS Type 3 (visual only) and Type 4 (greater to or equal to ¾ mile) surfaces depending upon the size of the vessel. As a result, these surfaces will need to be more closely studied as the planning team considers future runway development options during the airport alternatives analysis phase of the master plan.

DOT&PF should continue to monitor and review all proposals for the erection of temporary or permanent objects in proximity to the airport as filed by proponents via the FAA's 7460-1 and OE/AAA notification process. Further, DOT&PF should maintain its current pro-active role within this review process, with the goal of reducing or eliminating any potential penetrations to the various approach and departure surfaces to preserve the safe an efficient use of the airport.

5.5 Runway Design Standards Analysis

Runway design standards are provided by FAA AC 150/5300-13A, Change 1, *Airport Design* and FAA Advisory Circular 150/5325-4B, *Runway Length Requirements for Airport Design*. As shown below, Runway 13-31 does not completely meet current RDC B-II runway design standards. Previously, a runway practicability study was completed to address RSA deficiencies, and the airport doesn't meet current B-II ROFA, TSA, and TOFA standards. However, the critical aircraft analysis discussed in Section 4, identifies the need to meet RDC B-III runway design standards. The following sections discuss the needs associated with meeting the RDC B-III design standard.

5.5.1 Application of Declared Distances Criteria

Declared distances represent the airport owner's declared maximum runway length distances available and suitable for meeting takeoff, rejected takeoff, and landing distances performance requirements for turbine powered aircraft. By treating these distances independently, declared distances is a design methodology that results in declaring and reporting the following available runway distances for each operational direction:

- *Takeoff Run Available (TORA)* – the runway length declared available and suitable for the ground run of an aircraft taking off
- *Takeoff Distance Available (TODA)* – the TORA plus the length of any remaining runway or clearway beyond the far end of the TORA; the full length of TODA may need to be reduced because of obstacles in the Departure Surface
- *Accelerate-Stop Distance Available (ASDA)* – the runway plus stopway length declared available and suitable for the acceleration and deceleration of an aircraft aborting a takeoff; and
- *Landing Distance Available (LDA)* – the runway length declared available and suitable for landing an aircraft.

The application and use of declared distances may be required to:

- attain additional RSA and/or ROFA lengths prior to the runway's threshold (the start of the LDA) and/or beyond the stop end of the LDA and ASDA,
- to mitigate unacceptable incompatible land uses in the RPZ,
- to meet runway approach and/or departure surface clearance requirements, in accordance with airport design standards, or
- to mitigate environmental impacts.

Declared distances may also be used as an incremental improvement technique when it is not practicable to fully meet these requirements. However, declared distances may only be used for these purposes where it is impracticable to meet the airport design standards or mitigate the environmental impacts by other means, and the use of declared distances is practicable. Based on these types of mitigating actions by the airport owner, the application of declared distances may limit or increase runway use. The use of declared distances may also result in a displaced runway threshold, and may affect the beginning and ending of the RSA, ROFA, and RPZ. In such a case, the LDA is shortened by the length of the threshold displacement.

For airports receiving federal funding participation, the airport owner-declared distance for each runway (by direction of travel) must be documented, approved by the FAA and reported on the airport's current Airport Layout Plan Drawing and associated data sheet.

5.5.1.1 Past Need for and Application of Declared Distances

The application and use of declared distance criteria at DUT was instituted when Runway 12-30 had a physical (usable) length of 4,100 feet, a width of 100 feet, and was designated as having B-III Runway Design Code characteristics. Based on a variety of factors, primarily the lack of suitable land platforms beyond each runway end to accommodate the required extended length of the RSA and the ROFA, and to avoid or reduce penetrations to approach navigable airspace, airport owner-declared distance criteria was applied and published.

To provide the requisite (B-II) 300-foot extended length of the RSA beyond the southeast end of the runway, the Runway 30 threshold was displaced 100 feet inward to the northwest. For similar reasons, the Runway 12 threshold was displaced 200 feet to the northeast to mitigate similar RSA / land platform deficiencies beyond the northwest end of the runway. Based upon the displacement of the two thresholds and the need to provide albeit limited non-standard extended RSA runway lengths, the following declared distances were applicable to the 4,100-foot long Runway 12-30:

Runway 12

- ASDA: 4,000’ - Reduced by the limited available 100-foot extended portion of the RSA beyond departure end of Runway 30, and
- LDA: 3,800’ - Reduced by Displaced Threshold.

Runway 30

- ASDA: 3,900’ - Reduced by the limited available 200-foot extended portion of the RSA beyond departure end of Runway 12, and
- LDA: 3,800’ - Reduced by 300’ displaced threshold.

5.5.1.2 Current Application of Declared Distances

When Runway 12-30 later changed to its current magnetic heading 13-31 designation, each runway end was extended 200 feet to the northwest and southeast respectively to provide its current usable length of 4,500 feet. As part of that runway extension project, the land platform and shoreline located beyond the southeast of the runway was enhanced to not only accommodate the extension of the runway, but to also accommodate the development of a blast pad and the required realignment of Ballyhoo Road and its nearby intersection with Airport Beach Road. With the newly developed available 4,100-foot long runway, declared distance criteria was once again applied to provide the required (B-II) 300-foot extended RSA and ROFA distances beyond each end of the usable runway. As part of this runway extension project, the Runway 13 threshold was relocated 100 feet to the northwest thus providing identical 300-foot displacement of each runway threshold from each runway end.

When the runway was extended 200 feet to the southeast, two separate Runway Protection Zones (RPZs) were required; an Runway 31 Approach RPZ that begins 200 prior to the 300-foot displaced Runway 31 threshold, and a Runway 13 Departure RPZ that begins 200 beyond the useable end of the runway. The FAA establishes the geometric size and location of each RPZ based upon visibility minimums and RDCs. RPZs are established at ground level, are trapezoidal in shape, centered about the runway’s extended centerline, begin prior to the threshold or beyond the runway end, and serve to enhance the safety and protection of people and property on the ground.

When the runway was extended 200 feet to the southeast, the newly-established Runway 13 Departure RPZ was encroached by portions of the Delta Western Fuels Dock facility located southeast of the runway in Dutch Harbor. This in turn required a 163-foot reduction of the declared Runway 13 TORA distance.

As shown in **Table 5-2** and **Figure 5-1** and based upon the two 300-foot displaced thresholds and 300-foot extended portions of the RSA beyond each runway end, the following declared distances were applicable to the extended 4,500-foot Runway 13-31 and are:

Runway 13

- TODA: 4,500’ - No reduction required.
- TORA: 4,337’ - Reduced by the fueling dock encroachment of the Runway 13 Departure RPZ.
- ASDA: 4,200’ - Reduced by the required 300-foot extended portion of the RSA beyond departure end of runway, and
- LDA: 3,900’ - Reduced by 300-foot Displaced Threshold and required 300-foot extended portion of the RSA at the departure end of the runway.

Runway 31

- TODA: 4,500’ – No available runway length reduction required.
- TORA: 4,500’ - No available runway reduction length required.
- ASDA: 4,200’ - Reduced by the required 300-foot extended portion of the RSA beyond departure end of runway, and
- Reduced by 300-foot Displaced Threshold and required 300-foot extended portion of the RSA at the departure end of the runway.

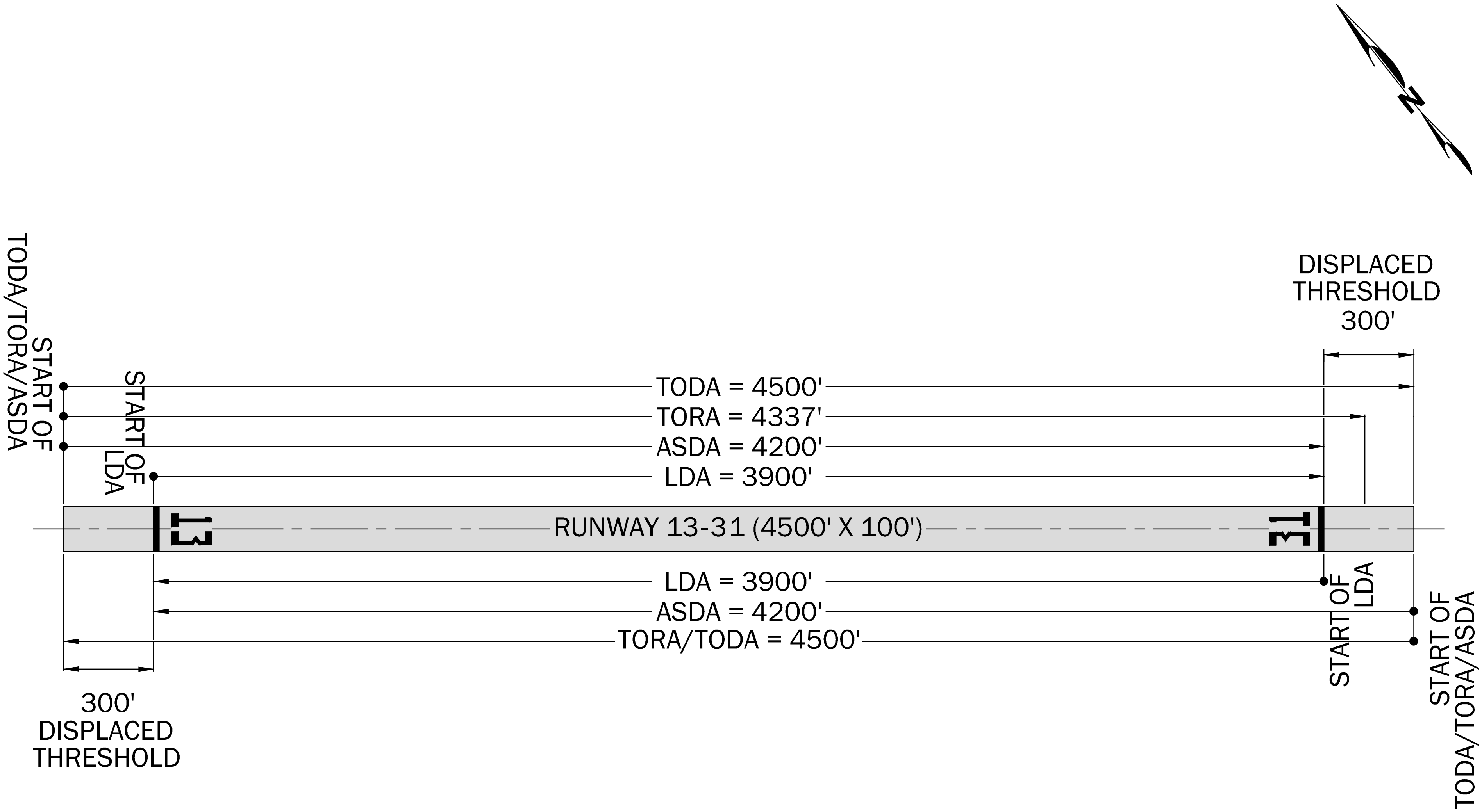
Table 5-2: Applicable Declared Distances, Runway 13-31

Runway	TORA (ft)	TODA (ft)	ASDA (ft)	LDA (ft)
13	4,337	4,500	4,200	3,900
31	4,500	4,500	4,200	3,900

Source: Michael Baker International, Inc., October 2020.
Note: declared distances are not applicable or published.

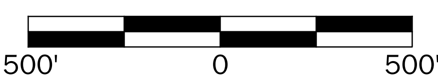
5.5.1.3 Future Application of Declared Distances

This update of the Airport Master Plan includes the airport owner’s identification of a Critical Aircraft that adequately reflects the FAA’s airport geometric design standards to support the safe and efficient operations by aircraft having RDC B-III operational and dimensional characteristics at DUT throughout the Airport Master Plan’s 20-year planning period. These standards establish the basis for all current and future design of runways and taxiways, their centerline separation, safety-related setbacks, protection of navigable airspace to and from the runway, and the protection of people and property on the ground beyond each runway end.



DECLARED DISTANCE STANDARDS

EXISTING DECLARED DISTANCES	RUNWAY 13	RUNWAY 31
TAKE-OFF DISTANCE AVAILABLE (TODA)	4,500'	4,500'
TAKE-OFF RUN AVAILABLE (TORA)	4,337'	4,500'
ACCELERATE STOP DISTANCE AVAILABLE (ASDA)	4,200'	4,200'
LANDING DISTANCE AVAILABLE (LDA)	3,900'	3,900'



Michael Baker INTERNATIONAL

Runway 13-31 Declared Distances Diagram

The airport owner's declaration, application and use of RDC B-III airport design criteria will require the reexamination of and potential and future modification of the current declared distances for Runway 13-31. Accordingly, such changes may directly serve to further reduce available TORA, TODA, ASDA, and LDA distances. Such reductions of available runway length will likely require the identification and evaluation of prudent, practicable and environmentally-acceptable options to further increase available runway length through the extension of the runway and its associated land development platform. These considerations will be later developed and vetted as part of the Airport Alternatives Chapter of the Airport Master Plan.

One of the many important airport development considerations forming the basis for the airport owner's declaration of future declared distances for Runway 13-31 will include the preservation and protection of airfield operations and navigable airspace to and from the runway. Another consideration may likely include the airport owner's potential adaptation of Title 49 [transportation] of the United States Code §44727. In part, Title 49 states that: an airport owner or operator in the State of Alaska shall not be required to reduce the length of a runway or declare the length of a runway to be less than the actual pavement length in order to meet standards of the Federal Aviation Administration applicable to runway safety areas. As required by this code, and as part of the update of this Airport Master Plan a Runway Safety Area Practicability Study will be conducted.

Because the intent and related geometric sizes of the RSA and the ROFA are directly related to RDC B-III airport design criteria, the identification of airport improvement alternatives must carefully examine the potential need and related practicability of the in-kind relocation and replacement of existing facilities, and the potential need to develop new and expand the environmentally-sensitive land platform into portions of Unalaska Bay to the northwest and Dutch Harbor to the southeast.

The need to preserve and protect aircraft departure navigable airspace must also be carefully considered to provide the continued safe and efficient use of the airport by both civilian and military aircraft operators. Although not currently part of the current B-II declared distances for Runway 13-31, the protection of the existing Departure Surfaces located along the extended runway departure centerline of each runway are not considered.

The Departure Surface is comprised of geometric planes of imaginary protected airspace that begin at the end of the TODA, are trapezoidal in shape, and rise upward and outward one foot vertically for every 40 feet horizontally (e.g., slope of 40:1).

Obstacles frequently penetrate the Departure Surface and may require:

- non-standard aircraft climb rates, and/or
- non-standard (higher) departure minimums, or
- reduction in the length of the TODA.

If the FAA determines that existing and/or planned future penetrations of this surface occur by naturally rising terrain and/or man-made structures, the runway improvement alternatives must examine as part of this Airport Master Plan. Such airfield development alternatives may include extending the runway to the northwest into Unalaska Bay to compensate for a potential associated need to reduce the Runway 13 TODA. This would be similar to the current reduction of the B-II Runway 13 TORA imposed by the encroachment of the Runway 13 Departure RPZ. It is important to note that since the TORA can never be longer than the TODA, whenever the TODA is shortened to less than the runway length to mitigate penetrations to the Departure Surface, the TORA is limited to the length of the TODA.

5.5.2 Runway Length Requirements

5.5.2.1 FAA Runway Length Planning Guidance

Runway length requirements for DUT were evaluated in accordance with FAA Advisory Circular (AC) 150/5325-4B, *Runway Length Requirements for Airport Design*. This AC provides guidelines for airport designers and planners to determine recommended runway lengths for new runways or extensions to existing runways. The FAA's mandatory use of this AC and its standards and guidelines are recommended strictly for use in the design of civil airport runway improvement projects receiving federal funding.

When planning for the required physical geometric design and layout of airfield pavements (i.e., runway and taxiways), aircraft operational aspects such as aircraft approach speeds and wingspan widths are considered. For runway length considerations, however, aircraft operational weights are used as part of the FAA's recommendations regarding runway lengths that would be required to fully accommodate the safe operation of aircraft during takeoff and landing operations.

Minimum runway takeoff and landing lengths as discussed within this update of the airport master plan are limited to a "family" or grouping of commercial regional air carrier aircraft having maximum gross takeoff weights greater than 12,500 pounds, but less than 60,000 pounds. These type and sizes of aircraft have historically, and are anticipated to continue to serve DUT throughout the 20-year master plan period.

Within Chapter 3 of the AC, Runway Lengths for Airplanes within a Maximum Certificated Takeoff Weight of More than 12,500 Pounds Up to and Including 60,000 Pounds, FAA recommended runway lengths are based upon the:

- airport's field elevation above mean sea level,
- documented mean daily maximum temperature of the hottest month at the airport,
- the critical design airplane (a single airplane make and model, or a grouping of airplanes having similar operational and physical characteristics),
- the relative population of these aircraft as a relative percentage of the overall fleet of similar aircraft, and
- the aircraft's useful load (relative percental use of available payload capacity).

Taking the FAA's "design approach," recommended runway lengths for this weight category of airplanes is based on performance curves developed from FAA-approved airplane flight manuals in accordance with the provisions of 14 Code of Federal Regulations Part 25, *Airworthiness Standards: Transport Category Airplanes*, and Part 91, *General Operating and Flight Rules*.

Figure 3-1 of that chapter, 75 Percent of Fleet at 60 or 90 Percent Useful Load was referenced and utilized based upon the historical level of service offered by a limited number of different makes and models of turboprop regional commuter airliner aircraft. It was assumed, however, that these aircraft typically operated to and from DUT at 90 percent or more of their respective useful load. Recommended runway lengths derived using the "90 percent useful load" curves are based on:

- zero headwind,
- dry runway surface, and
- zero effective runway gradient.

Based on DUT's mean daily maximum temperature of 58.7 degrees Fahrenheit (F) during the hottest month and above sea level elevation of 23.3 feet, Figure 3-1 of that Chapter recommended a minimum runway length 5,900 feet. Based solely on the FAA's (AC), the current available runway length of 4,500 feet falls well short of the FAA's recommended minimum runway length needed to fully accommodate the fleet of regional turboprop air carrier aircraft weighing between 12,500 and 60,000 pounds.

5.5.2.2 Aircraft-Specific Runway Takeoff and Landing Length Requirements

Inspection of FAA's Traffic Flow Management System Counts (TFMSC) for the historical 5-year period 2015 through 2019 revealed that within the entire state of Alaska, over 197,000 operations were conducted by three predominant makes and models of regional commuter turboprop aircraft: the 37-seat DHC-8-100 (66%), the 82-seat DHC8 Q-400 (19%) and the 45-seat Saab 2000 (15%). Over that same period, almost 10,000 operations were conducted at DUT by the DHC-8-100 (7%), and the Saab 2000 (93%). During the 2019 calendar year, over 900 operations were conducted at DUT by the DHC-8-100 (17%), and Saab 2000 (83%).

Published aircraft data for ten specific makes and models of regional turboprop airliner aircraft detailing available seats, maximum gross takeoff weight, approach speeds and wingspans were used to determine the minimum required runway takeoff and landing lengths for each respective aircraft at DUT and are listed in **Table 5-3** and were calculated by utilizing information specific to DUT that included:

- Above Mean Sea Level Elevation: 23.30
- International Standard Atmosphere (ISA) Temp at Sea Level: 59.00 degrees F
- ISA Temp at Field Elevation: 58.92 F
- Mean Daily Maximum Hottest Day temperature: 58.70 degrees F, and
- Runway Slope: 0.20%.

The minimum required runway takeoff length for each of the ten aircraft were based upon manufacturer-published aircraft runway takeoff lengths that were upwardly adjusted for DUT's above mean sea level elevation, hottest day temperature, and slope.

Similarly, the minimum required runway landing length for each of the same aircraft were based upon manufacturer-published aircraft runway landing lengths that were upwardly adjusted for DUT's above mean sea level elevation, hottest day temperature, and optional wet (contaminated) condition.

Although the physical usable length of Runway 13-31 is 4,500 feet, the current and anticipated future required application of Declared Distance Criteria will serve to reduce runway takeoff and runway landing distances to 4,200- and 3,900-feet, respectively. The immediate need to modify existing B-II airport design standards to fully accommodate sustained safe operation by regional commuter turboprop aircraft having B-III characteristics, the associated increases in the width and possible length of the Runway Safety Area and Runway Object Free Area may further reduce available runway takeoff and landing distances throughout the 20-year planning period.

As calculated, the upwardly-adjusted runway takeoff length requirements for the Saab 340 and Saab 2000 aircraft each exceed the runway's available (declared distance) Accelerate Stop Distance Available (ASDA) length of 4,200 feet. Similarly, the upwardly-adjusted runway landing lengths for the Saab 2000, ATR 42-300/320/400/500/600, and DHC-8 300 series aircraft each exceed the Landing Distance Available length of 3,900 feet.

Based upon these planning and safety-related considerations, there is a need, as part of this update of the airport master plan to examine prudent and practicable options to extend the runway to accommodate the runway takeoff length requirements for makes and models of regional commuter turboprop aircraft that currently operate, and are likely to operate at DUT throughout the 20-year planning period. It is important to note that during the mid- to long-term planning periods, airlines are expected to replace the current critical aircraft with newer ARC B-III aircraft offering similar operating characteristics and potential for increased seating and cargo capacities.

Table 5-3: Aircraft Runway Length Requirements by Aircraft Make and Model

Aircraft	Seats	Code	Runway Takeoff Length Requirement (Feet)	Runway Landing Length Requirement (Feet)
Saab 340	34	B-III	4,672	3,032
DeHavilland DHC-8 100B/200A/200B (Now Q200)	37	B-III	3,354	3,049
Saab 2000	45	B-III	4,314	4,530
ATR 42-300	48	B-III	3,899	4,265
ATR 42-320	48	B-III	3,899	4,265
ATR 42-400	48	B-III	3,899	4,265
ATR 42-500	48	B-III	3,899	4,265
ATR 42-600	48	B-III	3,916	4,250
DeHavilland DHC-8 300A/300E	50	B-III	3,699	3,929
DeHavilland DHC-8 300B	50	B-III	3,959	3,929
(yellow)	Likely Critical Aircraft (Years 1-10)			
(blue)	Likely Critical Aircraft (Years 11-20)			

Source: Michael Baker International, Inc. October 2020

Aircraft specific runway takeoff lengths calculated based on mean daily temperature of the hottest month at the airport, 58.7°F, and Unalaska Airport elevation, 23.3 feet MSL, and Runway slope of 0.20%.

Red Text = Exceeds Declared Runway Length of 4,200 feet ASDA and 3,900 feet LDA.

5.5.3 Runway Shoulders

Runway shoulders provide resistance to blast erosion and accommodate the passage of maintenance and emergency equipment and the occasional passage of an aircraft veering from the runway. A stabilized surface, such as turf, normally reduces the possibility of soil erosion and engine ingestion of foreign objects. Soil not suitable for turf establishment requires a stabilized or low-cost paved surface.

Paved shoulders are required for runways accommodating ADG-IV and higher aircraft and are recommended for runways accommodating ADG-III aircraft.

DUT currently has 25-foot wide paved shoulders in good condition. This exceeds the 20-foot width recommended for accommodating ADG B-III aircraft operations.

5.5.4 Runway End Blast Pad

Paved runway blast pads provide blast erosion protection beyond runway ends. Blast pads at runway ends should extend across the full width of the runway plus the shoulders.

With the historical predominance of propeller-drive aircraft operations at DUT, blast pads are not located beyond each runway end. However, a 150-foot long and 150-foot wide blast pad is located at the runway end of Runway 31. This dimension exceeds RDC B-II design guidelines; however, the existing blast pad does not meet the RDC B-III design guideline of 200 feet long and 140 feet wide. Standard B-III runway blast pads are recommended for each runway end in the future.

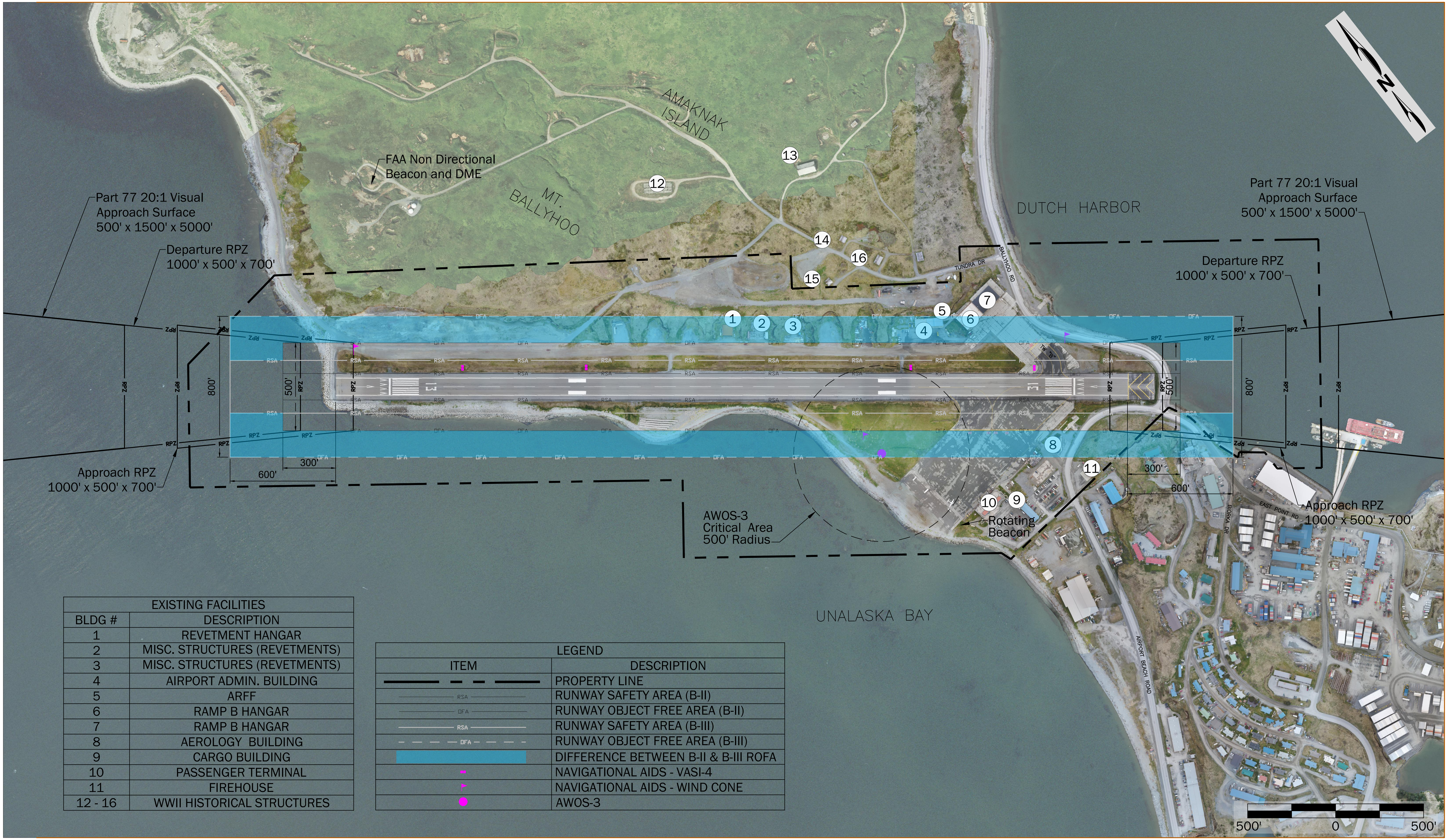
5.6 Runway Protection Standards

Runway protection standards are provided by FAA AC 150/5300-13A, Change 1, *Airport Design* and FAA Advisory Circular 150/5325-4B, *Runway Length Requirements for Airport Design.* As designed and quantified, various runway elements of Runway 13-31 do not currently meet RDC B-III runway protection standards. These items are discussed in further detail in the upcoming sections.

5.6.1 Runway Safety Area

The Runway Safety Area (RSA) is a defined surface surrounding the runway prepared or suitable for reducing the risk of damage to aircraft in the event of an undershoot, overshoot, or excursion from the runway. The RSA must be cleared and graded and have no potentially hazardous ruts, humps, depressions, or other surface variations. The required size of the RSA for Runway 13-31 applicable RDC of B-III-VIS and B-III-5000 design standards are listed in **Tables 5-4** and **5-5** and shown in **Figure 5-2**.

As shown, portions of Airport Beach Road, East Point Road, Ballyhoo Road, and the existing security fence are located in the future RSA. Also, improvements to the shoreline will be required to meet grading design requirements. Options to mitigate these issues will be further evaluated during the airport alternatives phase of this master plan.



EXISTING FACILITIES	
BLDG #	DESCRIPTION
1	REVETMENT HANGAR
2	MISC. STRUCTURES (REVETMENTS)
3	MISC. STRUCTURES (REVETMENTS)
4	AIRPORT ADMIN. BUILDING
5	ARFF
6	RAMP B HANGAR
7	RAMP B HANGAR
8	AEROLOGY BUILDING
9	CARGO BUILDING
10	PASSENGER TERMINAL
11	FIREHOUSE
12 - 16	WWII HISTORICAL STRUCTURES

LEGEND	
ITEM	DESCRIPTION
	PROPERTY LINE
RSA	RUNWAY SAFETY AREA (B-II)
DFA	RUNWAY OBJECT FREE AREA (B-II)
RSA	RUNWAY SAFETY AREA (B-III)
DFA	RUNWAY OBJECT FREE AREA (B-III)
	DIFFERENCE BETWEEN B-II & B-III ROFA
	NAVIGATIONAL AIDS - VASI-4
	NAVIGATIONAL AIDS - WIND CONE
	AWOS-3

Airfield Requirements

Figure 5-2

5.6.2 Runway Object Free Area

The Object Free Area (OFA) is an area centered on the ground on a runway, taxiway, or taxilane centerline provided to enhance the safety of aircraft operations by remaining clear of objects, except for objects that need to be located in the OFA for air navigation or aircraft ground maneuvering. The required size of the Runway Object Free Area for Runway 13-31 for the applicable RDC of B-III-VIS and B-III-5000 design standards is listed in **Tables 5-4** and **5-5** and shown in **Figure 5-2**.

Several existing on- and off-airport facilities are impacted by the location of the future ROFA. Key impacted facilities include the historic revetments, airport maintenance facilities and hangars, Ramps A and B parking, the Aleutian World War II National Historic Area Visitor Center, the existing security fence, and portions of Airport Beach Road, East Point Road, Ballyhoo Road. Options to mitigate these issues will be further evaluated during the airport alternatives phase of this master plan.

5.6.3 Runway Obstacle Free Zone

The Obstacle Free Zone (OFZ) is the three-dimensional airspace along the runway and extended runway centerline. It is required to be clear of obstacles for protection of aircraft landing or taking off from the runway and for missed approaches. The required size of the applicable Runway Obstacle Free Zones for large aircraft (over 12,500 pounds) are listed in **Tables 5-4** and **5-5**.

5.6.4 Approach / Departure Runway Protection Zones

The Runway Protection Zone (RPZ) in an area at ground level prior to the threshold or beyond the runway end that is designed to enhance the safety and protection of people and property on the ground. The required size of each Approach or Departure RPZ for each runway for the applicable RDC of B-III-VIS and B-III-5000 design standards (i.e., for Runways 13 and 31, respectively) is listed in **Tables 5-4** and **5-5** and shown in **Figure 5-2**.

5.6.5 Runway Separation Standards

5.6.5.1 Runway-to-Parallel Taxiway Centerline Separation

The runway centerline to parallel taxiway centerline separation standard for an RDC of B-III-VIS and B-III-5000 is 400 feet. With the current centerline separation of 240 feet, DUT does not currently meet this design standard.

5.6.5.2 Aircraft Holding Position

The runway centerline to aircraft holding position standard for an RDC of B-II-VIS and B-III-5000 is 200 feet. With the current runway centerline to aircraft holding position distance of 200 feet, DUT currently meets this design standard.

5.6.5.3 Parallel Taxiway-to-Parallel Taxilane Centerline Separation

The parallel taxiway-to-parallel taxilane centerline separation standard for an RDC of B-III-VIS and B-III-5000 is 300 feet. With the current centerline separation of 240 feet, DUT does not currently meet this design standard.

5.6.5.4 Aircraft Parking Area

The runway centerline to closest aircraft parking position separation standard for an RDC of B-III-VIS and B-III-5000 is 400 feet. With the current centerline separation of 250 feet, DUT does not currently meet this design standard.

5.6.6 Runway Design Standard Compliance Needs Summary

The runway design standards for DUT are summarized in **Tables 5-4** and **5-5** and shown in **Figure 5-2**. Currently, the runway does not fully satisfy current ARC B-III-VIS and B-III-5000 airport design standards.

Table 5-4: Runway Design Standard Matrix – DUT – Runway 13
Runway Design Code (RDC): B-III-VIS and B-III-5000

Item	Standard	Existing	Satisfies Requirements
Runway Design			
Runway Length	4,600 ft	4,500 ft	
Runway Width	100 ft	100 ft	Yes
Shoulder Width	20 ft	25 ft	Yes
Blast Pad Width	140 ft	None	
Blast Pad Length	200 ft	None	
Crosswind Component	16 knots	16 knots	Yes
Runway Protection			
Runway Safety Area (RSA)			
Length beyond departure end	600 ft	300 ft	
Length prior to threshold	600 ft	300 ft	
Width	300 ft	150 ft	
Runway Object Free Area (ROFA)			
Length beyond runway end	600 ft	300 ft	
Length prior to threshold	600 ft	300 ft	
Width	800 ft	500 ft	
Runway Obstacle Free Zone (ROFZ)			
Length	200 ft [2]	200 ft	Yes
Width	400 ft [2]	250 ft	
Approach Runway Protection Zone (RPZ)			
Length	1,000 ft	1,000 ft	Yes
Inner Width	500 ft	500 ft	Yes
Outer Width	700 ft	700 ft	Yes
Area (Acres)	13.77	13.77	Yes

Table 5-4: Runway Design Standard Matrix – DUT – Runway 13 Runway Design Code (RDC): B-III-VIS and B-III-5000			
Item	Standard	Existing	Satisfies Requirements
Departure Runway Protection Zone (RPZ)			
Length	1,000 ft	1,000 ft	Yes
Inner Width	500 ft	500 ft	Yes
Outer Width	700 ft	700 ft	Yes
Area (Acres)	13.77	13.77	Yes
Runway Separation			
Runway centerline to:			
Holding Position	200 ft	200 ft	Yes
Parallel Taxiway / Taxilane centerline	300 ft	240 ft	
Aircraft parking area	400 ft	250 ft	

Sources:
FAA Advisory Circular 150/5325-4B, Runway Length Requirements for Airport Design.
FAA Advisory Circular 150/5300-13A, Change 1, Airport Design.
Note 1: Refer to AC 150/5325-4B paragraph 206 Figure 2-1 and 95 percent of fleet.
Note 2: Refer to Advisory Circular 150/5300-13A paragraph 308 for design standards. ROFZ width changes based on aircraft size.
Note: N/A= Not Applicable

The remainder of this page is intentionally left blank.

Table 5-5: Runway Design Standard Matrix – DUT – Runway 31 Runway Design Code (RDC): B-III-VIS and B-III-5000			
Item	Standard	Existing	Satisfies Requirements
Runway Design			
Runway Length	4,600 ft	4,500 ft	
Runway Width	100 ft	100 ft	Yes
Shoulder Width	20 ft	25 ft	Yes
Blast Pad Width	140 ft	150 ft	Yes
Blast Pad Length	200 ft	150 ft	
Crosswind Component	16 knots	16 knots	Yes
Runway Protection			
Runway Safety Area (RSA)			
Length beyond departure end	600 ft	300 ft	
Length prior to threshold	600 ft	300 ft	
Width	300 ft	150 ft	
Runway Object Free Area (ROFA)			
Length beyond runway end	600 ft	300 ft	
Length prior to threshold	600 ft	300 ft	
Width	800 ft	500 ft	
Runway Obstacle Free Zone (ROFZ)			
Length	200 ft [2]	200 ft	Yes
Width	400 ft [2]	250 ft	
Approach Runway Protection Zone (RPZ)			
Length	1,000 ft	1,000 ft	Yes
Inner Width	500 ft	500 ft	Yes
Outer Width	700 ft	700 ft	Yes
Area (Acres)	13.77	13.77	Yes
Departure Runway Protection Zone (RPZ)			
Length	1,000 ft	1,000 ft	Yes
Inner Width	500 ft	500 ft	Yes
Outer Width	700 ft	700 ft	Yes
Area (Acres)	13.77	13.77	Yes
Runway Separation			
Runway centerline to:			
Holding Position	200 ft	200 ft	Yes

Table 5-5: Runway Design Standard Matrix – DUT – Runway 31 Runway Design Code (RDC): B-III-VIS and B-III-5000			
Item	**Standard**	**Existing**	**Satisfies Requirements**
Parallel Taxiway / Taxilane centerline	300 ft	240 ft	
Aircraft parking area	400 ft	250 ft	

Sources: FAA Advisory Circular 150/5325-4B, Runway Length Requirements for Airport Design.
FAA Advisory Circular 150/5300-13A, Change 1, Airport Design.
Note 1: Refer to AC 150/5325-4B paragraph 206 Figure 2-1 and 95 percent of fleet.
Note 2: Refer to Advisory Circular 150/5300-13A paragraph 308 for design standards. ROFZ width changes based on aircraft size.
Note: N/A= Not Applicable

5.6.7 Runway Pavement Strength

One of the most important features of airfield pavement is its ability to withstand repeated use by the most weight-demanding aircraft operating at the airport. As currently reported within the airport's Airport Master Record (FAA Form 5010-1), and based on the results of DOT&PF's 2018 Pavement Inspection Report, the runway asphalt is reported to have a weighted average PCI of 98.93 (good condition), as was considered sufficient to provide the required minimum single-wheel (S) load bearing capacity of 60,000 pounds and two single wheels in tandem type landing gear (2S) load bearing capacity of 210,000 pounds throughout the 20-year planning period.

5.7 Taxiway Design Standards

5.7.1 Taxiway Width

Taxiway pavement requirements are based the dimensions of the airplane's undercarriage, which includes the Main Gear Width (MGW) and Cockpit to Main Gear (CMG). For Taxiway Design Group (TDG) 2 and 3 taxiways, the design standard for width is 35 feet, and 50 feet, respectively. Taxiway A is a 220-foot by 454-foot taxiway that connects the runway to the terminal apron, and Taxiway B is a 200-foot by 92-foot taxiway that connects to the hangar apron. Both taxiways exceed current taxiway width design standards and connect to the Runway 31 end.

According to the 2018 DOT&PF Pavement Inspection Report, Taxiway A is reported to have a weighted average PCI of 0-39 and reconstruction of the taxiway is recommended in the future. Taxiway B is reported to have a weighted average PCI of 60-69 and corrective maintenance is recommended.

5.7.2 Taxiway Design Group

Taxiway width and fillet standards, and in some instances, runway to taxiway and taxiway separation requirements, are determined by TDG. Previous guidance on taxiway design was based only on Airplane Design Groups (ADG). ADGs are based on wingspan and tail height, but not the dimensions of the aircraft undercarriage. The design of pavement fillets must consider such undercarriage dimensions. Thus, the following guidance establishes TDGs, based on the overall MGW and the CMG Distance. TDG standards can be found in Advisory Circular 150/5300-13A, Change 1, *Airport Design*, Table 4-2.

TDG 3 design characteristics are applicable and existing taxiway pavements can fully accommodate taxi movements by DUT's current Critical Aircraft (Saab 2000), which requires TDG 3 taxiway intersection fillet geometries.

5.7.3 Taxiway Shoulders

Unprotected soils adjacent to taxiways are susceptible to erosion, which can result in engine ingestion problems for jet engines that overhang the edge of the taxiway pavement. Soil with turf not suitable for this purpose requires a stabilized or low-cost paved surface.

DUT currently does not have taxiway edge shoulders on Taxiway A, but has 25-foot paved taxiway edge shoulders on Taxiway B. In the future, a minimum 20-foot wide paved shoulder is recommended for pavement accommodating ADG-III aircraft taxi operations.

5.7.4 Taxiway Safety Area

The Taxiway Safety Area (TSA) is a defined surface alongside the taxiway centered about the taxiway centerline and is prepared or suitable for reducing the risk of damage to an aircraft deviating from the taxiway. The TSA also provides a suitable travel surface and area for rescue and fire-fighting operations. The current width of the TSA along Taxiways A and B is established at a width of 79 feet (ADG B-II). The existing taxiways do not provide the 118-foot TSA width required to fully protect taxiway movements of aircraft having ADG-III wingspans. This issue will be further addressed during the airport alternatives phase of the master plan.

5.7.5 Taxiway Object Free Area

The Taxiway Object Free Area (TOFA) is centered on the taxiway centerline. The TOFA clearing standards prohibit service vehicle roads, parked aircraft, and other objects, except for objects that need to be located in the OFA for air navigation or aircraft ground maneuvering. The current width of the TOFA along Taxiways A and B is established at a width of 131 feet (ADG B-II). This designated width does not provide the 186-foot TOFA required to fully protect taxiway movements of aircraft having ADG-III wingspans. This issue will be further addressed during the airport alternatives phase of the master plan.

5.7.6 Taxiway Edge Safety Margin

Prior to the FAA's issuance of AC 150/5300-13A, taxiway intersection design guidance referenced and used pre-established ADGs that were based on aircraft wingspan and tail height, but not the dimensions of the aircraft's undercarriage. The updated AC 150/5300-13A, Change 1 defines and references TDGs that relate to the undercarriage dimensions of the aircraft and the need to assure that the aircraft's inner-most main gear turning path remains with a defined (i.e., 10-foot wide) Taxiway Edge Safety Margin (TESM), and the extent of remaining full-strength pavement situated within the limits of the required TESM.

When considering taxiway design to regularly accommodate DUT's Critical Aircraft (Saab 2000) having a cockpit-to-main gear (CMG) length of 36.83 feet, and a main gear (i.e., outer-to-outer) width of 29.4 feet, the application and use of TDG 3 taxiway design criteria having a minimum TESM width of 10 feet is required. This requirement is based on identification of a Critical Aircraft as the most demanding aircraft type, or grouping of aircraft with similar characteristics, that make regular use of the airport as defined by FAA Advisory Circular 150/5000-17, *Critical Aircraft and Regular Use Determination*. Regular use is 500 annual operations, including both itinerant and local operations, but excluding touch-and-go operations. An operation is either a takeoff or landing. Inspection of FAA's TFMSC for DUT during 2019 identified 1,729 total operations by aircraft having TDG 3 design characteristics, well above the FAA's Regular Use threshold.

5.7.7 Aircraft Wingtip Clearance

As discussed previously, Taxiways A and B are wide enough to fully accommodate ADG-III aircraft taxi movements. Based on Taxiway A's current width of 220 feet, and Taxiway B's current width of 92 feet, these existing taxiways currently provide the ADG-III required wingtip clearance of 34 feet.

5.7.8 Taxiway Centerline to Fixed or Moveable Object

The Taxiway Centerline to Fixed or Moveable Object distance associated with ADG-III aircraft movements is 93 feet. Taxiway A currently meets the recommended ADG-III wingtip clearance; however, Taxiway B currently meets the ADG-II requirement of 65.5 due to the location of the existing fence line to the east.

5.7.9 Taxiway Design Standard Compliance Needs Summary

DUT does not entirely meet ADG-III and TDG 3 taxiway design standards, based on the design aircraft at the airport. Taxiways A and B do not meet ADG-III TSA and TOFA requirements. The development of paved shoulders is also recommended adjacent to paved surfaces accommodating taxi movements of ADG-III aircraft. For DUT, the recommended taxiway shoulder width is 20 feet.

The need to modify current taxiway intersection geometries to fully accommodate TDG 3 inner gear turning movement within the prescribed TESM will likely need to be addressed at such time that the taxiway and its various intersections require rehabilitation or repair within the 20-year planning period.

These issues will be addressed further as part of the airport alternatives analysis phase of the master plan.

5.8 Airfield Facility Requirements

5.8.1 Lighting

The DUT airfield lighting system consists of pilot radio-controlled medium intensity runway edge lights (MIRLs) located along the edge of Runway 13-31, and 4-light visual approach slope indicators (VASIs), each located on the north side of the runway. Each runway end is also equipped with Runway End Identifier Lights (REILS). As airfield lights reach the end of their useful life, new lights should be considered in conjunction with other new development and rehabilitation projects.

5.8.2 Marking and Signage

Advisory Circular 150/5340-1M, *Standards for Airport Markings,* contains standards for markings used on airport runways, taxiways, and aprons. Runway 13-31 is properly marked for non-precision instrument approach capabilities. The taxiways are all properly marked and in good condition. No non-standard dimensional, placement, orientation or location issues with the current airfield signage were identified.

5.9 Based Aircraft Hangar and Apron Tiedown Space Requirements

Although the airport is currently designed to fully accommodate aircraft having ARC B-II dimensional characteristics, larger, more demanding makes and models of aircraft (i.e., having wider wingspans and longer lengths - ARC B-III) operate their aircraft at the airport. Accordingly, hangar and apron tie-down/parking space needs for based aircraft must be identified to accommodate the parking and sheltering needs of these aircraft throughout the 20-year planning period.

5.10 Hangar Facility Needs

Based on the number and type of hangar facilities at DUT, there is a current and anticipated future need for additional aircraft storage space for single-engine aircraft, multi-engine aircraft, turboprops, jets, and helicopters over the 20-year planning period.

Projections of future based aircraft hangar storage and apron tie-down needs were developed using the FAA-approved aviation activity forecast for this Master Plan Update and the 2019 Base Year distribution of aircraft storage at the airport by aircraft type. As shown in **Table 5-6** and for space planning only, the distribution of based aircraft represents a CAAGR of 4.69 percent over the 20-year planning period.

The identification of additional based aircraft hangar space, or the location, layout and spacing for apron tie-downs vary for each airport primarily based on the type of type, make, and model of aircraft that are known to currently operate at the airport, or that are anticipated to operate at the airport.

Table 5-6: DUT Forecast of Based Aircraft

Type	2019	2024	2029	2034	2039
Single-Engine (Non-Jet)	2	3	4	4	5
Multi-Engine (Non-Jet)	3	3	1	1	1
Helicopter	0	1	1	1	2
Turboprops	0	1	2	2	2
Jets	0	1	1	1	1
Ultra-Light	1	1	1	1	1
Total Based Aircraft	**6**	**10**	**12**	**13**	**15**

Source: Michael Baker International, Inc., October 2020

The 20-year forecast of based aircraft identifies the need to accommodate the storage needs of nine additional aircraft (e.g., three single engine, one multi-engine, two helicopters, two turboprops, and one jet.)

During the initial stages of the public involvement process of this master plan, local tenants identified the importance of constructing additional aircraft storage facilities at the airport. Historically, the airport has had limited opportunities to provide individual hangar facilities due to restrictions and the lack of developable land available. For long-range planning, it is recommended that two large common use hangar storage facilities (12,000 square feet each) be provided to accommodate the 20-year forecast of based aircraft demand. As mentioned in previous sections, changes in RSA and ROFA requirements for the airport will reduce the land available for landside development, impacting the ability to accommodate hangar development in the future. As a result, these issues will be further studied during the airport alternatives phase of the master plan.

5.10.1 Itinerant Aircraft Apron and Tiedown Space Requirements

The itinerant apron (Ramp B) provides for the movement and parking of visiting general aviation aircraft that operate at DUT. Itinerant apron space determinations are typically based on calculated current and projected future Peak Month Average Day (PMAD) aircraft activity levels, relative percentage mix of local and transient operations, and aircraft type and size. Using industry accepted FAA planning guidance, the following procedural planning steps were used to identify required itinerant aircraft apron space:

- Step 1. Determine PMAD general aviation aircraft operations for the 2019 base year and all forecast planning years.
- Step 2. Increase PMAD aircraft operations by 10 percent.
- Step 3. Determine the relative percentage mix of local and itinerant aircraft operations as listed in Section 4.9.2, Forecast of Local/Itinerant General Aviation Operations (16.67 percent of the total aircraft operations were determined as itinerant).
- Step 4. Derive total itinerant operations by multiplying the value derived in step 2 by the itinerant percentage value.
- Step 5. Assume that 100 percent of all itinerant arrival operations require apron space.
- Step 6. Increase the value derived in step 7 by 10 percent.

Table 5-7 shows the itinerant aircraft apron area (Ramp B) needs assessment for the 20-year planning period.

Table 5-7: DUT Itinerant Apron Area Needs Assessment						
Step		2019	2024	2029	2034	2039
1	Peak Month Average Day Operations	4	4	5	5	5
2	Increase by 10%	5	5	6	6	6
3	Percent Itinerant Traffic (Assumed to Remain Constant)	16.67%	16.67%	16.67%	16.67%	16.67%
4	Total Itinerant Operations	1	1	1	1	1
5	Assumed 100% Need Transient Apron Space	1	1	1	1	1
6	Increase by 10%	2	2	2	2	2
	Total Itinerant Aircraft Requiring Apron	**2**	**2**	**2**	**2**	**2**

Source: Michael Baker International, Inc, 2020

Table 5-8 shows the spacing requirements in square yards for the aircraft fleet mix. The basis for this spacing was determined by analyzing ADG B-I and B-II aircraft that are known and anticipated to operate at DUT. This includes both the tie-down space and the required taxilane OFA to and from the tie-down position.

Table 5-8: Itinerant Aircraft Apron Area Needs by Aircraft Type				
	Single Engine	Multi Engine/ Turboprop	Jet Engine	Helicopter
Apron Space Needs (Square Yards)	713	972	1,890	713

Source: Michael Baker International, Inc, 2020

Since the total number of transient aircraft requiring apron is small, the larger spacing requirement for jet engine aircraft was used for planning purposes. Approximately 3,780 square yards (2 Itinerant Aircraft Requiring Apron * 1,890 SY) is needed throughout the 20-year planning period. The existing itinerant apron area is currently 6,700 square yards, of which 4,000 square yards is useable aircraft parking due to FAR Part 77 surface limitations. Therefore, it is anticipated that additional itinerant apron area is not needed today and through the 20-year planning period.

5.10.2 Navigational Aids

Navigational Aids are used for airport approaches and allow pilots to navigate to the airport and runway ends. The airport is served by two non-precision circling instrument approaches, an NDB-A and an RNAV (GPS)-B. The current NDB-A approach allows operations with ceilings no lower than 2,900 feet above ground level (AGL) at 1¼-mile visibility.

The space based RNAV GPS-B approach allows operations with ceilings no lower than 2,000 feet AGL at 3-mile visibility and does not support vertically guided IAPs. Approaches to the runway ends are visual as there are currently no established IAPs to Runways 13 and 31. The FAA is solely responsible for the operation and maintenance of the off-airport NDB/DME navigational facilities.

The REILs and VASIs serving Runways 13 and 31, Airport Rotating Beacon and the AWOS-3 are all reported to be in good working order and without need of repair. These facilities are not anticipated to require upgrade or replacement within the 20-year planning period.

In the future, as new technologies become available or reduced approach minimums are desired, approach lighting systems will likely be necessary. The possibility of providing such improvements at DUT in the future will be considered as part of the Alternatives Analysis.

5.10.3 Windcone/Segmented Circle

The segmented circle and windcone and supplemental wind cones are in good condition and are anticipated to adequately serve the airport through the 20-year planning period.

5.11 Passenger Terminal Area

5.11.1 Terminal Apron

The Terminal Apron is located adjacent to Dutch Harbor on the east side of the airport, south of Runway 31. It consists of approximately 30,000 square yards of asphalt pavement for the parking and maneuvering of commercial aircraft utilizing the nearby passenger terminal and cargo facilities. Access to this area is restricted to badged personnel.

Due to Federal Aviation Regulations (FAR) Part 77 surface limitations, approximately 15,000 square yards of pavement is usable to accommodate smaller commuter sized aircraft (ARC B-II) parking configurations associated with passenger and cargo activities. However, as RDC B-III design standards are implemented at DUT, over half of the terminal apron will be unavailable for aircraft parking, requiring future expansion of the Terminal Apron and Passenger Terminal area. In the future, the Terminal Apron will need to accommodate movement and parking for up to 6 aircraft (i.e. 2 ADG B-III aircraft and 4 ADG B-II aircraft). Options for future Terminal Apron development will be evaluated during the airport alternatives phase of the master plan.

5.11.2 Passenger Terminal Building

The airport is served by a single Passenger Terminal Building that is owned and operated by the City of Unalaska. The Terminal Building is approximately 13,700 square feet in size and includes ticket and check-in counters, a restaurant, rental car agents, travel agents, the Alaska Weather Operations Service, administrative offices, communications storage, passenger boarding area, and baggage claim. The facility currently provides an adequate level of service; however, improvements to the terminal will be required as the aircraft fleet mix changes and the facility nears the end of its useful service life.

As mentioned in previous sections of this chapter, the Passenger Terminal and the adjacent Terminal Apron will be directly impacted by the improvements required to meet RDC B-III design standards. Therefore, it is recommended that a new terminal that meets current design standards be constructed in an alternate location to maximize the use of the Terminal Apron area. Future passenger terminal area improvements at DUT will be considered as part of the alternatives evaluation phase of this master plan.

5.11.3 Automobile Parking Requirements

5.11.3.1 Public Parking

Unalaska Airport is a commercial service airport, as such there is a need for parking passengers as well as visitors. Due to the frequency and nature of the scheduled airline and passenger charter operations, existing vehicle parking is reported to be sufficient during peak operational periods. Pavement is in fair condition and should be regularly maintained in accordance with the airport's pavement maintenance program.

For ease of use and circulation, it is not suggested that parking be divided into long-term and short-term lots. Per FAA AC 150/5360-13A, *Airport Terminal Planning*, separation of parking is recommended only after annual enplanements exceed 200,000 per year. Travel distances to the terminal are short and minimally varied. Therefore, no additional parking capacity is required throughout the 20-year planning period. In the future, all parking facilities associated with new terminal area development proposed in this airport master plan must meet applicable local code requirements.

5.11.3.2 Employee Parking

Employee parking associated with the passenger terminal operation is accommodated in the Passenger Terminal Parking Lot along the westernmost edge. In addition, airport employees utilize other parking areas associated with administration, operations and maintenance facilities at the airport. Existing employee parking facilities were determined to be sufficient and no additional capacity is required during the planning period.

Ample parking is provided adjacent to existing tenant facilities throughout the airport. In the future, all parking facilities associated with new development proposed in this airport master plan must meet applicable local code requirements.

5.11.3.3 Rental Car Parking

Currently, rental car services are available on airport. Rental car ready/return and storage spaces are collocated within the southernmost portion of the Passenger Terminal Parking Lot. According to FAA Advisory Circular AC 150/5360-13A, *Airport Terminal Planning*, a minimum of 10 spaces for each rental car agency is recommended. Additional parking may be added when actual demand is demonstrated to exceed the current capacity.

5.11.3.4 Long-Term Parking

The Long-Term Parking Lot is located on the north side of the Cargo Building. and is accessible from Airport Road. Parking in this lot is limited to a maximum of 28 days. This area is in good condition and has a capacity of 50 parking spaces. Based upon its historical use, the parking lot was determined to meet the airport's long-term parking needs over the 20-year planning period.

5.12 Cargo Facilities

The airport's cargo facility is located next to the terminal on the east side. This cargo facility is approximately 8,000 square feet in area and is owned by Alaska Central Express (ACE) Air Cargo and operated under lease agreement with DOT&PF. The facility is adequately sized to meet the owner's needs, and also houses a shipping company, an electronics company and a car rental business.

Similar to other terminal area facilities, implementation of RDC B-III design standards at DUT in the future will likely require the relocation of the existing cargo facility. Related development options will be considered during the alternatives evaluation phase of the master plan.

5.13 Support Facilities

As described in AC 150/5070-6B, support facilities include a wide range of functions intended to ensure the smooth, efficient, and safe operation of the airport. The FAA provides design guidelines for these facilities in the Advisory Circulars and Airport Cooperative Research Program (ACRP) reports. However, the requirements for these facilities were also based on interviews with airport staff, airport tenants, and users which facilitated a better understanding of the existing and future facility requirements.

5.13.1 Airport/Airfield Maintenance, Equipment, and Facilities

Staff from DOT&PF are responsible for the day to day maintenance functions on the airfield, including record keeping, and repairs. Pavement maintenance includes crack sealing, seal coating, and striping. Other general maintenance responsibilities include safety area repairs, mowing, general electrical repairs, and snow removal. Equipment and materials to perform general airport maintenance functions are available and stored in the corresponding maintenance equipment storage facilities. Airport maintenance facilities and administrative offices are located north of the runway accessible via Tundra Drive. The complex includes facilities for the storage and repair of maintenance equipment. These facilities are in good condition and well maintained. Beyond regular maintenance, no additional expansion of these facilities is required during the planning period.

5.13.2 Snow Removal Equipment

FAA AC 150/5220-20A, *Airport Snow and Ice Control Equipment* provides guidance regarding the selection of the appropriate snow and ice control equipment for airport use. As a general requirement, runways and taxiways should be maintained, if possible, to a no worse than wet condition. In other words, there should be no accumulation of contaminants (snow or ice) during winter storms.

The minimum snow and ice control equipment requirements are defined by two parameters, the total square footage of the Priority 1 paved area, and the airport's service classification area. The Priority 1 airfield clearing area is described in the DUT Snow and Ice Control Plan (SICP), and includes the following areas:

- Runway 13-31
- Principal taxiway (Taxiway A)
- Primary apron area (Ramp A - Terminal Apron)
- ARFF access route
- Airfield NAVAIDS

Priority 2 airfield clearing area includes:

- Secondary taxiway (Taxiway B)
- Other apron area (Ramp B)
- Face of all signs and runway lights (kept clear of snow and ice at all times)

FAA AC 150/5200-30D, *Airport Field Condition Assessments and Winter Operations Safety*, defines the minimum clearance times for commercial service airports. The clearance times for commercial service airports are determined by the total annual airplane operations (including cargo operations). Over the 20-year planning period, the total annual aircraft operations are forecasted to decrease from 6,030 operations in 2019 to 3,782 operations in 2039. According to this operational level, the minimum time to clear 1 inch of falling snow weighing up to 25 lb/ft^3 on the Priority 1 areas is between 1½ and 2 hours. According to the National Climatic Data Center (NCDC), historically DUT averages approximately 95 inches of snow per winter year and most snow and ice events occur in the January timeframe. The SICP indicates that the current clearance time for the Priority 1 areas is typically under 2.5 hours.

Table 5-9 shows the minimum snow removal equipment requirements described in FAA AC 150/5220-20A. Table 3-5, Snow Removal Equipment Inventory, shows the existing inventory of snow removal equipment as of 2020. The current snow and ice removal equipment at DUT meets the minimum requirements. The equipment is currently housed in both the maintenance shop and second hangar facility. Future equipment requirements are dependent upon the square footage of the future Priority 1 area, which may increase as new critical areas such as taxiways and aprons are developed in the future.

Table 5-9 Minimum Required Snow Removal Equipment

Equipment	Minimum Required
High-Speed Rotary Plow	1
Displacement Plows	2
Sweeper	1[1]
Hopper Spreader	1[2]
Liquid deicing/anti-icing chemical Spraying Vehicle	1
Front End Loader	1[3]

Source: Snow and Ice Control Plan, DOT&PF. FAA AC 150/5220-20A Airport Snow and Ice Control Equipment
Notes:
1. *One per 750,000 square feet pavement*
2. *One hopper spreader per 750,000 square feet of pavement*
3. *One front end loader per 500,000 square feet of critical apron space*

5.13.3 Aircraft Rescue and Firefighting Services

The airport is currently a 14 CFR Part 139, Class I certificated airport, categorized as ARFF Index A. However, the facility maintains equipment capable of meeting Index B requirements. Over the 20-year planning horizon, a requirement to increase the ARFF Index is not expected. The availability of this equipment is expected to continue over the 20-year planning horizon. Therefore, there are no additional ARFF requirements.

5.13.4 Aircraft Fueling Storage Requirements

Currently, there are no above-ground aviation fuel storage facilities at DUT. However, aviation Jet A and AvGas fuel is provided by Delta Western and Apun under lease agreement with DOT&PF. Fuel is supplied by wholesalers Delta Western and North Pacific Fuel. The local providers are responsible for maintaining adequate supplies of AvGas and Jet A fuel as outlined in their agreement with DOT&PF.

The fuel providers maintain two 10,000-gallon Jet A fuel trucks and a 1,000-gallon trailer-mounted AvGas tank along the west edge of the Terminal Apron area. As RDC B-III design standards are implemented at DUT in the future, an alternate location for storing fuel trucks will likely need to be considered as part of the alternatives evaluation phase of the master plan.

5.14 Summary of Facility Requirements

Table 5-10 identifies and summaries DUT's facility requirements. The following table presents recommendations to satisfy these facility requirements.

Table 5-10: Summary of Facility Requirements

Category	Requirements
Airfield Capacity and Configuration	No Improvements Recommended
Design Aircraft and Airport Reference Code (ARC)	Existing - Saab 2000 (B-III)/Future - DHC-8-300 (B-III)
Runway Orientation and Wind Coverage	No Improvements Recommended
Runway Length	4,300 feet
Runway Strength	No Improvements Recommended
Protection of Navigable Airspace	Potential Part 77 penetrations to be resolved as part of the Alternatives Analysis
Instrument Approaches and Runway End Siting	IAPs - To be determined Potential OCS penetrations to be resolved during the Alternatives Analysis
Runway Design Standards	Runway Blast Pads Taxiway fillet improvements, as needed
Runway Protection Standards	RSA, ROFA and OFZ improvements needed in accordance with RDC B-III design criteria.
Declared Distance Criteria	Reexamination of and potential and future modification of the current declared distances for Runway 13-31 during alternatives evaluation phase.
Taxiway/Taxilane Design Standards	Taxiway Shoulders Recommended Taxiway fillet improvements, as needed.
Airfield Lighting	No Improvements Recommended

Table 5-10: Summary of Facility Requirements	
Category	**Requirements**
Airfield Markings	No Improvements Recommended
Airfield Signage	No Improvements Recommended
Visual Navigational Aids	No Improvements Recommended
Aircraft Terminal Apron	Reconfiguration and expansion recommended to meet future aircraft movement and parking requirements associated with RDC B-III and TDG 3 design standards.
Based Aircraft Storage and Tiedown Space	Additional two large common use hangar storage facilities (12,000 square feet each), as demand dictates. Current deficiencies in ADG-II (or larger) aircraft itinerant apron parking/tiedown space currently exist and should be addressed as demand dictates.
Fueling Facilities	Relocate as part of future terminal area improvements
Automobile Access	Possible reconfiguration as part of future terminal area improvements
Automobile Parking	Relocate as part of future terminal area improvements

Source: Michael Baker International, Inc., 2020