Ted Stevens Anchorage International Airport AeroNexus®

Ted Stevens Anchorage International Airport

2014 MASTER PLAN UPDATE

CHAPTER 4 - FACILITY REQUIREMENTS

FINAL
DECEMBER 2014

RS&H
IN ASSOCIATION WITH:
HDR
DOWL HKM
RIM Architects
ATAC

Photo credit: Vanessa Bauman

TED STEVENS
ANCHORAGE INTERNATIONAL AIRPORT
MASTER PLAN UPDATE

CHAPTER 4
FACILITY REQUIREMENTS

December 2014

FINAL

Prepared for:
Ted Stevens Anchorage International Airport
State of Alaska Department of Transportation & Public Facilities

Prepared by:

RS&H

In association with:
HDR
DOWL HKM
RIM Architects
ATAC

AKSAS Project No.: 54320
RS&H Project No. 226-2566-000

"The preparation of this document was financed in part through a planning grant from the Federal Aviation Administration (FAA) as provided under Section 505 of the Airport and Airways Improvement Act of 1982, as amended by the Airway Safety and Capacity Expansion Act of 1987. The contents do not necessarily reflect the official views or policy of the FAA. Acceptance of this report by the FAA does not in any way constitute a commitment on the part of the United States to participate in any development depicted therein, nor does it indicate that the proposed development is environmentally acceptable in accordance with applicable public laws."

PREFACE

The Ted Stevens Anchorage International Airport (Airport) Master Plan Update (Master Plan Update) provides Airport management and the Alaska Department of Transportation & Public Facilities (DOT&PF) with a strategy to develop the Ted Stevens Anchorage International Airport. The intent of the Master Plan Update is to provide guidance that will enable Airport management to strategically position the Airport for the future by maximizing operational efficiency and business effectiveness, as well as by maximizing property availability for aeronautical development through efficient planning. While long-term development is considered in master planning efforts, the typical planning horizon for the Master Plan Update is 20 years.

The Federal Aviation Administration provides guidance for Master Plan development in *FAA Advisory Circular 150 / 5070-6B, Airport Master Plans*. Although not required, the Advisory Circular strongly recommends airports prepare a Master Plan. Funding for the Master Plan Update is provided primarily by the Federal Aviation Administration through an Airport Improvement Program grant.

A comprehensive Master Plan Update was last prepared in 2002 and a partial update was undertaken between 2006 and 2008. This Master Plan Update was initiated in June 2012 and concluded in December 2014. The DOT&PF entered into a contract with the firm RS&H to lead this effort. The Master Plan Update included a robust public and stakeholder involvement program.

Page intentionally left blank

Chapter 4 - Facility Requirements

Table of Contents

List of Figures

List of Tables

Page intentionally left blank

Acronyms and Abbreviations

AAAC	Airport Airline Affairs Committee
AAC	Aircraft Approach Category or Alaska Administrative Code
AACC	Anchorage Airport Communications Committee
AAD	Annual Average Day
AADT	Annual Average Daily Traffic
AAGR	Average Annual Growth Rate
AC	Advisory Circular
ACHP	Advisory Council on Historic Preservation
ACMI	Aircraft, Crew, Maintenance, and Insurance
ACMP	Anchorage Coastal Management Plan
ACRP	Airport Cooperative Research Program
ADAPT	Annual Delay and Activity Performance Times
ADEC	Alaska Department of Environmental Conservation
ADF	Aircraft Deicing Fluid
ADF&G	Alaska Department of Fish and Game
ADG	Airplane Design Group
ADNR, OHA	Alaska Department of Natural Resources, Office of History and Archaeology
ADOLWD	Alaska Department of Labor and Workforce Development
AEDC	Alaska Economic Development Corporation
AFSC	Anchorage Fueling and Service Company
AGL	Above Ground Line
AHPA	Alaska Historic Preservation Act
AHRS	Alaska Heritage Resource Survey
AIAS	Alaska International Airport System
AIDEA	Alaska Industrial Development and Export Authority
AIP	Airport Improvement Program
Airport	Ted Stevens Anchorage International Airport
AIT	Advanced Imaging Technology
AMATS	Anchorage Metropolitan Area Transportation Study
ANGB	Air National Guard Base
AOA	Air Operations Area
APDES	Alaska Pollutant Discharge Elimination System
APU	Auxiliary Power Units
ARC	Airport Reference Code
ARFF	Aircraft Rescue and Fire Fighting
AS	Alaska Statute

ASDA	Accelerate-Stop Distance Available
ASDE	Airport Surface Detection Equipment
ASIG	Aircraft Service International Group
ASPM	Aviation System Performance Metrics
ASR	Airport Surveillance Radar
ATCT	Airport Traffic Control Tower
AWMP	Anchorage Wetlands Management Plan
AWWU	Anchorage Water and Wastewater Utility
BAT	Best Available Technology
BGEPA	Bald and Golden Eagle Protection Act
BMPs	Best Management Practices
BRAC	Base Realignment and Closure
BRL	Building Restriction Line
CAA	Clean Air Act
CAD	Computer-aided Design
CATS	Compliance Activity Tracking System
CBIS	Checked Baggage Inspection System
CBP	Customs and Border Protection
CBRA	Checked Baggage Resolution Area
CCSF	Certified Cargo Screening Facility
CDS	Consolidated De-Icing Services
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CESQG	Conditionally Exempt Small Quantity Generator
CFC	Customer Facility Charge
CFR	Code of Federal Regulations, or Crash / Fire / Rescue
CIP	Capital Improvement Plan
CO	Carbon Monoxide
Coastal Trail	Tony Knowles Coastal Trail
COD	Chemical Oxygen Demand
CONRAC	Consolidated Rental Car Facility
CUPPS	Common Use Passenger Processing Systems
CZMA	Coastal Zone Management Act
DHS	Department of Homeland Security
DME	Distance Measuring Equipment
DNL	Day-night Average Sound Level
DO	Dissolved Oxygen
DOT	U.S. Department of Transportation

DOT&PF	Alaska Department of Transportation and Public Facilities
EAS	Essential Air Service
EDS	Explosive Detection System
EMS	Environmental Management System
EOC	Emergency Operations Center
EQA	Equivalent Aircraft
ETD	Explosive Trace Detection
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulation
FBO	Fixed Base Operator
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency
FIRMs	Flood Insurance Rate Maps
FIS	Federal Inspection Service
FMRA	FAA Modernization and Reform Act of 2012
FY	Fiscal Year
GA	General Aviation
GPS	Global Positioning System
GRE	Ground Run-Up Enclosure
GSE	Ground Service Equipment
HLB	Heritage Land Bank
IAS	International Aviation Services, Inc.
IATA	International Air Transport Association
IBC	International Building Code
IFR	Instrument Flight Rules
IFT	International Freight Terminal
ILS	Instrument Landing System
INM	Integrated Noise Model
ISER	Institute of Social and Economic Research (at the University of Alaska Anchorage)
JBER	Joint Base Elmendorf-Richardson
LDA	Landing Distance Available
LOC	Localizer
LOS	Level of Service
LUST	Leaking Underground Storage Tank
Master Plan Update	Ted Stevens Anchorage International Airport Master Plan Update
MEP	Mechanical, Electrical, and Plumbing

MOA	Municipality of Anchorage
MSA	Metropolitan Statistical Area
MSGP	Multi-Sector General Permit
MSL	Mean Sea Level
MTOW	Maximum Takeoff Weight
NAAQS	National Ambient Air Quality Standards
NAC	Northern Air Cargo
NADP	Noise Abatement Departure Profiles
NAMS	Northern Air Maintenance Services
NAVAID	Navigational Aid
NCP	Noise Compatibility Program
NDB	Non-directional Beacon
NEMs	Noise Exposure Maps
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPIAS	National Plan of Integrated Airport System
NPL	National Priorities List
NRHP	National Register of Historic Places
O&D	Origin and Destination
O&M	Operations and Maintenance
OAIASS	Optimize AIAS Strategy
OER	Operating Expense Ratio
OFA	Object Free Area
OFZ	Obstacle Free Zone
OSR	On-Screen Resolution
PAL	Planning Activity Level
PAPI	Precision Approach Path Indicator
PCC	Portland Cement Concrete
PCI	Pavement Condition Index
PDARS	Performance Data Analysis and Reporting System
PFC	Passenger Facility Charges
PM-10	Particulate Matter with a Diameter of 10 Microns or Less
PM-2.5	Particulate Matter with a Diameter of 2.5 Microns or Less
QTF	Quick-Turnaround Facility
RCRA	Resource Conservation and Recovery Act

RDC	Runway Design Code
RNAV	Area Navigation
ROFA	Runway Object Free Area
RON	Remain Overnight
RPZ	Runway Protection Zone
RSA	Runway Safety Area
RSIP	Residential Sound Insulation Program
RTR	Remote Transmitter Receiver
SCS	Sterile Corridor System
SHPO	State Historic Preservation Office(r)
SIDA	Security Identification Display Area
SIP	State Implementation Plan
SSCP	Security Screening Checkpoint
STEP	South Terminal Expansion Project
SWPPP	Stormwater Pollution Prevention Plan
TACAN	Tactical Air Navigation
TDG	Taxiway Design Group
TERPS	Terminal Instrument Procedures
TODA	Takeoff Distance Available
TORA	Takeoff Run Available
TRACON	Terminal Radar Approach Control
TSA	Transportation Security Administration
UPS	United Parcel Service
USDA-WS	U.S. Department of Agriculture - Wildlife Services
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USPS	United States Postal Service
VASI	Visual Approach Slope Indicator
VFR	Visual Flight Rules
VOCs	Volatile Organic Compounds
VOR	Very High Frequency Omnidirectional Range
WAAS	Wide Area Augmentation Systems
WADP	West Anchorage District Plan
WBI	Whole Body Imaging
WHA	Wildlife Hazard Assessment
WHMP	Wildlife Hazard Management Plan

Page intentionally left blank

CHAPTER 4
FACILITY REQUIREMENTS

SECTION 1
INTRODUCTION

Facility requirements are defined by the Federal Aviation Administration (FAA) as "an assessment of the ability of existing facilities to meet current and future demand." Chapter 4, Facility Requirements, of the Ted Stevens Anchorage International Airport Master Plan Update (Master Plan Update) documents 1) the technical analysis methodology used to determine facility requirements for Ted Stevens Anchorage International Airport (Airport), and 2) the space (e.g., square feet of building, number of gates, number of vehicular parking stalls, etc.) required to accommodate forecast demand through 2030.

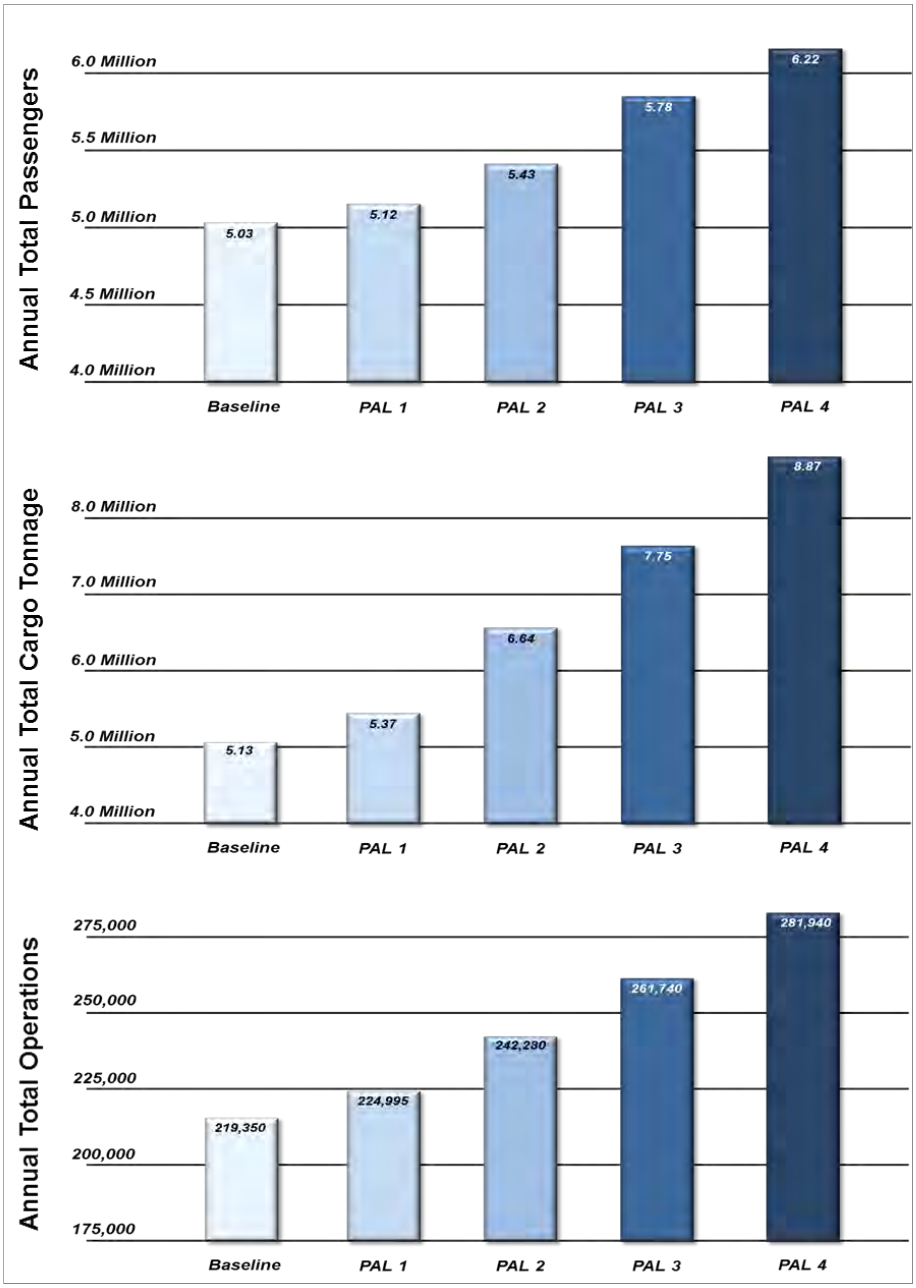
Developing facility requirements is a foundational element of this and any airport master plan. The resulting facility requirements were used as the basis for planning the future development at the Airport, as documented in **Chapter 5**, Alternatives Development and Evaluation and **Chapter 6**, Implementation Plan.

Facility requirements were determined for the following functional components:

- Airfield runways and taxiways
- Airfield apron / ramp areas
- Passenger terminal gates and parking positions
- Passenger terminal functional building areas
- Airport access and roadways
- Terminal curbside
- Commercial vehicle staging area
- Public and employee parking
- Rental car facilities
- Cargo building, apron, and landside space
- General aviation building, apron, and landside space
- Airport Traffic Control Tower
- Aircraft Rescue and Firefighting / police and fire space
- Airport maintenance space
- Snow disposal sites
- Deicing pads
- Ground support equipment storage
- Fueling and other utility needs

Facility requirements were determined for the baseline year (2012) and four future planning activity levels (PAL) corresponding to the 2015, 2020, 2025, and 2030 forecast years. The Master Plan Update forecasted demand by planning activity level is shown in **Figure 4.1**.

Figure 4.1
Master Plan Update Forecast Demand by Planning Activity Level



Source: *2013 Alaska International Airport System Forecast Technical Report*.
Note: PAL = Planning Activity Level.

SECTION 2
AIRFIELD REQUIREMENTS

Section 2 presents the airfield requirements at Ted Stevens Anchorage International Airport (Airport). The airfield requirements include airfield geometric changes, such as runway width / length or safety area dimensions, which are necessary to 1) comply with current design standards, 2) enhance safety, and 3) improve overall airfield efficiency. The airfield requirements were determined in consideration of the forecast demand, fleet mix, flight schedule, airfield usage, airspace constraints, and flight conditions (i.e., visibility, weather).

To determine airfield requirements, various analyses including a demand / capacity analysis (**Section 2.1**), NextGen impacts analysis (**Section 2.2**), and runway length analysis (**Section 2.3**), were completed to better understand the Airport's airfield capabilities and limitations. A gap analysis was performed to assess current airfield geometric conditions against current and future design standards for runways and taxiways / taxilanes (**Section 2.4**) and identify airfield safety enhancements (**Section 2.5**). Other airfield considerations are also documented (**Section 2.6**). **Section 2** concludes with a summary of the overall airfield requirements (**Section 2.7**).

2.1 DEMAND / CAPACITY ANALYSIS

Fast-time simulation modeling of forecast aviation demand was performed to assess the current airfield's capability to accommodate forecast demand. The goal of the analysis was to determine if the Airport's operational throughput rate (e.g. operations per hour) would accommodate demand without untenable delay accruing. Inputs for the analysis included the forecast demand levels, future fleet mix and future flight schedules. The delay results calculated as part of the demand / capacity analysis are meant to aid Airport management staff in future airfield planning and decision making. Two demand / capacity analyses were completed: one as part of the *2013 Alaska International Airport System (AIAS) Planning Study* (AIAS Planning Study) and the other as part of this Ted Stevens Anchorage International Airport Master Plan Update (Master Plan Update).

2.1.1 AIAS DEMAND / CAPACITY ANALYSIS SUMMARY

The AIAS Planning Study team completed a demand / capacity analysis based on forecast results documented in the *2013 AIAS Forecast Technical Report* (AIAS Forecast) and gated design day flight schedule for the Airport. The gated design day flight schedule of aircraft operations is based on the average day within the peak month of the year. This methodology is standard practice for airport demand / capacity analysis. Two future gated design day schedules were developed reflecting two forecast levels of demand. Planning Activity Level (PAL) 2 represents approximately 860 daily operations and 242,000 annual operations. PAL 4 represents approximately 1,004 daily operations and 282,000 annual operations. Anticipated future airfield delay was determined using SIMMOD modeling software. SIMMOD accounts for many real world variables that influence the capacity and delay of a given airport, including but not limited to aircraft separation, aircraft speed, and the various runway configurations used at the Airport.

SIMMOD is used to calculate delay, which is defined as the time added to the "normal" time for an aircraft to pass through the route the aircraft wants to take. The AIAS Planning Study team determined through airline surveys and interviews that 30 minutes of average aircraft delay during peak periods (peak hour) more than 10% of the time would be untenable to the airlines. SIMMOD analysis indicated that 30 minutes of average delay during peak periods would likely occur more than 10% of the time when demand reaches approximately 258,000 annual operations. This result assumes no changes are made to the existing airfield infrastructure. According to the AIAS Forecast, demand of 258,000 annual operations is anticipated to occur in approximately 2024 but could occur as early as 2016 if high growth occurs or as late as 2030 and beyond if a low or no growth occurs.

As previously mentioned, at 258,000 annual operations, aircraft are projected to experience 30 minutes of average delay during peak periods, more than 10% of the time (approximately 37 days a year). This delay occurs between 11 a.m. and 7 p.m. when international cargo operations and cargo technical stops are at their peak and especially during the peak hour, which occurs between 3 p.m. and 4 p.m. Peak delay was measured on an average hourly basis rather than average annual basis due to cargo operations sensitivity to delay.

Integrated cargo airlines (e.g., FedEx and United Parcel Service [UPS]) and other large cargo airlines are assumed to be the most sensitive to delay as they must meet delivery times at cargo hubs in the Lower 48 States and Asia. Delay that occurs at the Airport may be felt downstream as Anchorage is a stopover point for international cargo airlines. Cargo airlines can be expected to reduce or eliminate operations at the Airport if peak period delays at the Airport approach 30 minutes on a regular basis. For integrated cargo airlines, the normal turn time includes 90 minutes for aircraft loading / unloading and refueling. Additional time for normal taxiing of about 19 minutes (express cargo carriers) would be added. Any delay beyond 30 minutes would increase the turn time by 33% and increase total time on the ground by 28%, which would cause carriers to change their sort windows in the Lower 48 States and increase delivery times and cost. For technical stop operations, a 30-minute delay would add 50% to the turn time, which is also deemed significant. For passenger and general aviation operations, the delay threshold is typically 15 to 20 minutes of average annual delay. Peak period delay is considered a more important metric to evaluate congestion for cargo airlines.

The results of the hourly demand / capacity analysis of the existing airfield are shown in **Table 4.1** for the various runway configurations

(Figure 4.2) in use at the Airport. At PAL 2, delay exceeds 30 minutes at 151.0 and 64.3 minutes, respectively, for Configuration 4 arrivals and departures under Visual Flight Rules (VFR) conditions. However, Configuration 4 occurs approximately 3% of the time (approximately 11 days per year) with arrivals to and departures from Runway 15. Today, the Airport and airlines have the capacity to work around the delays in this configuration. At PAL 4, delay conditions under Configuration 4 worsen to 196.2 and 69.2 minutes, respectively. Also at PAL 4, delay exceeds the untenable delay threshold at 38.6 and 37.4 minutes, respectively, for Configuration 1 departures under VFR and Instrument Flight Rules (IFR) conditions. Configuration 1 VFR occurs approximately 62% of the time and involves arrivals to Runway 7L and Runway 7R, and departures from Runway 33 and Runway 7L. Configuration 1 IFR occurs approximately 10% of the time.

Table 4.1
2013 AIAS Planning Study Hourly Airfield Capacity and Delay Results Summary

Annual Usage				
	Configuration 1	Configuration 2	Configuration 3	Configuration 4
VFR	62%	20%	3%	3%
IFR	10%	2%	N/A	N/A

Total Hourly Capacity (arrivals / departures / peak combined)[1]								
	Configuration 1		Configuration 2		Configuration 3		Configuration 4	
	PAL 2	PAL 4	PAL 2	PAL 4	PAL 2	PAL 4	PAL 2	PAL 4
VFR	35/28/56	43/32/63	32/32/59	38/37/70	N/A	N/A	24/22/44	25/28/44
IFR	30/29/58	35/33/65	N/A	N/A	N/A	N/A	N/A	N/A

Peak Average Hourly Delay (minutes / time)[2]									
		Configuration 1		Configuration 2		Configuration 3		Configuration 4	
Activity Level		PAL 2	PAL 4	PAL 2	PAL 4	PAL 2	PAL 4	PAL 2	PAL 4
VFR	Arrivals	1.8 1-2 p.m.	3.5 1-2 p.m.	3.8 1-2 p.m.	10.7 2-3 p.m.	N/A	N/A	151.0 10-11 p.m.	196.2 10-11 p.m.
	Departures	16.3 4-5 p.m.	38.6 5-6 p.m.	3.3 5-6 p.m.	9.6 4-5 p.m.	N/A	N/A	64.3 5-6 p.m.	69.2 5-6 p.m.
IFR	Arrivals	7.0 2-3 p.m.	20.3 2-3 p.m.	N/A	N/A	N/A	N/A	N/A	N/A
	Departures	14.8 4-5 p.m.	37.4 5-6 p.m.	N/A	N/A	N/A	N/A	N/A	N/A

Source: 2013 Alaska International Airport System Planning Study.

Notes: VFR = Visual Flight Rules, IFR = Instrument Flight Rules, PAL = Planning Activity Level.

1 - The operations for arrivals and departures, when treated separately, do not add to the peak combined operations shown. The peak combined operations shown are for a single peak hour when arrivals and departures are combined.

2 - Peak average hourly delay results highlighted in red indicate where average aircraft delay exceeds 30 minutes.

To resolve delay, the AIAS Planning Study team was tasked with assessing the potential of shifting operations to Fairbanks International Airport. Additional information pertaining to the demand / capacity analysis, delay results, and the feasibility of shifting traffic to Fairbanks International Airport can be found in **Chapter 5**, Alternatives Development and Evaluation, and the AIAS Planning Study.

2.1.2 MASTER PLAN AIRFIELD DEMAND / CAPACITY ANALYSIS

For the Master Plan Update, an airfield demand / capacity analysis was performed using Simmod *PRO!*. This software is a fast-time computer simulation program (more robust than SIMMOD) that was used to model the airfield at two future demand levels: PAL 2 (2020), and PAL 4 (2030). The most recent simulation was built upon modeling efforts completed as part of the AIAS Planning Study and used the same gated design day schedule. The new model differs from the AIAS Planning Study model in that it is based on new assumptions about gating configurations and the airspace structure. The model was developed in order to be used later to assess the delay impacts of the airfield alternatives. These delay impacts are documented in **Chapter 5**, Alternatives Development and Evaluation. The demand / capacity analysis and delay results for the existing airfield model are documented in this section.

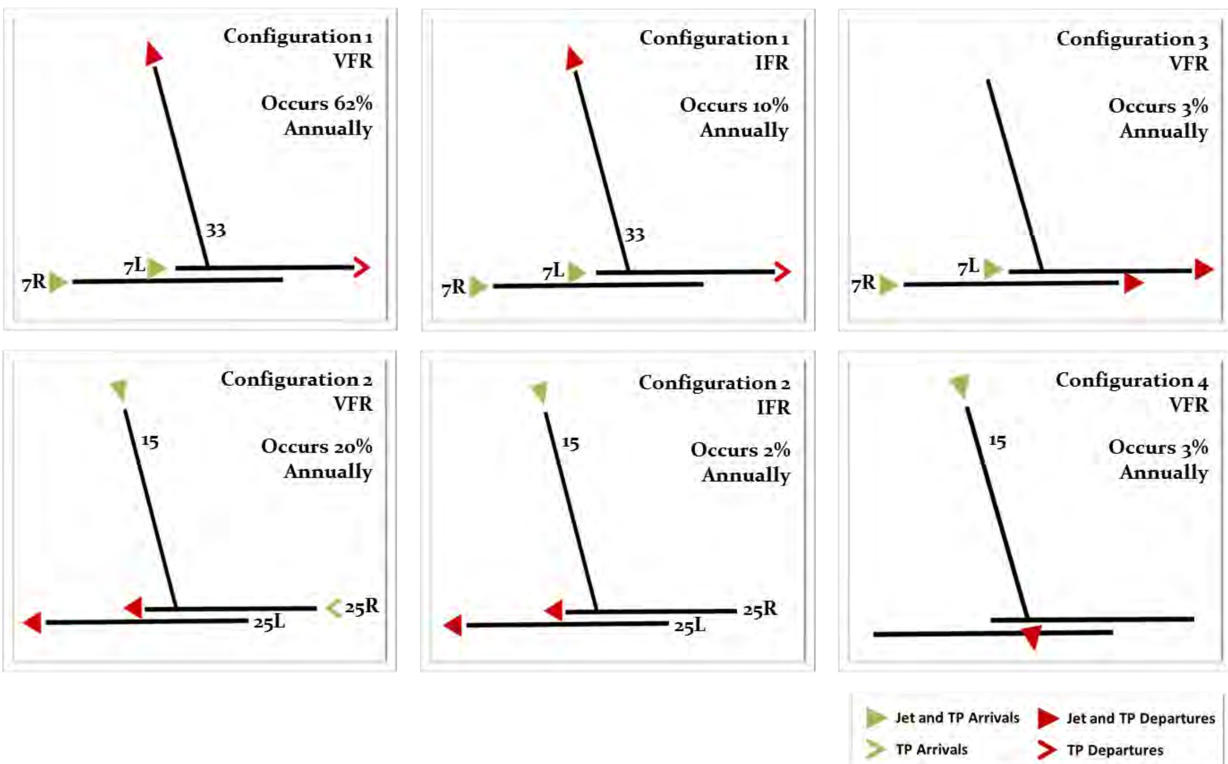
2.1.3 BACKGROUND DATA, CONSIDERATIONS, AND ANALYSIS METHODOLOGY

To set up modeling efforts for the Master Plan Update, a baseline model was developed based on the existing airfield and calibrated against existing conditions and operations using actual radar data from the Federal Aviation Administration's (FAA's) Performance Data Analysis and Reporting System, and reported ground travel times collected from the Aviation System Performance Metrics (ASPM) Taxi Times Standard Report. These data were confirmed and supplemented with information obtained from interviews with Airport operations personnel and FAA Airport Traffic Control Tower and terminal radar approach control representatives. Two airfields in close proximity to the Airport were researched to determine potential conflicts with airspace operations. Lake Hood Airport lies to the east of the Airport and consists of one gravel runway and three water runways. The airspace and procedures used by Lake Hood Airport air traffic do not conflict or interact with Airport operations, thereby negating the need to consider Lake Hood Airport operations in the simulation study. However, during certain runway configurations, military operations to Joint Base Elmendorf Richardson (JBER) do interact with the Airport's air traffic. JBER operations and their interactions with the Airport's air traffic were included in the simulation study.

The calibration was performed for the most common existing airfield use configuration, Configuration 1 (arrivals to Runways 7L / 7R and departures from Runways 33 and 7L). The purpose of the calibration was to ensure that the simulation model accurately represented travel time, throughput, and delay at the Airport. An accurately calibrated model is critical since it is the foundation for the baseline and all alternative scenarios developed for the Master Plan Update.

Following calibration, additional simulation models for the remaining airfield configurations presented in **Figure 4.2** were constructed using the initial calibration model data. The annual percentages along with the runway use configurations are shown in **Figure 4.2** and are consistent with the previous 2008 Master Plan Study findings as well as the demand capacity analysis performed as part of the AIAS Planning Study. These percentages were used to annualize the simulation runs.

Figure 4.2
Scenarios Modeled and Annual Percentage Use



Source: Master Plan Update team, 2013.
Notes: IFR = Instrument Flight Rules, VFR = Visual Flight Rules.

In addition, three demand schedules, representing a baseline activity level and two future activity levels, were incorporated into each of the six modeled configurations, resulting in 18 total baseline simulation exercises. The demand schedules shown in **Table 4.2** were developed for the baseline 2012, PAL 2 and PAL 4 activity levels with operations of 219,350, 242,000, and 282,000, respectively. In order to reflect the effect that IFR conditions have on the schedule, single-engine piston and multi-engine piston aircraft, which are most commonly general aviation traffic, were removed from those schedules utilized in IFR models because they do not typically fly in IFR conditions.

Finally, a baseline analysis was performed to evaluate the effectiveness of existing airside facilities to handle impacts that might be caused by proposed modifications to airfield facilities, changes in operations, and increased volumes of aircraft traffic. For the baseline analysis, the average daily delay, peak hour delay, and average annual delay results are presented.

Table 4.2
Daily Operations Counts for Baseline Model

	Baseline Operations [1]		Planning Activity Level 2		Planning Activity Level 4	
Annual Operations	219,350		242,275 15% increase from base operations		281,942 33% increase from base operations	
	VFR	IFR	VFR	IFR	VFR	IFR
Peak Month Average Day[2]	742	706	860	830	1,004	968
Arrivals	371	353	430	415	502	484
RON[3]	43	43	56	56	53	53
Tow-off[4]	29	29	39	39	47	47
Turnaround[5]	218	218	254	254	306	306
General Aviation[6]	81 (63/18)	63 (45/18)	81 (56/25)	66 (41/25)	96 (65/31)	78 (47/31)
Departures	371	353	430	415	502	484
RON[3]	51	51	56	56	53	53
Tow-off[4]	21	21	39	39	47	47
Turnaround[5]	218	218	254	254	306	306
General Aviation[6]	81 (63/18)	63 (45/18)	81 (56/25)	66 (41/25)	96 (65/31)	78 (47/31)

Source: Master Plan Update team, 2013.
Notes: VFR = Visual Flight Rules, IFR = Instrument Flight Rules, RON = Remain Overnight.
1 - Interpolated 2012 values based on Alaska International Airport System Forecast base year and growth rate.
2 - Average weekday during the peak months (July / August).
3 - Aircraft that remain at the gate for the remainder of the day.
4 - Arrival aircraft that are required to move off the gate due to future activity expected at the gate.
5 - Aircraft that arrive and then depart within the 24-hour day schedule.
6 - General aviation includes operations at Lake Hood Airport and at Ted Stevens Anchorage International Airport (within the South Airpark).

Average Daily Delay

Delay, as defined in the simulation model, is the amount of time above the normal flight time experienced by each flight due to congestion and required air traffic control spacing within the model. The average daily delay is the average delay for a group of flights across an entire 24-hour schedule. Each of the simulation exercises is run independently of one another for an entire 24-hour period, and the average delay per aircraft is calculated per simulation run. These values are presented in **Table 4.3**.

Most airports consider capacity to be constrained at 10 minutes of average daily delay. The red highlighted values in the table indicate times when average daily delay exceeds 10 minutes per aircraft. Instances when 10 minutes of average daily delay is exceeded occur in Configuration 4 at PAL 2 and PAL 4 under VFR conditions (3% of the time), whereas Configurations 1 and 2 both exceed the 10-minute threshold at the PAL 4 activity level for arrivals in IFR conditions (12% of the time).

Table 4.3
Average Daily Delay Results Overview

Annual Usage				
	Configuration 1	Configuration 2	Configuration 3	Configuration 4
VFR	62%	20%	3%	3%
IFR	10%	2%	N/A	N/A

Average Minutes of Delay (Average Day)[1]												
	Configuration 1			Configuration 2			Configuration 3			Configuration 4		
	Baseline[2]	PAL 2	PAL 4	Baseline[2]	PAL 2	PAL 4	Baseline[2]	PAL 2	PAL 4	Baseline[2]	PAL 2	PAL 4
VFR	1.9	3.4	8.5	1.3	1.9	3.2	1.6	2.2	5.4	5.4	11.8	41.2
IFR	2.8	5.8	21.6	2.4	5.2	19.6	N/A	N/A	N/A	N/A	N/A	N/A

Source: Master Plan Update team, 2013.
Notes: VFR = Visual Flight Rules, IFR = Instrument Flight Rules, PAL = Planning Activity Level.
1 - Peak average daily delay results highlighted in red indicate when average aircraft delay exceeds 10 minutes.
2 - Baseline data are based on *2013 Alaska International Airport System Forecast Technical Report* gated design day flight schedule.

Peak Hour Delay

Most airports do not consider peak hour delay as the driving metric in capacity studies. The Airport, however, is unique due to its cargo turnaround time windows. In order for cargo carriers to meet deadlines in other markets, delay cannot go over a specific threshold during any given hour. Previous studies have concluded and airport personnel have confirmed that 30 minutes is the threshold of untenable delay during the peak hour; this technical analysis assumes the same threshold. Due to this, the average amount of delay for any given hour is a key metric.

The peak hour delay metric reports the highest average hourly delay of all flights that operate during each hour over the 24-hour period. In other words, it represents the average amount of delay experienced by any given flight within the peak hour of delay. **Table 4.4** presents the peak hour delay in each configuration. Values exceeding 30 minutes of delay are highlighted in red. Configuration 4 in VFR conditions already exceeds 30 minutes at the baseline activity level (3% of the time). Configurations 1 and 3 under VFR conditions exceed the 30-minute delay threshold at the PAL 4 activity level (65% of the time).

Configurations 1 and 2 exceed the 30-minute delay threshold at the PAL 4 activity level under IFR conditions (12% of the time).

Table 4.4
Average Peak Hour Delay Results Overview

Annual Usage				
	Configuration 1	Configuration 2	Configuration 3	Configuration 4
VFR	62%	20%	3%	3%
IFR	10%	2%	N/A	N/A

Average Minutes of Delay (Peak Delay Hour)[1]												
	Configuration 1			Configuration 2			Configuration 3			Configuration 4		
	Baseline[2]	PAL 2	PAL 4	Baseline[2]	PAL 2	PAL 4	Baseline[2]	PAL 2	PAL 4	Baseline[2]	PAL 2	PAL 4
VFR	10.9	17.2	50.4	4.7	7.1	17.0	6.1	8.7	30.9	30.1	60.9	150.6
IFR	16.1	29.2	99.6	15.8	28.3	76.3	N/A	N/A	N/A	N/A	N/A	N/A

Source: Master Plan Update team, 2013.
Notes: VFR = Visual Flight Rules, IFR = Instrument Flight Rules, PAL = Planning Activity Level.
1 - Peak average hourly delay results highlighted in red indicate where average aircraft delay exceeds 30 minutes.
2 - Baseline data are based on *2013 Alaska International Airport System Forecast Technical Report* gated design day flight schedule.

Average Annual Delay

The most common metric used for airport capacity analysis is known as "average annual delay." This is a composite number made up of the various annual delay values in each configuration as a factor of how often they occur each year. The annual usage percentages shown in both **Table 4.3** and **Table 4.4** are applied to the daily delay values shown in **Table 4.3** to calculate annual delay at the Baseline, PAL 2, and PAL 4 activity levels. **Table 4.5** presents the average annual delay for each activity level.

Average annual delay values generally have a large influence on decisions related to airport infrastructure improvements within the United States. Most United States airports consider average annual delay values in excess of 8 to 10 minutes per aircraft to be disruptive to the efficient operation of flights. Based on this general assumption, the Airport would begin to experience a delay issue somewhere between PAL 2 and PAL 4 demand levels under today's airport configuration and operating conditions.

Delay Summary

For the Airport, average peak hour delays, rather than average annual delays, are a primary focus due to the sensitivity of cargo carrier operations in meeting delivery times in the Lower 48 States. Most airports do not place a substantial value on the average peak hour of delay in their capacity studies. As shown in **Table 4.4**, average peak hour delays become untenable (exceeding 30 minutes of average hourly delay more than 10% of the time) between PAL 2 and PAL 4 as aircraft operations approach 258,000 annually in all but Configuration 2 VFR.

Table 4.5
Average Annual Delay

		Planning Activity Level[2]	
	Baseline[1]	2	4
Existing Airfield	2.0	3.6	9.9

Source: Master Plan Update team, 2013.
Notes:
1 - Baseline data are based on *2013 Alaska International Airport System Forecast Technical Report* gated design day flight schedule.
2 - Peak average annual delay results highlighted in red indicate where average aircraft delay exceeds 8 to 10 minutes.

Given the existing runway use configurations, fleet mix, and peak operational trends, airfield capacity is currently constrained during peak hours 3% of the time, and that continues to be the case through PAL 2. By PAL 4, all three metrics—peak-hour delay, average daily delay, and average annual delay—reveal significant delays. PAL 4 average annual delay of 9.9 minutes is at the upper limit of industry standards and considered disruptive to efficient operations. PAL 4 average daily delay is a constraint on capacity 15% of the time, while peak-hour delay is untenable 80% of the time.

By PAL 4, the capacity of the airfield will be operationally constrained and delay will increase substantially. Before this point is reached, plans should be taken to increase the capacity of the airfield. At the Airport, runway capacity is limited by many factors. These include aircraft separation distances between heavy and light / small aircraft approaching the runway; the location, separation distances, and dependencies of parallel runways (e.g., the 700-foot separation distance between Runways 7L and 7R does not allow for simultaneous operations under IFR conditions); jet blast issues impacting Runway 7R arrivals and Runway 33 departures; and the sequencing of aircraft on the airfield.

For the Airport, demand could potentially be managed by any number of methods. Flight schedules can be modified if airlines are willing. Flight procedures and runway use can be changed. Technological improvements such as NextGen (discussed in **Section 2.2**) can also increase capacity for the Airport. Managing demand by shifting some traffic to Fairbanks International Airport could mitigate delays at the Airport though it would not increase the Airport's capacity. The Airport does not have the ability to shift traffic to Fairbanks International Airport; this effort would require coordination with other parties / entities. Also, modifying or adding to the geometry of the existing runways and taxiways could also increase capacity. Some consideration has been made in the past to add a new fourth, full-length north / south runway parallel to existing Runway 15-33. These airfield capacity and safety-enhancing options will be explored further and documented in **Chapter 5**, Alternatives Development and Evaluation.

2.2 NEXTGEN AND NAVAIDS

The FAA is implementing the NextGen system throughout the National Plan of Integrated Airport System in an effort to create a more responsive, fuel-efficient, and efficient aviation system. NextGen represents an evolution from a ground-based system of air traffic control to a satellite-based system of air traffic management. The system uses Global Positioning Systems, Wide Area Augmentation Systems, and other newer technologies to allow more aircraft to safely fly closer together on more direct routes. The system allows pilots and air traffic controllers to identify exact locations of neighboring aircraft and project a flight path in real-time mode, essentially allowing for additional aircraft in the sky, reducing the separation between aircraft while enhancing the safety of travel. In addition to being more efficient, NextGen is also environmentally and economically friendly, allowing planes to depart and arrive at their destinations more quickly while using less fuel, and may reduce noise impacts. Since the program's implementation, the airspace system has not only seen a reduction in delay, but also a reduction in both the emission of fossil fuels and the cost of flying overall.

While NextGen does involve the application of new flight procedures, it is unclear at this stage what additional impacts NextGen will have on both air traffic and ground development at the Airport. Benefits may be possible during bad weather (low-visibility conditions requiring instrument operations or under IFR) where separation requirements, particularly for a one-runway system, are greater. Several airports nationwide have started to use NextGen capabilities to increase airfield capacity, but this requires a large investment by airlines and airports to install necessary equipment within their aircraft and on the ground. Presently, most of the benefits and delay savings appear to be within the airspace. While this may resolve some delay, it does not necessarily address ground (taxi) or gate delay. These delays need to be resolved by improving the geometry or operations that occur on the ground. This involves coordination with the FAA air traffic controllers and Airport personnel and will be further explored and documented in **Chapter 5**, Alternatives Development and Evaluation.

There is little doubt that the Airport would benefit from implementation of some elements of the NextGen program. The benefits of the program are real but will vary in degree from airport to airport. A NextGen component was recently introduced at Memphis International Airport that had a notable impact on reducing delays. Memphis, however, happens to be an ideal candidate for the benefits of the program because of its operational parameters, including consistent demand, homogeneous fleet mix, and single-operator dominance. Anchorage, in contrast, has inconsistent demand, a highly diverse fleet mix, and a substantial number of different airlines.

Implementation of the most recent elements of NextGen improvements, including Wake Recategorization, requires certain equipment to be present at the Terminal Radar Approach Control and also requires training of Air Traffic Control personnel. Correspondingly, implementation of these elements at each airport has a cost. This is important because the FAA cannot predict with any degree of certainty when the program might be implemented at any given airport due to uncertain long-term FAA funding and budgets.

It is assumed that elements of NextGen would be implemented at the Airport during the Master Plan Update planning horizon. These improvements would potentially enhance airport capacity and would delay the need for other means of delay reduction. The Airport should continue to monitor NextGen enhancements and assess their benefits along with implementation of other projects intended to maintain the Airport's operational safety and efficiency.

2.3 RUNWAY LENGTH

A runway length analysis was conducted to determine whether the existing runways can serve the current and future fleet throughout the planning horizon. Runway length requirements were determined based on the design aircraft and other large aircraft primarily used by the cargo carriers. The largest aircraft, identified by their Runway Design Code[1] (RDC), Airplane Design Group (ADG), and Taxiway Design Group (TDG) currently serving the Airport are as follows:

- Boeing 777-200 / 300 / F (ADG-V, TDG-6)
- Boeing 747-200 / 300 / 400 (ADG-V, TDG-5)
- Boeing 747-8 (ADG-VI, TDG-6)
- MD-11 (ADG-IV, TDG-6)

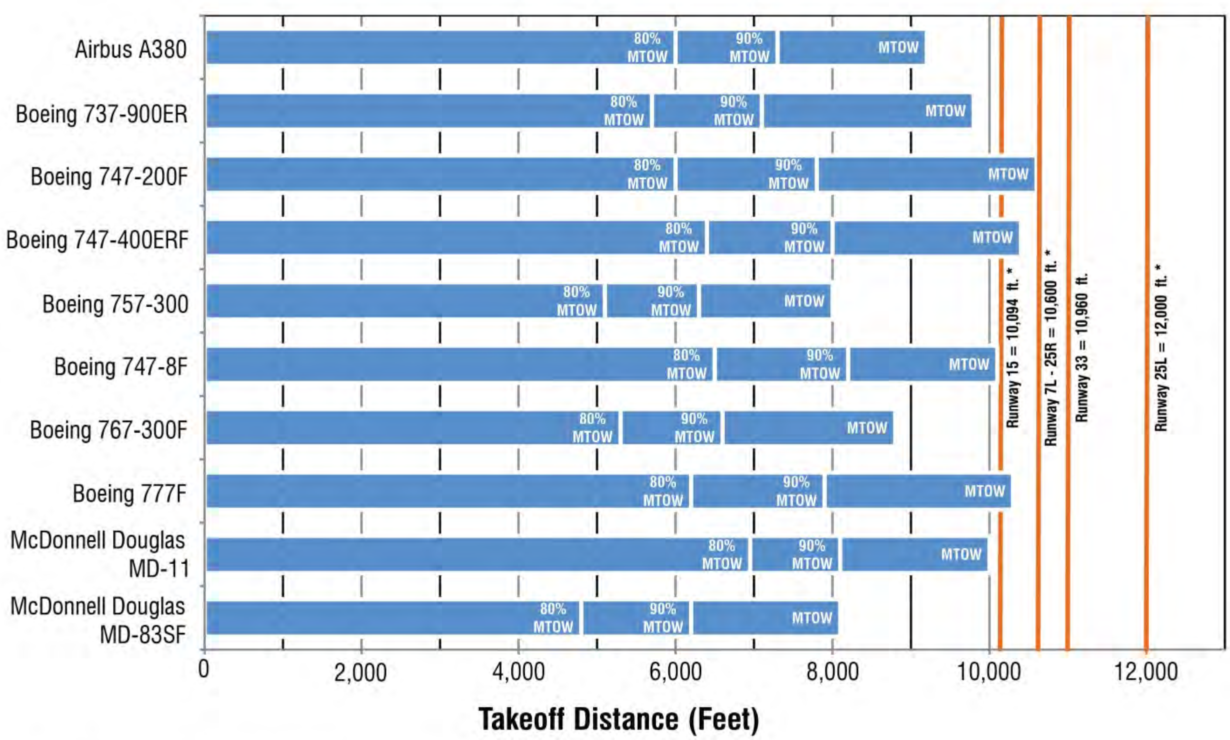
The Airbus A380 (ADG-VI, TDG-7) is projected to serve the Airport sparingly within the planning horizon and was also added to the future fleet mix.

The analysis also considered the fleet mix at a variety of aircraft operating weights—i.e., maximum takeoff weight (MTOW), 90% of MTOW, and 80% of MTOW. This variability provides an idea of how well the existing runway lengths can serve the fleet mix under different operational conditions. Aircraft weight based on stage length was not factored into the analysis because there is always a tradeoff between aircraft payload and range. Additionally, the analysis was conducted using the highest performing engine types for each aircraft.

[1] The Runway Design Code (RDC) is a code signifying the design standard to which the runway is to be built. The Aircraft Approach Category ("A" through "E") and Airplane Design Group (Roman numerals "I" through "VI") are combined to make up the RDC.

Finally, the runway length determination was based upon the average daily maximum temperature of the hottest month of the year and the Airport's elevation. At the Airport, the average maximum temperature of the hottest month is 65 degrees Fahrenheit while the Airport elevation is 151 feet. The FAA calculates airport elevation as the highest point of an airport's usable runway measured from mean sea level. It was assumed that these variables would remain constant over the planning horizon. Landing distance requirements were not considered because aircraft generally require a longer runway to takeoff than to land. **Figure 4.3** shows the runway takeoff length requirements for each aircraft compared with the accelerate-stop distance for each of the departure runways (note that Runway 7R is not used for departures). In the future, the Boeing 747-8 requires 10,100 feet for takeoff at MTOW which means it can depart from any of the existing runways. The aircraft that requires the longest runway takeoff length is the Boeing 747-200F, which cannot takeoff at MTOW from Runway 15. However, the Boeing 747-200F, while still being used today, will gradually be phased out throughout the planning horizon. All other aircraft shown in **Figure 4.3** can takeoff at MTOW on the existing runways.

Figure 4.3
Runway Takeoff Distance Requirements - Standard Day



*Accelerate-Stop Distance Available from 5010 Airport Master Record

Source: RS&H, 2014; Airbus and Boeing aircraft planning manuals.

2.4 COMPLIANCE WITH AIRFIELD DESIGN STANDARDS

The FAA establishes airport geometric design standards and recommendations to ensure safety and efficiency of an airport. The FAA publishes these standards and recommendations in *Advisory Circular (AC) 150 / 5300-13A, Airport Design* (AC 150 / 5300-13A). According to AC 150 / 5300-13A, the specific geometric design standards that apply to each airport depend on two primary criteria: the Aircraft Approach Category (AAC) and the ADG. The AAC classifies each aircraft according to its approach speed, whereas the ADG classifies aircraft according to wingspan length or tail height. These two criteria (AAC-ADG) determine the specific standards that apply to runways, taxiways / taxilanes, aprons, and other facilities at each airport. AC 150 / 5300-13A went through a substantial update that modified the geometric airfield standards and was published in its current iteration in fall 2012.

The newly revised AC 150 / 5300-13A kept the AAC and ADG classifications; however, a new TDG criterion was added. The TDG criterion is based on the distances between the outer edges of the main gear and the distance between the cockpit and main gear. The TDG is used primarily as a basis for establishing the dimensional standards for taxiway width, taxiway edge safety margin, and taxiway shoulder width. In some cases, the TDG is also used as a basis for establishing the separation distances for taxiway / taxilane centerline to parallel taxiway / taxilane centerline. The current design aircraft is specified by a composite of several aircraft. Runway 7L-25R, Runway 15-33, and their associated taxiways are currently designed to accommodate ADG-V, TDG-6 aircraft such as the Boeing 747-200, -300, -400 or Boeing 777-200, -300. Runway 7R-25L and its associated taxiways are currently designed to accommodate ADG-VI, TDG-6 aircraft such as the Boeing 747-8 aircraft.

The ultimate design aircraft for the Airport is the Boeing 747-8, an ADG-VI, TDG-6 aircraft. However, not all areas of the airfield meet those standards. Operations for the Boeing 747-8 are expected to increase, as well as regular operations of the Airbus A380-800, throughout the planning horizon. The Airbus A380 is an ADG-VI, TDG-7 aircraft, and therefore specific areas of the airfield where the Airbus A380 will be used will need to be designed to ADG-VI, TDG-7 design standards. The design standards for the Boeing 747-8 and Airbus A380 are shown in **Table 4.6.** The current long-term goal for the Airport is to bring the airfield up to ADG-VI standards. As previously mentioned, currently there are modifications to standards in place to allow the Boeing 747-8 to operate in areas that do not currently meet the ADG-VI standards. However, as improvements occur for maintenance or capacity enhancement purposes, where possible and feasible, the FAA will likely require the elimination of these modifications to standards by rebuilding facilities to meet current standards.

A gap analysis was completed to identify existing facilities that do not or will not meet FAA standards based on the Airport's critical aircraft and airport design criteria. **Figure 4.4** and **Figure 4.5** show the areas on the airfield where there may be deficiencies or non-standard conditions now and in the future. The majority of the airfield facilities will need to meet ADG-VI, TDG-6 standards with some exceptions as noted in the following sections. In addition to what is shown in **Figure 4.4** and **Figure 4.5**, the deficiencies are described in the following sections.

2.4.1 RUNWAYS

The existing runway width, runway shoulder width, runway safety area, runway object free area, runway protection zone, runway obstacle free zone, and runway-to-runway and runway-to-taxiway separation distances were assessed with the latest runway design standards and are documented in this **Section 2.4** by runway. Runway length was also assessed and is documented in **Section 2.3**. **Figure 4.4** depicts the runway designations, non-standard conditions in PAL 4, and current modification to standards.

Runway 15-33

Runway 15-33 is categorized as a D-V runway and has a length of 10,960 feet. A modification of standards is in place for the Boeing 747-8, an ADG-VI aircraft, to operate on Runway 15-33. If this modification of standard were ever eliminated, Runway 15-33 would need to be widened by 50 feet, to 200 feet, to meet D-VI runway design standards.

The blast pad on the Runway 15 end is measured at 205 feet long from the demarcation line. FAA standards are for the blast pad to be 400 feet long; however, aircraft do not depart from the Runway 15 end. Back-taxiing is not allowed from Taxiway Q, so aircraft departing Runway 15 have 405 feet of pavement (which includes full-strength runway pavement) behind the departure point that meets the blast pad dimensional requirements. This condition is deemed to meet design standard as it reduces the erosive effects of jet blast and propeller wash as effectively as a conventional blast pad design.

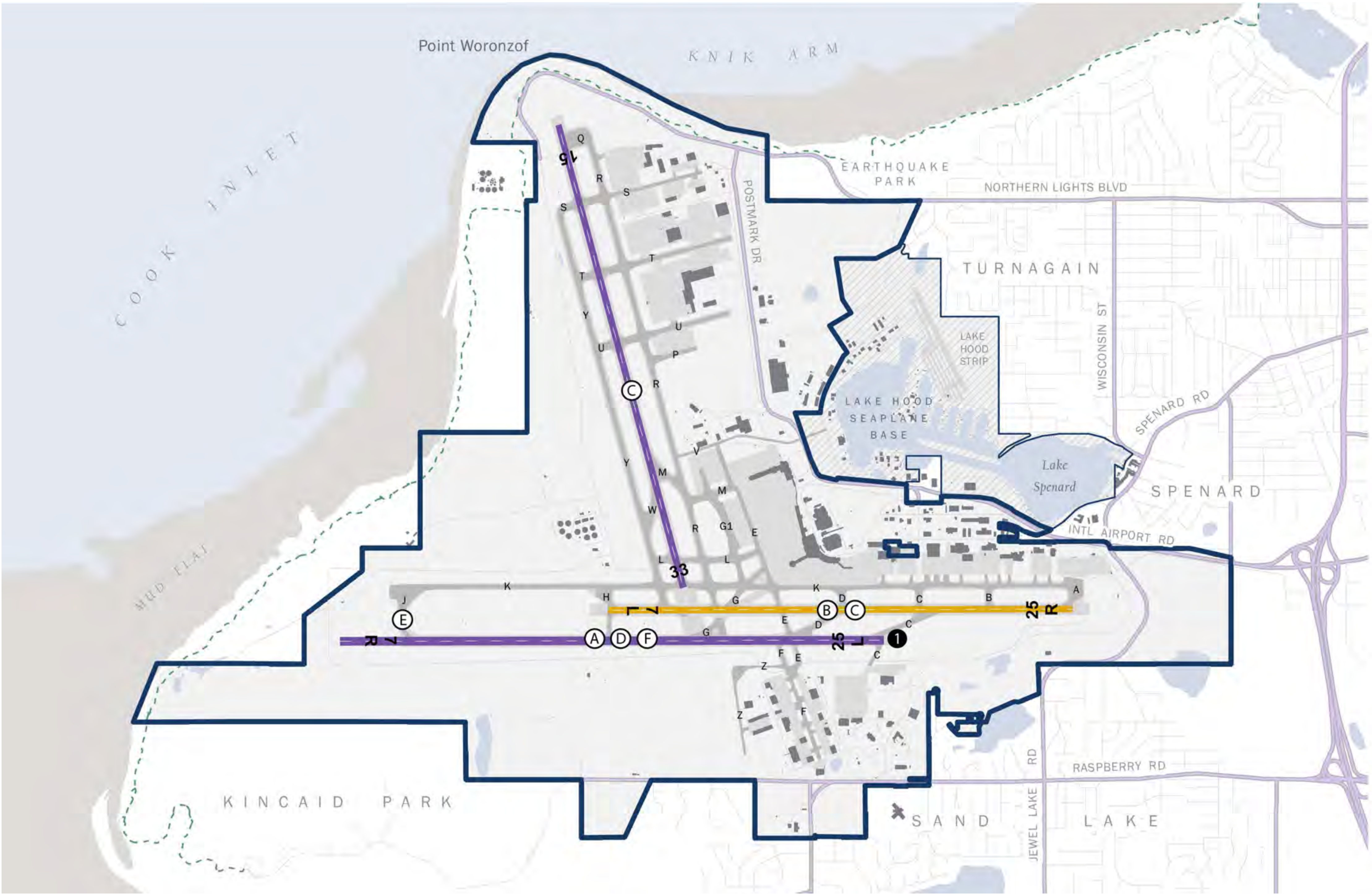
Table 4.6
Airfield Dimensional Design Standards for Boeing 747-8 and Airbus A380 (in feet)

	Boeing 747-8[1] (ADG-VI[2], TDG-6)	Airbus A380[1] (ADG-VI[2], TDG-7)
Runway Width	200	
Runway Shoulder Width	40	
Runway Safety Area Width	500	
Runway Safety Area Length Prior to Landing Threshold	600	
Runway Safety Area Length Beyond Runway End	1000	
Runway Object Free Area Width	800	
Runway Object Free Area Length Prior to Threshold	600	
Runway Object Free Area Length beyond Runway End	1000	
Precision Obstacle Free Zone[3]	Length - 200 / Width - 800	
Approach Runway Protection Zone Dimensions[3]	Inner - 1000 Outer - 1750 Length - 2500	
Departure Runway Protection Zone Dimensions[3]	Inner - 1000 Outer - 1750 Length - 2500	
Runway Obstacle Free Zone Width	400	
Runway Obstacle Free Zone Length	200	
Runway Centerline to Taxiway / Taxilane Centerline Separation	500	
Runway Centerline to Parallel Runway Centerline[4]	700	
Runway Centerline to Taxiway Centerline from High-speed Exit- 180-Degree Turn	Minimum - 484 Recommended - 600	
Runway Centerline to Holdline Separation	280	
Blast Pad Width	280	
Blast Pad Length	400	
Taxiway Width	75	82
Taxiway Shoulder Width	30	40
Taxiway Safety Area Width	262	262
Taxiway Object Free Area Width	386	386
Taxiway / Taxilane Centerline to Parallel Taxiway / Taxilane Centerline Separation	324	324
Taxiway / Taxilane Centerline to Parallel Taxilane Centerline Separation where 180-Degree Turns Between Parallel Taxiways Required	312	312
Taxiway Centerline to Fixed/Movable Object	193	193
Taxilane Centerline to Fixed/Movable Object	167	167

Source: *FAA Advisory Circular 150 / 5300-13A, Airport Design.*
Notes: ADG = Airplane Design Group, TDG = Taxiway Design Group.
1 - Current and future critical design aircraft.
2 - The Runway Design Code indicating aircraft with an Aircraft Approach Speed “D” and Aircraft Design Group “VI.”
3 - Dimensions When Visibility Minimum Lower Than ¾ Mile.
4 - Standard Dimension for Simultaneous Landings and Takeoffs Using Visual Flight Rules.

Page intentionally left blank

Figure 4.4 Runway Designations, Non-Standard Conditions at Planning Activity Level 4, and Current Modification of Standards



Design Standard Requirements

- ADG-VI Runway
- ADG-V Runway
- Apron
- Building
- Taxiway
- Airport Boundary
- Lake Hood Airport Boundary
- Major Road
- Local Road
- Tony Knowles Coastal Trail

Runway Non Standard Conditions

1. Runway 25L End Blast Pad Length

Current Modification of Standards

- (A) Runway 7R-25L Grooving
- (B) Runway 7L Gradient
- (C) Boeing 747-8 can be safely operated on 150ft-wide runways
- (D) Runway 7R-25L dowels
- (E) Runway 7R departure from TWY J intersection-back taxiing not allowed
- (F) Runway 7R-25L Bituminous Pavement

0 2,000 4,000 Feet

Source: RS&H and HDR, 2014.

Page intentionally left blank

Runway 7R-25L

Currently, Runway 7R-25L is categorized as a D-VI runway and has a length of 12,400 feet and width of 200 feet. Boeing 747-8 and Airbus A380 aircraft can operate without any restrictions or modifications to standards. Taxiway K does not extend to the Runway 7R end, but there is conditional approval for a modification to standard that prohibits back taxiing to the Runway 7R end. Aircraft taking off from Runway 7R must do so starting at Taxiway J, which lies approximately 1,400 feet east of the Runway 7R end. The Runway 7R end also does not have a blast pad. The reason for this may be due to the departure point being situated where Taxiway J intersects Runway 7R-25L. This condition is deemed to meet design standard as it reduces the erosive effects of jet blast and propeller wash as effectively as a conventional blast pad design. The blast pad on the Runway 25L end has a nonstandard length. The standard blast pad length is 400 feet long, whereas the current length is 200 feet.

Runway 7L-25R

Runway 7L-25R is currently categorized as a D-V runway and has a length of 10,600 feet and width of 150 feet. In the future, Runway 7L-25R will remain as a D-V runway. However, a modification to standard currently is in place that allows the Boeing 747-8, an ADG-VI aircraft, to operate on Runway 7L-25R. Runway 7L-25R meets all applicable design standards.

2.4.2 TAXIWAYS / TAXILANES

A gap analysis was completed for all taxiways / taxilanes at the Airport. Existing dimensions were taken from the latest 2012 conditionally approved Airport Layout Plan. Taxiways / taxilanes were evaluated to determine if they met relevant ADG and TDG design standards. The TDG was used as a basis for the taxiway width, taxiway edge safety margin, and taxiway shoulder width dimensional standards. In some cases, the TDG was also used as a basis for the taxiway / taxilane centerline-to-parallel taxiway / taxilane centerline dimensional standards. All other dimensions are based on the ADG.

The future ADG and TDG for each of the taxiways / taxilanes were identified based on the aircraft that may use the taxiway / taxilane segment. They are listed below and shown in **Figure 4.5**.

- **ADG-VI, TDG-7 (e.g., Airbus A380)** – Taxiways R, Q, U (between Runway 15-33 and R), M (west of R), G (south of K), J, K (west of C), D, and C; Taxilanes T (east of R), U (east of R), and P
- **ADG-VI, TDG-6 (e.g., Boeing 747-8)** – Taxiways Y, S (west of R), T (west of R), U (west of Runway 15-33), M (east of R), W, L, G (between E and K), H, B, E (between K and Runway 7R-

25L), and A; Taxilanes G1, G (between K and E), and E (north of K)

- **ADG-V, TDG-5 (e.g., Boeing 747-400)** – Taxilanes E1, E2, E3
- **ADG-III, TDG-3 (e.g., Boeing 737)** – Taxiways Z, F, E (south of Runway 7R-25L), former Air National Guard, and S (east of R)
- **ADG-I, TDG-1A (e.g., DeHavilland Beaver)** – Taxiway V (west of E); Taxilane V (east of E)

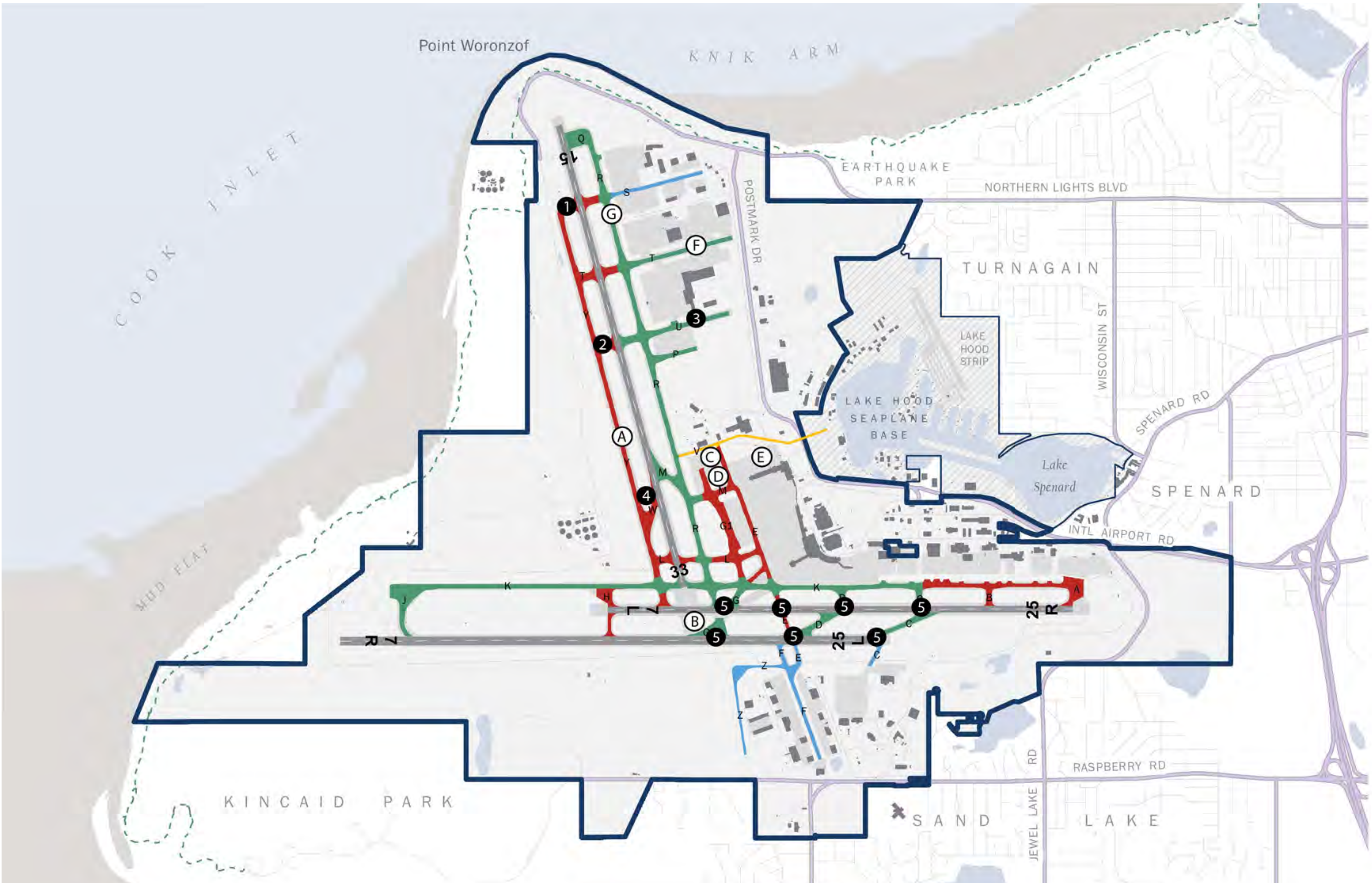
The dimensional standards are summarized in **Table 4.6** for the ADG-VI; TDG-7 (Airbus A380); and ADG-VI, TDG-6 (Boeing 747-8) aircraft. The dimensional standards for the ADG-III, TDG-3 and ADG-I, TDG-1A aircraft are shown in **Table 4.7**.

Table 4.7
Taxiway Dimensional Design Standards for ADG-III, TDG-3 and ADG-I, TDG-1A Aircraft (in feet)

	ADG-III, TDG-3	ADG-I, TDG-1A
Taxiway Width	50	25
Taxiway Shoulder Width	20	10
Taxiway Safety Area Width	118	49
Taxiway Object Free Area Width	186	89
Taxilane Object Free Area Width	162	79
Taxiway / Taxilane Centerline to Parallel Taxiway / Taxilane Centerline Separation	152	70
Taxiway Centerline to Parallel Taxilane Centerline Separation where 180-Degree Turns Between Parallel Taxiways Required	162	70
Taxilane Centerline to Parallel Taxilane Centerline Separation where 180-Degree Turns Between Parallel Taxiways Required	162	70
Taxiway Centerline to Fixed / Movable Object	93	44.5
Taxilane Centerline to Fixed / Movable Object	81	39.5

Source: *FAA Advisory Circular 150 / 5300-13A, Airport Design.*
Notes: ADG = Airplane Design Group, TDG = Taxiway Design Group.

Figure 4.5 Taxiway Designations, Non-Standard Conditions at Planning Activity Level 4, and Current Modification of Standards



Design Standard Requirements

- ADG-I, TDG 1A Taxiway/Taxilane
- ADG-III, TDG 3 Taxiway/Taxilane
- ADG-VI, TDG 6 Taxiway/Taxilane
- ADG-VI, TDG 7 Taxiway/Taxilane

Taxiway/Taxilane Non Standard Conditions

1. Taxiway S Shoulder width
2. Taxiway U (west of Rwy 15-33) Shoulder width
3. Taxilane U (east of Twy R) Centerline to Fixed/Movable Object and Object Free Area
4. Taxilane W Shoulder width
5. Acute angled taxiway/runway intersections

Current Modification of Standards

- (A) Taxiway Y OFA
- (B) Taxiway G centerline lights placement
- (C) Taxilane E wingtip clearance to R12 - R14
- (D) Turning radius Taxilane E to R12 - R14
- (E) North Terminal North Taxilane OFA
- (F) Taxiway T Safety Area and OFA
- (G) Taxiway R OFA between T and Q

N W E S

0 2,000 4,000 Feet

Source: HDR, 2014.

Page intentionally left blank

It should be noted that the Airport does have in place three modifications of standards for the Boeing 747-8 to operate in essential non-standard taxiway / taxilane areas:

- The Taxiway R ADG-VI Object-Free Area (OFA) distance between Taxiway T and Taxiway Q is reduced, resulting in a height restriction on the tug road. Taxiway T does not meet ADG-VI standards, but ADG-VI aircraft such as the Airbus A380 may use it with an approved modification to standard based on guidance provided in *FAA Engineering Brief No. 63B, Taxiways for Airbus A380 Taxiing Operations*.
- The Taxilane E OFA is reduced to allow the Boeing 747-8 to operate on Taxilane E while aircraft are parked at R12, R13, and R14.
- The turning radii for R12, R13, and R14 parking positions are non-standard but the modification of standard allows for ADG-VI aircraft to continue to park at these positions.

Upgrades are required to bring all areas up to standard. They are listed below by ADG and TDG.

- **ADG-VI, TDG-7 (e.g., Airbus A380)** – Taxilane U (east of Taxiway R)
  - **Taxilane U** – Taxilane centerline distance to the aircraft parking positions (south) and the vehicle service road (north) needs to be addressed to increase the taxiway centerline-to-fixed / movable object standard distance from 153 feet to 167 feet and meet ADG-VI standards. The OFA also needs to be increased to 334 feet to meet TDG-7 standards.
- **ADG-VI, TDG-6 (e.g., Boeing 747-8)** – Taxiways S (west of R), U (west of Runway 15-33), and W
  - **Taxiway S** – The taxiway shoulder is currently 23 feet wide and needs to be increased to 30 feet wide to meet TDG-6 standards
  - **Taxiway U** – The taxiway shoulder is currently 23 feet wide and needs to be increased to 30 feet wide to meet TDG-6 standards.
  - **Taxiway W** – The taxiway shoulder is currently 23 feet wide and needs to be increased to 30 feet wide to meet TDG-6 standards.

2.5 AIRFIELD SAFETY

Airfield safety was evaluated to determine upgrades and actions required to meet standards and mitigate FAA-identified hot spots. Airfield facilities that no longer meet FAA airfield design criteria that are evaluated include the acute angle taxiways between Runways 7R-25L and 7L-25R. There is one FAA-identified hot spot at the Airport located at the intersection of Taxiways G, E, G1, and K.

2.5.1 FAA STANDARDS AND AIRFIELD GEOMETRY

There are five existing acute angle taxiways (G, R, E, D, and C) that lead from Runway 7R-25L directly to Runway 7L-25R. Taxiway F and the former Air National Guard Taxiway also exhibit acute angle intersections with Runway 7R-25L. The new standards contained in AC 150 / 5300-13A prohibit acute angle taxiways directly linking two runways. These non-standard taxiway intersections are depicted in **Figure 4.5**. The FAA no longer permits acute angle taxiway directly connecting two runways for two reasons:

1. Acute angle taxiways are designed to enable arriving aircraft to exit the runway at a higher rate of speed. Aircraft taxiing at a high rate of speed are less likely to be able to stop prior to crossing a hold-bar and entering the adjacent runway where another aircraft may be landing or taking off and traveling at a high rate of speed.
2. Pilots in an aircraft on an acute angle taxiway will have limited visibility of the runway they are crossing due to the relative angle of the airplane. Lack of visibility may reduce pilot situational awareness, making it difficult to see traffic on the runway the pilot is preparing to cross.

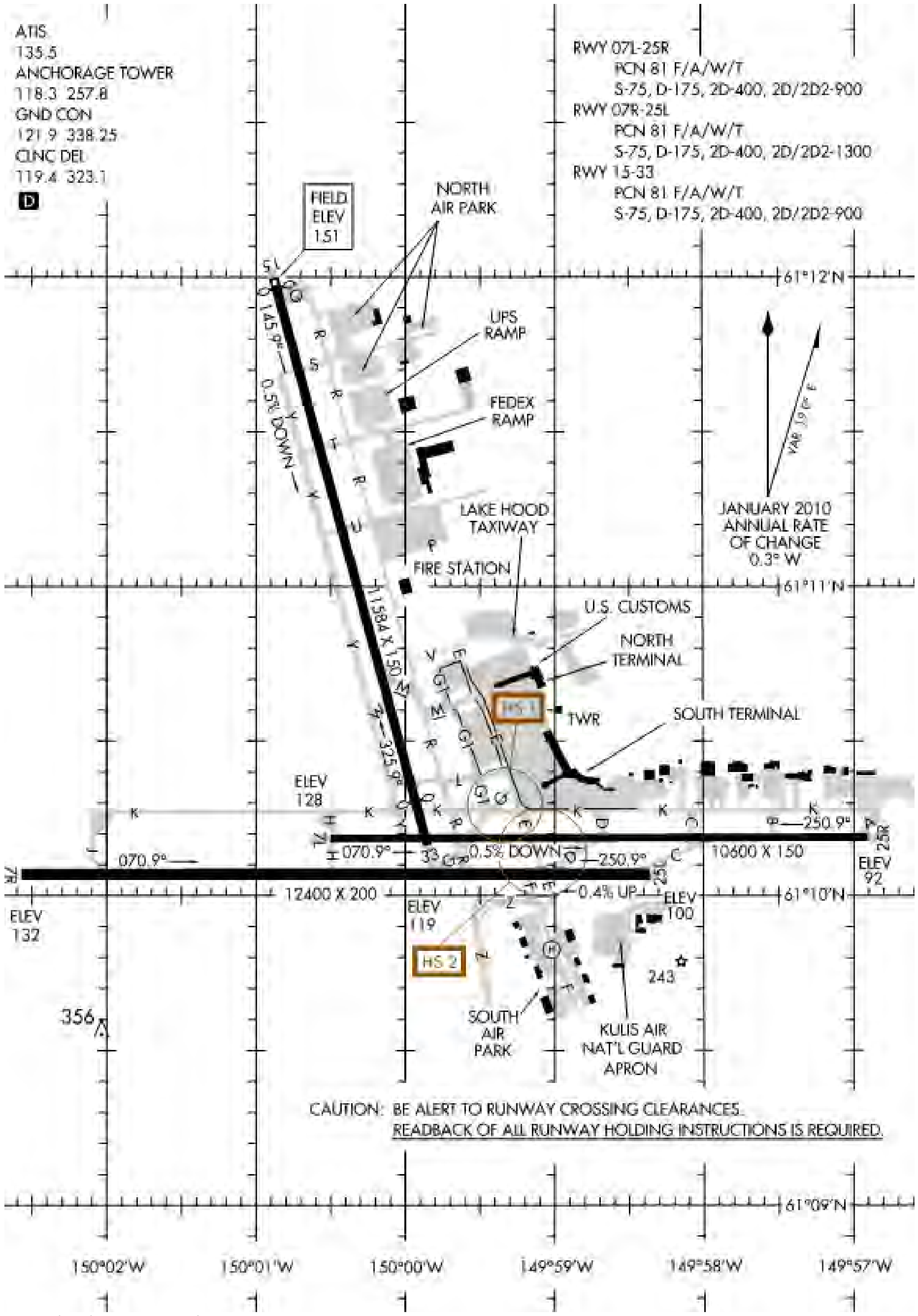
FAA standards contained in AC 150 / 5300-13A now require perpendicular runway-taxiway intersections to increase pilot situational awareness near the runway-taxiway interface unless the acute angle taxiways lead to a parallel taxiway.

2.5.2 HOT SPOTS

The FAA defines hot spots as locations on an airport movement area with a history of potential risk of collision or runway incursion, and where heightened attention by pilots and drivers is necessary. Hot Spot 1 and Hot Spot 2 are shown in **Figure 4.6**. Hot Spot 1, located at the intersection of Taxiways G, E, G1, and K, is a four-node design at which an aircraft can taxi in four different directions from that intersection. FAA standards prohibit intersections with more than three nodes. Reconfiguration of this taxiway intersection to comply with airport design standards may result in the resolution and removal of Hot Spot 1.

Hot Spot 2 is located along Taxiway E between Runway 7L-25R and Runway 7R-25L. At this location, there is potential for pilots to confuse hold short instructions for Runway 7L-25R and Runway 7R-25L when taxiing to Taxiway K via Taxiway E or Taxiway F. Additionally, Taxiway D signage may not be visible from Taxiway E and Taxiway F hold positions. Reconfiguration of these taxiways to comply with airport design standards may result in the resolution and removal of Hot Spot 2.

Figure 4.6
Location of Hot Spots 1 and 2



Source: Federal Aviation Administration, 2014.

2.6 OTHER AIRFIELD REQUIREMENTS

2.6.1 GROUND RUN-UP AREAS

The Airport has two designated ground run-up areas—Taxiway Q and Taxiway J. Both are sufficient to meet the needs of the Airport throughout the planning horizon and they also minimize noise impacts to the community. However, it may become preferable to construct a ground run-up enclosure during the planning horizon that would be more effective in mitigating noise during aircraft maintenance activities that entail engine run-ups. Potential locations around the Airport were identified as part of the alternatives development task to determine the most viable location if and when it becomes necessary.

2.6.2 APRON AREAS

Future aircraft parking and apron area requirements, including holding areas or remain overnight (RON) parking positions, are documented within the following sections pertaining to the terminal, cargo, and general aviation areas.

2.7 AIRFIELD REQUIREMENTS / RECOMMENDATIONS SUMMARY

Based on the various airfield analyses completed, it is recommended that design standard deficiencies be addressed along with safety enhancements. For example, the realignment of Taxiways G, D, and C between Runway 7R-25L and Runway 7L-25R to be perpendicular to the runways would meet current FAA design standards. Further, airfield Hot Spot 1 at the intersection of Taxiways G, E, G1, and K may be resolved with the removal of the segment of Taxiway G between Taxiway K and Taxiway E. Hot Spot 2 may be resolved with the realignment of Taxiway E between Taxiway Z and Taxiway K and / or the reconfiguration of Taxiway D.

Airfield capacity and efficiency enhancements will likely be needed to address increased delays that become untenable by PAL 4 under various runway use configurations and flight conditions. This may involve the construction of a new north / south runway as currently shown on the Airport Layout Plan. Should a new north / south runway be constructed, secure access to the west side of the Airport would need to be explored. Previous plans considered the construction of a roadway tunnel underneath Runway 15-33 or rerouting the service road around the existing and new runway. Options to increase capacity and improve airfield efficiency were explored and documented in **Chapter 5**, Alternatives Development and Evaluation.

Finally, it is recommended that the siting and feasibility of a ground run-up enclosure be explored to minimize noise impacts to the surrounding community. Other related recommendations pertain to: 1) airfield security issues, particularly in the East Airpark, which are addressed in **Section 7.3**; 2) aircraft apron requirements, which are addressed in **Section 3.1** (terminal), **Section 5.4** (cargo), and **Section 6.4** (general aviation); and 3) siting of a new FAA Airport Traffic Control Tower, which is addressed in **Section 7.1**.

SECTION 3
TERMINAL REQUIREMENTS

The Ted Stevens Anchorage International Airport (Airport) passenger terminal area is comprised of the North and South terminal buildings. The South Terminal serves the A Concourse, B Concourse, and C Concourse. The South Terminal is connected to the North Terminal via a weather-protected, enclosed, connector corridor that extends from the north side of the C Concourse to the south side of the North Terminal baggage claim area. As shown in **Figure 4.7**, the terminal area is bordered by taxiways on the north, west, and south sides, and by parking areas and roadway infrastructure to the east.

Figure 4.7
Terminal Area

Source: RS&H and HDR, 2014.

The passenger terminal facility requirements to meet forecast demand are presented within this section. This includes the number of aircraft gates / parking positions, and the terminal space requirements. Note that these requirements are based on the anticipated needs throughout the planning horizon—these requirements should not be taken as hard limits if additional needs arise.

3.1 GATE REQUIREMENTS

Aircraft gate and parking position requirements were determined for the terminal building complex and the parking positions on the airfield.

3.1.1 GATED DESIGN DAY FLIGHT SCHEDULES

Gate requirements for the Ted Stevens Anchorage International Airport Master Plan Update (Master Plan Update) were determined using gated design day flight schedules developed by the Alaska International Airport System (AIAS) Planning Study team as part of the *2013 Alaska International Airport System (AIAS) Forecast Technical Report* (AIAS Forecast). The AIAS Forecast gated design day schedules include the 2011 baseline year, Planning Activity Level (PAL) 2, and PAL 4.

The gated design day flight schedules include all forecast scheduled flights occurring on the 24-hour design day. For each scheduled flight, information is shown pertaining to the operational category (e.g., passenger, cargo, general aviation, or military), gate / parking position assignments, arrival and departure times, origin / destination cities, airline or carrier, aircraft type, and number of enplaning / deplaning or originating / terminating passengers.

The design day reflects a representative day for 2011 and an average weekday for 2020 and 2030 during the peak month of July. Although July is the Airport peak activity month, general aviation activity actually peaks in June, and heavy / large aircraft operations such as cargo peak in October. The latter part of the week also tends to be busier than the earlier part of the week.

3.1.2 GATE / ADDITIONAL PARKING POSITION CAPACITY AND USAGE

Prior to determining the gate requirements, an inventory of the existing gates and parking positions at the North and South terminals was completed. For documentation purposes, the term "gate" is used to represent gates at the terminal building with or without jet bridges (a boarding gate holdroom and its associated adjacent aircraft parking position). There are additional marked parking positions associated with the lower level A gates and L gates.

The existing gate and parking position capacities at the North and South terminals are shown in **Table 4.8**. Combined, the North Terminal and South Terminal have a total of 29 gates and an additional nine marked parking positions. It is important to note, however, that not all of these parking positions are used for passenger operations. The North Terminal gates are shared with cargo operators.

Mainline carrier gates include three gates in the North Terminal (Gates N4, N6, and N8) and one additional marked parking position (the holdroom for Gate N2 was repurposed to accommodate the international passenger corridor and processing area), and all 17 gates in the B and C Concourses in the South Terminal, for a total of 20 gates and one additional marked parking position. It is not typical for mainline carrier aircraft (larger jets requiring passenger boarding bridges or air stairs) to be loaded / unloaded using different gates and parking positions. Therefore, this additional aircraft parking position was not factored into the analysis.

Regional carrier gates include nine gates and an additional eight marked parking positions in the A Concourse at the lower level A and L gates in the South Terminal. It is common practice to use different gates and parking positions to load / unload aircraft, unlike mainline carrier aircraft. Therefore, the combined 17 gate / parking position count for regional carriers was used in the analysis.

Table 4.8
Existing Terminal Gate and Parking Position Count[1]

	Gates	Additional Marked Parking Positions
Mainline Carrier		
North Terminal	3	1
South Terminal – B Concourse	8	-
South Terminal – C Concourse	9	-
Subtotal	20	1
Regional Carrier		
South Terminal – A Concourse / Lower Level	9	8
Total (Mainline / Regional Carrier Totals)	29 (20 / 9)	9 (1 / 8)

Source: Airport staff, 2014.
Note:
1 - Four additional gates and parking positions are available at the North Terminal, but these are regularly used for cargo parking.

The airline gate assignments and maximum aircraft sizes that can be accommodated at the South Terminal are shown in **Table 4.9.** The gated design day schedule indicates that only one wide-body aircraft, the Boeing 767-300, is anticipated on the future design day. All other mainline carrier aircraft reflected in the gated design day schedule are narrow-body aircraft such as the Boeing 737 series aircraft. Despite the anticipation of one wide-body aircraft, it is realistic to assume that more gates could be used by wide-body aircraft. Many of the gates are capable of accommodating wide-body aircraft. It is expected that these gates will continue to accommodate wide-body aircraft throughout the planning horizon. The Boeing 767-300 listed in the design day schedule is associated with a scheduled flight to Frankfurt, Germany.

Table 4.9
South Terminal Gate / Position Assignments

Concourse	Gate	Airline Assignments	Max. Aircraft at Gate based on Design Day Flight Schedule[1]
Lower Level "L" Gates	L1	Pen Air	Saab 340
	L2	Grant	BE99
A Concourse Lower Level "A" Gates	A10	Era	B1900
	A11	Common Use	DH8A
	A12	Era	B1900
	A13	Era	DH8A
	A14	Era	B1900
	A15	Era	DH8A
	A16	Era	DH8A
B Concourse	B1	NAC / Frontier	B737-900W
	B3	United / Air Canada	B767-400
	B4	American / Air Canada	B757-300W
	B5	United	B757-300W
	B6	Delta	B767-400
	B7	US Airways	B757-200W
	B8	Delta	A330-300
	B9	Condor / JetBlue	B767-300
C Concourse	C1	Alaska	B737-900
	C2	Alaska	B737-900
	C3	Alaska	B737-900
	C4	Alaska	B737-900
	C5	Alaska	B737-900
	C6	Alaska	B737-900
	C7	Common Use	B737-900
	C8	Common Use	B757-300W
	C9	Common Use	B757-300W[2]

Source: *2013 Alaska International Airport System (AIAS) Planning Study*; Airport staff, 2014.
Notes:
1 - The maximum aircraft accommodated at each gate / parking position is based on maximum aircraft size utilizing a gate / parking position from the gated design day flight schedule.
2 - Boeing 747-400 capable of parking at this position, but impacts C-8 parking position.

It should be noted that in the development of the gated design day schedule, the AIAS Planning Study team allocated all international flights that would have been assigned to the North Terminal to the South Terminal. Similarly, for the gate requirements analysis, international passenger flights were also assigned to the South Terminal. The 2030 (PAL 4) gated design day flight schedule listed four international passenger flights between Anchorage and Vancouver, Canada as well as between Anchorage and Frankfurt, Germany. These flights were assigned to Gates B3, C5, and C7.

To determine gate requirements, the gated design day flight schedule data for 2011, 2020, and 2030 was extrapolated to the years and planning activity levels 2012, 2020 (PAL 2), and 2030 (PAL 4) associated with the Master Plan Update. Gate requirements were determined separately for mainline and regional carriers. For each of the carrier types, gating / position requirements were determined based on an aircraft turns per gate, per day analysis.

3.1.3 AIRCRAFT TURNS PER GATE

The gating requirements analysis was completed based on the number of aircraft turns per gate that are possible during the design day. As previously noted, actual schedules differ and it is likely that an actual gate occupancy schedule will be more efficient because attempts will be made by the air carriers to modify flight schedules to minimize the need for holdover gates / positions. The aircraft turns per gate analysis assumes all mainline and regional carrier gates will be flexible to accommodate all mainline and regional aircraft, respectively.

A planning factor for the number of turns per gate was determined based on the total number of departure flights in the gated design day schedule divided by the number of gates / positions. For mainline carriers, the number of gates / positions used to determine the turns per gate / position were the 17 gates at the South Terminal plus three gates at the North Terminal. In the baseline year (2012), there were 85 departures during the average day of the peak month. This represents approximately 4.3 aircraft turns per gate. As such, the analysis was conducted using 5.0 aircraft turns per gate to determine the future gate requirement. The analysis was also conducted using the 6.0 aircraft turns per gate planning factor for mainline carriers to represent the result if airlines were able to distribute their flight schedules for greater efficiency. For regional carriers in the baseline year (2012), there were 98 departures and 15 gates[2], resulting in a planning factor of 6.5 turns per gate. As such, the analysis was conducted using 6.5 aircraft turns per gate to determine the future gate requirement. The analysis was also conducted using the 8.0 aircraft turns per gate planning factor for regional carriers to represent the result if airlines were able to distribute their flight schedules for greater efficiency. The results of the analysis are shown in **Table 4.10**.

[2] Only 15 gates were used in the gated design day flight schedule from the *2013 Alaska International Airport System (AIAS) Forecast Technical Report*.

Table 4.10
Gate / Position Requirement Summary

	Existing	Baseline[1]	Planning Activity Level 1	2	3	4
Mainline Carrier						
Average Day Peak Month Departures[2]		85	88	94	99	105
Required Gates (5.0 Turns per Gate per Day)	20	17	18	19	20	21
Required Gates (6.0 Turns per Gate per Day)		15	15	16	17	18
Regional Carrier						
Average Day Peak Month Departures[2]		98	108	126	132	139
Required Positions (6.5 Turns per Gate per Day)	17	15	17	20	21	22
Required Positions (8.0 Turns per Gate per Day)		13	14	16	17	18

Source: RS&H, 2014.
Notes:
1 - Baseline 2012 values were interpolated based on the AIAS gated design day flight schedule which used a baseline year of 2011.
2 - The average day peak month arrivals and departures are extrapolated from the 2011, 2020, and 2030 gated design day flight schedules from the *2013 Alaska International Airport System Forecast Technical Report*.

3.1.4 RESULTS

A discussion of the results is presented below.

<u>Mainline Carriers</u>

Based on the gate occupancy schedule analysis, no new mainline gates (international and domestic operations) are needed through PAL 4. This assumes three North Terminal gates are used. As part of the Master Plan Update, the feasibility of demolishing the North Terminal was explored. Should the North Terminal be demolished in the future, up to three replacement gates would need to be added at the South Terminal to achieve a one-for-one replacement.

The forecast of aviation activity anticipates that average day peak month departures increase from 85 to 105 between the baseline year (2012) and PAL 4. In the baseline year, the 85 departures represent approximately 4.3 turns per gate per day. The 105 departures in PAL 4 represent 5.3 turns per gate per day. In order to maintain 5.0 turns per gate per day, a total of at least 21 gates are needed which creates a deficit of one gate. If 6.0 turns per gate per day is achieved, no additional gates would be required. Should the North Terminal be demolished, additional gate capacity would be needed at the South Terminal.

Regional Carriers

The forecast of aviation activity anticipates that average day peak month departures increases from 98 to 139 between the baseline year (2012) and PAL 4. In the baseline year, these 98 departures represent approximately 5.8 turns per gate per day. The 139 departures represent 8.2 turns per gate per day. In order to maintain 6.5 turns per gate per day, a total of at least 22 regional aircraft gates / parking positions are needed, indicating a deficit of five regional gates by PAL 4. Alternatively, if eight turns per gate per day can be achieved, a total of 18 regional gates / parking positions would be required, resulting in a deficit of a single gate. However, because regional carriers typically use aircraft with shorter lengths and wingspans compared to mainline carriers, there may be some flexibility in how these aircraft can be arranged on the apron adjacent to the A Concourse. It should be recognized that the analysis accounts only for aircraft that are parked at the marked parking positions. In actuality, more aircraft may be able to be accommodated on the apron than indicated by the number of marked positions. As passenger activity grows, or during peak times, the need for gates should be re-evaluated in coordination with regional air carriers.

3.2 REGIONAL AND DOMESTIC OPERATIONS REQUIREMENTS

Since the 2002 Master Plan Update, the South Terminal facility, which is used primarily for regional and domestic operations, was renovated and expanded. The C Concourse and the north ticketing lobby were opened in 2004, while renovation and seismic upgrades of the south ticketing lobby and of the A (including lower level L) and B concourses were completed in 2009. These recent renovations and capital improvements contribute to the building's high level of performance and utilization. The mechanical and structural components of the building are expected to provide adequate service throughout the planning horizon.

Facility requirements were determined for the airline areas (ticketing, outbound baggage make-up area, baggage claim lobby and inbound baggage service area, and departure lounge area) and Transportation Security Administration (TSA) areas (security screening checkpoint area, baggage screening / inspection area, and TSA administration areas). Area requirements were not determined for concessions, public space (circulation areas, restrooms), airport administration space, or building systems space. A high-level assessment (e.g., observations and interviews with Airport staff) indicated that these secondary facilities in the South Terminal were deemed to be adequate since they were recently renovated or constructed.

To determine terminal facility requirements for regional and domestic operations, rolling 20-, 30-, and 60-minute passenger data were extrapolated from the gated design day schedule. Specifically, originating and terminating passenger data were used. For originating passengers, the peak hour fluctuated between around 11 p.m. and 12 a.m.

in 2011 (PAL 1), to around 7 p.m. to 8 p.m. in 2020 (PAL 2) and 2030 (PAL 4). For terminating passengers, the peak hour corresponded to generally 8 p.m. to 9 p.m. throughout the planning horizon. Passenger data were adjusted to better reflect realistic times when passengers enter or exit the terminal building, rather than at the scheduled flight departure or arrival times. The passenger Airport arrival and departure times were distributed as shown below.

Distribution of the Time Passengers Arrive at Airport Prior to Scheduled Flight Departure

- More than 120 minutes 15%
- 90 to 120 minutes 35%
- 60 to 90 minutes 33%
- 30 to 60 minutes 15%
- Less than 30 minutes 2%

Distribution of the Time Passengers Leave the Airport After Scheduled Flight Arrival

- Less than 30 minutes 70%
- 30 to 60 minutes 20%
- 60 to 90 minutes 8%
- 90 to 120 minutes 2%

The analysis also accounted for international traffic, since it was included within the gated design day flight schedule for the South Terminal. In the gated design day flight schedules, international traffic comprised several flights occurring between Anchorage, Alaska and Frankfurt, Germany as well as Anchorage, Alaska and Vancouver, Canada. Biweekly flights between Anchorage, Alaska and Reykjavik, Iceland occur during the summer months; however, because the gated design day schedule represents an average day during the peak month, they are not reflected in this schedule. Peak periods for international traffic generally occurred between 12 p.m. and 5 p.m. throughout the planning horizon. These peak hours do not correspond to the peak regional and domestic traffic hour. So while the requirements accounted for international passenger traffic, they do not account for the peak international traffic periods. Peak international traffic periods were, however, accounted for in the determination of the North Terminal facility requirements for international operations **(Section 3.3)**.

Finally, the methodologies used to assess terminal facility requirements, including the use of various planning factors, are contained in the following documents and manuals:

- *Airport Passenger Terminal Planning and Design – Airport Cooperative Research Program Report 25, 2010, Volumes 1 and 2*

- *Checkpoint Design Guide, Revision 3, Transportation Security Administration (TSA), 2011*
- *Federal Aviation Administration (FAA) Advisory Circular (AC) 150 / 5360-13, Planning and Design Guidelines for Airport Terminal Facilities, 1988*
- *Planning Guidelines and Design Standards for Checked Baggage Inspection Systems, Version 3.0, 2009*
- *The Apron and Terminal Building Planning Manual, Parsons, 1975*
- *The International Air Transport Association (IATA) Airport Development Reference Manual, 2009*
- *Airport Technical Design Standards – Passenger Processing Facilities, U.S. Department of Homeland Security, U.S. Customs and Border Protection, August 2009*

Analysis was performed for each of the planning activity levels (2015 – PAL 1, 2020 – PAL 2, 2025 – PAL 3, and 2030 – PAL 4). Requirements for each functional area were estimated using an additional set of planning factors relating to the space required to provide a determined Level of Service as defined by the *International Air Transport Association (IATA) Airport Development Reference Manual* (2009). The manual refers to quantitative standards established by IATA that correspond to the stability of passenger flows, levels of delay, and levels of passenger comfort.

In this analysis, the space requirements to provide a Level of Service C during the peak hour were estimated. According to IATA, a Level of Service C will provide good service with "stable flows, acceptable delays, and good levels of comfort" during peak times. Additionally, by planning to provide a Level of Service C during the peak hour, a Level of Service C or greater can be assured when passenger loads are less than peak. The areas indicated are the minimum net square footage requirements, and may be exceeded in the final recommended plan due to other considerations, including architectural design and tenant needs.

3.2.1 AIRLINE AREA

The airlines are typically the primary tenants of the terminal due to their role in the care and processing of passengers transitioning between ground and air transportation modes. In many ways, the services airlines provide to their passengers reflect directly on the Airport and the community it serves. These include passenger ticketing, outbound baggage processing, inbound baggage processing, and passenger holdroom services.

Regional and Domestic Airline Ticketing Area

Future airline ticketing area requirements are summarized in **Table 4.11** and described below. Requirements were determined for the number of ticketing stations (kiosks and counters), ticket counter length, ticket counter area, ticket counter active area, ticket counter queuing, and ticket offices / administration areas. The requirements were determined separately for each commercial airline and then summed for a total requirement. Data for regional carriers were combined in the determination of ticketing area requirements.

Table 4.11
Regional and Domestic Operations - Airline Ticketing Area Requirements

		Planning Activity Level			
	Existing	1	2	3	4
Peak Hour Originating Passengers		693	706	718	730
Peak 30-Minute Originating Passengers		365	367	373	379
Number of Stations					
Kiosk (Self-Service) – Online Boarding Pass / No Checked Bags		10	11	11	11
Kiosk – Online Boarding Pass and Checked Bags		30	35	36	38
Full Service Conventional Check-In Counter with Checked Bags		31	35	36	37
Total Number of Stations	111	71	81	83	86
Full-Service Counter Length (linear feet)[1]	465	215	245	250	260
Area Requirements (square feet)					
Kiosk (Self-Service) – Online Boarding Pass / No Checked Bags		240	265	265	265
Kiosk – Online Boarding Pass and Checked Bags		1,350	1,575	1,620	1,710
Full Service Conventional Check-In Counter with Checked Bags[2]		10,050	11,370	11,680	12,010
Total Airline Ticketing Area (square feet)	15,648	11,640	13,210	13,565	13,985

Source: RS&H, 2014.
Notes: Numbers may not add exactly, due to rounding.
1 - The existing full-service counter length excludes frontage for self-service kiosks.
2 - The full-service conventional check-in counter with checked bag area includes the sum of the ticket counter area, ticket counter active area, ticket counter queuing area, and ticket offices and administration areas.

Passengers today are presented with a variety of ways to obtain their boarding passes and check baggage. For each method, listed below, the share of passengers using the method and the average processing rates are shown. The average processing time is 135 seconds (2.25 minutes) per passenger.

- **At Home – Online Boarding Pass / No Checked Bags** – 12%, negligible processing time
- **At Airport Kiosk – Online Boarding Pass / No Checked Bags** – 8%, 100 seconds per passenger
- **At Home – Online Boarding Pass / Checked Bags** – 15%, 108 seconds per passenger
- **At Airport Kiosk – Online Boarding Pass / Checked Bags** – 30%, 138 seconds per passenger
- **Full Service Conventional Check-in with Checked Bags** – 35%, 195 seconds per passenger (includes a scale)

Passenger Ticketing and Baggage Check-in Stations

Passenger ticketing and baggage check-in stations include both kiosks and conventional counters. Kiosk stations can either be self-service, where the passenger retrieves his or her own boarding pass, or it can be agent assisted, where the ticket agent assists primarily with any checked baggage the passenger has. Other passengers may prefer the conventional full-service ticket counters, typically located at the back counter of the ticketing area, where the passenger stands in a queue to have an agent issue his or her boarding pass and check-in baggage.

Today, the Airport has a total of 111 passenger / baggage check-in stations. Future station requirements were determined based on the passenger processing rates and share of passengers using kiosks versus counter areas as previously described. Through PAL 4, a total of 86 stations are required to accommodate passenger demands. The existing capacity is adequate to accommodate regional and domestic passenger demand throughout the planning horizon. However, should international traffic from the North Terminal be moved to the South Terminal, the overall ticketing area may need to expand unless common use ticketing technology is implemented to increase processing rates, or other creative layout methods are used to increase overall space usage. Detailed space usage analysis, as well as a passenger survey to identify passenger preferences, is recommended following the Master Plan Update.

Ticket Counter Length

Ticket counters are used to check in passengers and baggage, as well as to sell tickets. These are typically located near the entrance to the terminal building. Full-service conventional ticket counters are normally placed in a straight line that runs parallel to the entrance doors and are staffed by airline ticket agents. The ticket counter frontage planned for is 7 linear feet. The existing counter frontage today is approximately 9.5 feet. With regard to full-service conventional ticket counters, arranged linearly, by PAL 4, approximately 260 feet of linear counter is required. However, if none of the existing ticket counters are reconfigured, and a 9.5-foot-wide counter is retained, the PAL 4 requirement would increase to 350 feet. The existing frontage of 465 feet, which excludes the frontage for kiosks, is adequate throughout the planning horizon.

Ticketing Area

Within the Airport South Terminal, which is currently used for regional and domestic operations, Alaska Airlines, Delta, and US Airways are currently the only airlines that utilize electronic kiosks year-round. Each airline arranges their kiosk layout slightly differently. However, for planning purposes, ticketing area requirements were determined based on a kiosk with a frontage of 3 feet and a depth, including queue area, of 8 feet for kiosks used to obtain boarding passes only, and of 15 feet for stand-alone kiosks equipped with bag drop areas where passengers can check baggage with assistance from an agent. In these cases, for future planning purposes, it is assumed that two kiosks would share one bag drop belt.

For full-service ticketing and baggage check, the area requirement comprises the sum of the ticket counter area, ticket counter active area, and the ticket counter queuing area.

The ticket counter area includes the counter itself and the area extending to the back wall with a depth of approximately 10 feet, or 10 square feet per linear feet of ticket counter. This area allows for circulation of airline ticket agents behind the counters and provides conveyor access to the outbound baggage system. The counter area requirement considers counters with a frontage of 7 feet and an area of 10 square feet per linear foot of ticket counter frontage.

The ticket counter active area is the space between the front of the ticket counters and the ticket counter queuing, where passengers stand to check in and circulate between the queuing area and the ticket counters. This area represents 11 square feet per linear foot of ticket counter frontage.

Typically, check-in queues are located between the entrance doors and the check-in area. Sufficient open area should be provided in front of the check-in counters and kiosks so that the longest queue to be reasonably expected during a peak period can be accommodated without blocking circulation to other areas of the terminal. This ticket counter queuing area represents 25 square feet per linear foot of ticket counter frontage.

The total airline ticketing area requirement includes the area used for kiosks, full-service conventional counters, and airline ticketing offices.

The area used for airline offices are traditionally located behind the check-in counter back wall. The offices are used primarily by airline ticket agents as a work space, but may also include the airline manager's office and other functions such as a baggage service office. This area represents 30 square feet per linear foot of ticket counter frontage.

The total area requirement by PAL 4 reaches approximately 14,000 square feet. With an existing ticketing area of approximately 15,650 square feet, the facilities are adequate to serve regional and domestic passenger demand levels throughout the planning horizon. However, as previously mentioned, should international traffic be moved to the South Terminal, the ticketing area may need to be expanded. Further studies are recommended to determine detailed building space impacts of consolidating international operations from the North Terminal with regional and domestic operations in the South Terminal.

Regional and Domestic Outbound Baggage Make-up Area

The baggage make-up area in the South Terminal is the space in which airline personnel assemble checked-in baggage for outbound flights following the baggage security screening process by TSA personnel. This make-up area includes the make-up units, baggage cart staging area, and baggage cart circulation area or maneuvering lanes.

Calculated baggage make-up area requirements are shown in **Table 4.12**. Requirements were determined in consideration of the aircraft fleet (by equivalent aircraft) and industry standard planning factors for the number of staged baggage carts per equivalent aircraft, staging and make-up unit area per baggage cart, and baggage cart circulation area.

Table 4.12
Regional and Domestic Operations – Outbound Baggage Make-up Area Requirements

		Planning Activity Level			
	Existing	1	2	3	4
Equivalent Aircraft (EQA)		27	31	34	36
B Concourse		5	5	5	5
C Concourse		14	17	18	18
Regional Gates		7	10	11	13
Staged Carts per Container per EQA		66	79	85	90
Area Required per Cart (square feet)		39,810	47,580	50,785	54,210
Baggage Make-up Area (includes 10% circulation allowance; square feet)	47,172	43,790	52,340	55,865	59,630

Source: RS&H, 2014.
Note: Numbers may not add exactly, due to rounding.

Equivalent aircraft (EQA) is an industry standard way to look at the capacity of a gate and is used as a technique to help size terminal facilities. An EQA is determined by first multiplying the total number of gated aircraft during the peak hour of the average day of the peak month, as indicated in the gated design day flight schedule for the Airport, by an EQA index. The calculation is completed for each airplane design group and the values are then summed for a total EQA. The EQA index is an industry standard planning factor that equates 145 aircraft seats to one (1.0) EQA. As documented in *Airport Cooperative Research Program (ACRP) Report 25, Airport Passenger Terminal Planning and Design* (ACRP Report 25), a 1.0 EQA represents an Airplane Design Group (ADG)-III narrow-body jet (e.g., Boeing 737). Larger aircraft with more seats are represented by an EQA index value higher than 1.0 and smaller aircraft with fewer seats are represented by an EQA index value lower than 1.0. The calculated EQA represents baggage cart staging needs only during the peak hour. However, because passengers arrive at an airport typically 2 to 4 hours prior to the flight, the EQA is typically increased by 33% to account for early baggage storage needs. The total EQA at the Airport today is 23. This EQA increases to 36 by PAL 4. The EQA for the B Concourse, C Concourse, and Regional Gates (lower level "A" and "L" Gates) are shown in **Table 4.12**.

ACRP Report 25 reports an industry standard planning factor of 2.5 staged baggage carts per EQA (145 seats) and 600 square feet of space per baggage cart. Circulation allowance for baggage carts generally comprises 10% of the baggage make-up area. These planning factors were used to calculate a total baggage make-up area requirement that considers the baggage make-up area (which includes the area where make-up units and baggage cart staging areas are located), and the baggage cart circulation area. The total baggage make-up area today totals 47,172 square feet. By PAL 4, the baggage make-up area requirement is expected to reach 59,630 square feet. Starting as early as PAL 2, additional space will need to be added to the baggage make-up area, totaling up to 12,428 square feet to meet demand through the planning horizon.

In conversations with Airport staff in spring 2013, the B Concourse baggage make-up area was identified as lacking adequate capacity for current operations during peak departure times. The South Terminal's B Concourse baggage make-up unit consists of a single baggage belt used by all airlines. After an on-site examination and interviews with operators, it was determined the unit could accommodate demand if bag handler operations were optimized for greater efficiency.

An operational improvement to help improve the baggage system is to encourage the cooperation and coordination of the operators currently using the belt. An agreement with all the operators to work their staff and positions proactively generated a more flexible application of each operator's assigned spaces. This proactive distribution of staff allowed greater flexibility to handle peak loads. The facility is believed to have performed sufficiently during the summer 2013 peak tourist season.

Through the efficiencies achieved with these operational improvements, the baggage system meets current demand. However, as previously mentioned, additional capacity is needed as early as PAL 2.

Regional and Domestic Baggage Claim Area and Inbound Baggage Service Area

Regional and domestic airline passengers retrieve their checked baggage in the baggage claim lobby. The baggage claim lobby includes the sloped bed or flatbed baggage claim devices, space around the devices where passengers, and sometimes meeters / greeters, wait to retrieve their baggage, as well as an area to house lost baggage services. The inbound baggage service area is located behind the baggage claim area and is not accessible by passengers. The inbound baggage service area is used by airline personnel to offload bags from baggage carts onto baggage claim belts. These belts convey baggage from the inbound baggage service area to the baggage claim lobby, where passengers retrieve their baggage from the baggage claim devices.

Baggage Claim Device Frontage and Area Requirements

Requirements for baggage claim device frontage and the baggage claim area were determined based on the number of terminating passengers during the peak hour on the average day of the peak month. Terminating passenger data were derived from the AIAS Forecast and the gated design day flight schedule. Industry standards used for determining baggage claim facility requirements were derived from ACRP Report 25.

- Baggage claim demand surges as flights arrive. It is estimated that approximately 55% of rolling 60-minute peak hour terminating passengers will collect bags during a 20-minute period within the peak hour. The baggage claim area and device frontage requirements account for this surge in demand within the peak hour.
- Not all terminating passengers have checked baggage to retrieve. It was assumed that 70% of peak 20-minute passengers terminating their trips at the Airport would have checked baggage to retrieve in the baggage claim area.
- The industry standard for baggage claim device frontage is 1.5 linear feet per passenger claiming baggage.
- The industry standard for baggage claim area is 15 square feet per person in the baggage claim area. The baggage claim area is occupied by both passengers claiming bags and their meeters / greeters. Meeters / greeters are estimated as an additional 30% of passengers claiming baggage.

Off-Loading Baggage Belt Frontage and Inbound Baggage Requirements

The inbound baggage area is where airline employees off-load baggage onto baggage belts so the baggage can be conveyed from the non-public, secure portion of the airport to public baggage claim devices. It also includes the off-loading baggage belt frontage as well as baggage cart circulation areas. Industry standards used for determining baggage claim facility requirements were derived subjectively based upon existing utilization and from ACRP Report 25.

- Off-loading baggage belt frontage (linear feet) requirements were determined subjectively based on the existing 1:1 ratio of off-loading baggage belt to baggage claim device frontages.
- The off-loading area is determined by multiplying the off-loading baggage belt frontage by a depth of 20 feet for the off-loading area in front of the off-loading baggage belt frontage.
- The same calculated area was used as the area requirement for the tug bypass (circulation area) and service area.

Requirements

As shown in **Table 4.13**, the total area required to accommodate forecast traffic levels by PAL 4 is a baggage claim device frontage totaling 600 linear feet, a baggage claim area totaling 7,810 square feet, an inbound baggage belt frontage for off-loading baggage of 300 feet, and an inbound baggage service area of 12,100 square feet. Baggage claim and inbound baggage service area facilities are adequate through the planning horizon.

Table 4.13
Regional and Domestic Operations - Baggage Claim Area and Inbound Baggage Service Area Requirements

		Planning Activity Level			
	Existing	1	2	3	4
Peak Hour Terminating Passengers		1,016	1,016	1,027	1,039
Peak 20-Minute Passengers		560	560	565	572
Passengers Claiming Baggage		390	390	395	400
Baggage Claim Area					
Baggage Claim Device Frontage (linear feet)	1,062	585	585	595	600
Baggage Claim Area (square feet)[1]	17,585	7,630	7,630	7,710	7,810
Inbound Baggage Services Area					
Off-Loading Baggage Belt Frontage (linear feet)	298	295	295	300	300
Off-Loading Area (square feet)		5,870	5,860	5,940	6,010
Tug Bypass and Service Area (square feet)		5,870	5,860	5,940	6,010
Total Inbound Baggage Service Area (square feet)	17,160	11,800	11,800	11,900	12,100

Source: RS&H, 2014.
Notes: Numbers may not add exactly, due to rounding.
1 - The existing and calculated future baggage claim area reflects the area used actively by passengers claiming baggage. The displayed area excludes the surrounding circulation area around the baggage claim devices as well as the area occupied by the baggage claim devices.

Regional and Domestic Passenger Departure Lounge Area

The passenger departure lounge or holdroom is the area adjacent to the boarding gate where passengers congregate while waiting to board the aircraft. It includes an airline gate agent counter and an area for passengers to sit and stand. This analysis excludes overall concessions, restrooms, and overall concourse circulation space.

Departing passenger lounges are located within each of the three Concourses.

- **A Concourse** accommodates regional airlines that operate under Federal Aviation Regulation (FAR) Part 135. FAR Part 135 passengers are not subject to security screening and the maximum aircraft is a De Havilland Dash 8-100 (DH8A) with approximately 40 seats. The lower level A Concourse has seven gates. There are two additional "L" gates near the A Concourse.
- **B Concourse** features eight jet gates, each with a jet bridge. Three B Concourse gates accommodate the Boeing 757 series narrow-body aircraft. Five B Concourse gates accommodate the Boeing 767 series and the Airbus A330 wide-body aircraft without impact to adjacent parking positions. However, for the purpose of this analysis and considering impacts to adjacent parking positions, the Boeing 757- and 767-capable gates were classified as "wide-body" to align with industry standard planning metrics, for seven wide-body gates and one narrow-body gate.
- **C Concourse** features nine jet gates, all of which are capable of accommodating narrow-body aircraft. Gates C8 and C9 are capable of accommodating Boeing 757-300W aircraft. Gate C9 is also capable of accommodating aircraft as large as the Boeing 747-400, but it impacts the C-8 parking position. All C Concourse gates feature jet bridges except Gate C8. Passengers boarding aircraft at Gate C8 must walk downstairs to the apron level and be ground loaded.

The South Terminal gate assignments are described in **Table 4.9**. A more detailed description of the existing passenger gates at the Airport is presented in **Chapter 2**, Inventory of Existing Conditions.

Departure lounge size is based largely on the size of aircraft served by the gate and parking position. Average aircraft load factors were calculated for flights departing Anchorage and attributed to the different aircraft types. The calculated average load factors for regional, narrow-body, and wide-body flights are 61%, 82%, and 93%, respectively. These load factors were calculated for each of the years a gated design day flight schedule was developed for the Airport and averaged for each aircraft type.

A peak departure lounge occupation was determined using the peak half-hour departures for each aircraft type. This was necessary to assess the ability for the departure lounge facilities to accommodate the number of departing flights and passengers during peak periods. The departure lounges were deemed "occupied" for a period of one hour prior to departure. Note that the peak times differed for regional, narrow-body, and wide-body operations.

For this analysis, it was assumed that 85% of passengers are sitting and the remaining 15% of passengers are standing. This split is reflective of a Level of Service B facility based on industry standards. As indicated in ACRP Report 25, for a Level of Service B departure lounge, each seated person would need 15 square feet, while each standing person would need 10 square feet.

The number of required departure lounge check-in counters differs depending on the aircraft size. As indicated in ACRP Report 25, a typical single-position check-in counter is 5 feet wide. The depth of the counter and area behind the counter is typically 8 feet deep. A 15-foot-deep area in front of the counter is allocated to allow for queuing. These planning factors were confirmed and set based on actual departure lounge dimensions and check-in counter placement at the Airport.

The deplaning / enplaning hall is the circulation space within the departure lounge used to access the passenger boarding bridge and is planned at 350 square feet per gate based on existing deplaning / enplaning hall space utilization. Overall circulation and structural space are considered 10% and 2%, respectively, of the combined departure lounge, departure check-in counter, and deplaning / enplaning hall area.

The industry standard analysis method is to accommodate each peak hour aircraft at separate gates; however, there are often times when departing aircraft share a single gate and holdroom. This is especially true for regional operations at the Airport where one gate could accommodate multiple aircraft.

The analysis results are presented in **Table 4.14**, **Table 4.15,** and **Table 4.16**. The regional and narrow-body passenger departure lounge requirements of 7,500 square feet and 23,900 square feet, respectively, are adequate throughout the planning horizon. The wide-body passenger departure lounge requirement is 15,500 square feet, which exceeds existing capacity of 11,748 square feet. For wide-body passenger departure lounges, a deficit of 2,150 square feet of space exists in PAL 1, which will grow to 3,750 square feet by PAL 4.

Table 4.14
Regional Passenger Departure Lounge Requirements

	Existing	Planning Activity Level 1	2	3	4
Peak Holdroom Occupation		6	6	6	7
Number of Design Passengers (Total Passengers at Gates)		170	177	203	224
Departure Lounge Seating / Standing Area					
Number of Seated Passengers (85%)		145	151	173	191
Departure Lounge Seating Area (at15 square feet per passenger; square feet)		2,175	2,265	2,595	2,865
Number of Standing Passengers (15%)		26	27	31	34
Departure Lounge Standing Area (at 10 square feet per passenger; square feet)		260	270	310	340
Total Departure Lounge Seating / Standing Area (square feet)		2,435	2,535	2,905	3,205
Departure Lounge Check-in Counters					
Number of Check-in Counter Positions	5	6	6	6	7
Check-in Counter Length (at 5 feet per position; linear feet)		28	29	30	34
Check-in Counter Area (at 8 square feet per linear feet of counter; square feet)		225	231	240	272
Check-in Counter Queuing Area (at 15 square feet per linear feet of counter; square feet)		422	433	450	509
Total Check-in Counter Area (square feet)		650	670	690	790
Deplaning / Enplaning Hall (at 350 square feet per gate)		1,970	2,020	2,100	2,376
Circulation (10% of holdroom, check-in counter, and deplaning / enplaning hall area; square feet)		510	520	540	610
Structure (2% of holdroom, check-in counter, and deplaning / enplaning hall area; square feet)		100	100	110	120
Total Passenger Departure Lounge Area (square feet)	10,781	5,800	6,000	6,800	7,500

Source: RS&H, 2014.
Note: Numbers may not add exactly, due to rounding.

Table 4.15
Domestic Narrow-body Passenger Departure Lounge Requirements

	Existing	Planning Activity Level 1	2	3	4
Peak Holdroom Occupation		10	11	11	11
Number of Design Passengers (Total Passengers at Gates)		1,181	1,288	1,288	1,288
Holdroom Seating / Standing Area					
Number of Sitting Passengers (85%)		1,004	1,095	1,095	1,095
Holdroom Seating Area (at 15 square feet per passenger; square feet)		15,060	16,425	16,425	16,425
Number of Standing Passengers (15%)		178	194	194	194
Holdroom Standing Area (at 10 square feet per passenger; square feet)		1,780	1,940	1,940	1,940
Total Holdroom Area (square feet)		16,840	18,365	18,365	18,365
Holdroom Check-in Counters					
Number of Check-in Counter Positions	10	20	22	22	22
Check-in Counter Length (at 5 feet per position; linear feet)		100	110	110	110
Check-in Counter Area (at 8 square feet per linear feet of counter; square feet)		800	880	880	880
Check-in Counter Queuing Area (at 15 square feet per linear feet of counter; square feet)		1,500	1,650	1,650	1,650
Total Check-in Counter Area (square feet)		2,400	2,530	2,530	2,530
Deplaning / Enplaning Hall (at 350 square feet per gate)		3,530	3,850	3,850	3,850
Circulation (10% of holdroom, check-in counter, and deplaning / enplaning hall area; square feet)		2,270	2,480	2,480	2,480
Structure (2% of holdroom, check-in counter, and deplaning / enplaning hall area; square feet)		450	490	490	490
Total Passenger Departure Lounge (square feet)	27,308	21,900	23,900	23,900	23,900

Source: RS&H, 2014.
Note: Numbers may not add exactly, due to rounding.

Table 4.16
Domestic Wide-body Passenger Departure Lounge Requirements

	Existing	Planning Activity Level			
		1	2	3	4
Peak Holdroom Occupation		5	5	5	5
Number of Design Passengers (Total Passengers at Gates)		746	822	833	833
Holdroom Seating / Standing Area					
Number of Sitting Passengers (85%)		634	699	709	709
Holdroom Seating Area (at 15 square feet per passenger; square feet)		9,510	10,485	10,635	10,635
Number of Standing Passengers (15%)		112	124	125	125
Holdroom Standing Area (at 10 square feet per passenger; square feet)		1,120	1,240	1,250	1,250
Total Holdroom Area (square feet)		10,630	11,725	11,885	11,885
Holdroom Check-in Counters					
Number of Check-in Counter Positions	14	14	15	15	15
Check-in Counter Length (at 5 feet per position; linear feet)		68	75	75	75
Check-in Counter Area (at 8 square feet per linear feet of counter; square feet)		544	600	600	600
Check-in Counter Queuing Area (at 15 square feet per linear feet of counter; square feet)		1,021	1,125	1,125	1,125
Total Check-in Counter Area (square feet)		1,565	1,725	1,725	1,725
Deplaning / Enplaning Hall (at 350 square feet per gate)		1,590	1,750	1,750	1,750
Circulation (10% of holdroom, check-in counter, and deplaning / enplaning hall area; square feet)		1,380	1,520	1,540	1,540
Structure (2% of holdroom, check-in counter, and deplaning / enplaning hall area; square feet)		280	300	310	310
Total Passenger Departure Lounge (square feet)	11,748	13,900	15,300	15,500	15,500

Source: RS&H, 2014.
Note: Numbers may not add exactly, due to rounding.

3.2.2 DOMESTIC TRANSPORTATION SECURITY ADMINISTRATION AREA

Most mainline airline passengers and baggage boarding commercial aircraft must be security screened prior to entering an aircraft. The Airport is one of the few major commercial airports in the United States that also accommodates airlines subject to FAR Part 135. Part 135 airlines and their passengers are not subject to security screening. However, Part 135 aircraft are limited to 30 or fewer seats. All non-Part 135 passengers at the Airport are subject to security screening. Security screening is intended to prevent hijackings and deter the transport of explosive, incendiary, or deadly and dangerous weapons on board commercial aircraft. The TSA, part of the U.S. Department of Homeland Security (DHS), is responsible for all screening activities. TSA areas include passenger security screening checkpoints, baggage screening and inspection facilities, administration offices, and support space.

Domestic Security Screening Checkpoint Area

The Security Screening Checkpoint (SSCP) is an area required, staffed, and regulated by the TSA. Its purpose is to deter and prevent aircraft hijackings and the passage of dangerous or illegal items onto aircraft. In the North Terminal, the SSCP is located on the boarding level between the first floor passenger ticketing and baggage check-in area and the departure lounge area.

In the South Terminal, the passenger security screening checkpoint is located on the departure level adjacent to the South ticketing lobby. All originating passengers departing from the B or C concourses must be screened prior to entering the sterile area. An additional 10% of passenger traffic was included to represent non-passengers, employees, and flight crew accessing the sterile side of the terminal. Regional carrier passengers departing out of the lower level A gates and lower-level L gates are not required to be screened.

Passengers connecting within the B or C concourses are not considered because there is no need for those connecting passengers to exit the sterile area prior to departing on their connecting flight. Passengers departing from the A Concourse are not taken into account because passengers and baggage traveling on regional and charter flights[3] are not screened with the same level of rigor as those departing on scheduled passenger flights. Passengers arriving at the A Concourse and connecting via gates on the B or C concourses are not included in the analysis because of the data limitations. However, those connecting passengers are not expected to represent a significant portion of the peak hour demand.

[3] Certificated under Federal Aviation Regulation Part 135.

SSCP requirements are calculated based on the rolling peak 30-minute originating passenger demand. A peak 30-minute period is the industry standard for computing checkpoint requirements per terminal planning guidelines, as it best captures the surge flow during the peak hour.

Currently, the SSCP at the Airport consists of six positions or lanes. Throughout the planning horizon the requirement is five positions. This determination is based on the assumption that 172 passengers are processed per hour per position. Four secondary inspection positions are used today based on a planning factor of one secondary inspection station per two positions. Throughout the planning horizon, only three secondary inspection positions are required. Two TSA search rooms are used today based on a planning factor of one room per eight lanes. Throughout the planning horizon, only one search room is required. The existing number of inspection lanes, secondary inspection positions, and search rooms is adequate throughout the planning horizon.

The SSCP consists of the following six components:

- Queuing area where passengers queue prior to screening
- Divestiture area where passengers divest of their belongings prior to screening
- Primary inspection area where passengers and their belongings are screened and where passengers retrieve belongings
- Secondary inspection area where selected passengers are subjected to secondary inspection
- TSA search rooms where additional passenger screening may occur
- TSA supervisor station area where supervisory personnel oversee the SSCP area

The planning factor for each SSCP component, as indicated in ACRP Report 25 (for queuing area only) and the *TSA Checkpoint Layout Design Manual (2006)* (for all other planning factors) is as follows:

- **Queuing area** - 12 square feet per peak 30-minute passenger
- **Divestiture area** - 400 square feet per inspection lane
- **Primary inspection area** - 688 square feet per primary inspection position / lane
- **Secondary inspection area** - 688 square feet per secondary inspection position / lane
- **TSA search room(s)** - 48 square feet per search room
- **TSA supervisor station area** - 10% of the total primary and secondary inspection areas

The total screening area requirement throughout the planning horizon is 14,560 square feet. The existing SSCP area is 10,425 square feet. The facility requirements analysis indicates that the SSCP may need to be expanded by approximately 4,135 feet to meet the highest levels of forecasted demand.

Interviews with Airport staff and observations by the Master Plan Update team suggest that the passenger security screening checkpoint becomes congested during peak periods today. During peak times, the queue line overflows the stanchions and designated queue area. The facility requirements analysis indicates that a larger area is needed for passenger queuing. This determination is based on the metric that each passenger occupies 12 square feet. This ratio is in line with industry standards and reflects a higher Level of Service (between B and C) than existing conditions. In total, the passenger security screening checkpoint size should be increased by approximately 4,135 square feet to sufficiently meet demand levels (see **Table 4.17**). This additional space is expected to satisfy the demand through the planning horizon. It should be noted, however, that despite increases in checkpoint size, there is no guarantee that it will be sufficiently staffed by the TSA. TSA staffing has a substantial effect on passenger processing rates and the overall efficiency of the SSCP. An understaffed SSCP may actually require a larger queue area if lines are not manageable within the existing queue area.

Domestic Baggage Screening / Inspection and Administration Areas

After the events of September 11, 2001, the screening of all checked baggage for explosives or other incendiary devices was mandated by Congress. The space required for screening operations includes room for Explosive Trace Detection Units and Checked Baggage Inspection Systems, as well as areas for baggage to be pulled aside for additional inspection.

TSA personnel also typically have training and break rooms in this area. The TSA requires some areas adjacent to the passenger security checkpoint for office space, but the majority of the offices, lockers, break-rooms, and training spaces can be remote from the passenger security checkpoint. They must be within easy walking distance of the checkpoint, but can be located in any area of the terminal.

TSA baggage screening requirements are based on peak hour originating passengers, with each passenger checking 0.9 bags. A TSA surge rate of 1.19 bags is applied and odd-sized or large bags, which get sent straight to Level 3 screening, is subtracted from the total number of checked bags to determine the number of bags processed through Level 1 screening. Baggage is screened via an Explosive Detection System (EDS) unit at a rate of 220 bags per hour. For planning purposes, one extra unit is added to account for peak processing times. The entire area in the Checked Baggage Inspection System (CBIS) is planned at 1,600 square feet per EDS unit. From Level 1 screening, approximately 13% of all bags are alarmed and sent on to Level 2 screening. On-Screen Resolution operations are then required to review the scans of the alarmed baggage. Some bags are then sent to the baggage make-up areas and processed through the baggage encoding station area where the bags are transferred to the flight's sorting area. Other bags are selected for Level 3 screening, where they are screened at the Checked Baggage Resolution Area (CBRA) via Explosive Trace Detection (ETD) units. Each ETD unit can process a bag in about 20 seconds and within an hour, can process up to 180 bags. Finally, a number of maintenance, storage, and administrative rooms are in place to support the baggage screening process.

Table 4.17
Domestic Operations - Passenger Security Screening Checkpoint Area Requirements

		Planning Activity Level			
	Existing	1	2	3	4
Peak Hour Originating Passengers		681	681	681	684
Peak 30-Minute Originating Passengers		363	363	363	363
Crew and Staff Personnel		68	68	68	68
Passenger Security Screening Checkpoint					
Number of Inspection Positions / Lanes Required	6	5	5	5	5
Number of Secondary Inspection Positions	4	3	3	3	3
Number of Search Rooms	2	1	1	1	1
Queuing Area (square feet)	2,820	4,360	4,360	4,360	4,360
Divestiture Area (square feet)		2,000	2,000	2,000	2,000
Primary Inspection Area (square feet)		3,440	3,440	3,440	3,440
Secondary Inspection Area (square feet)		2,065	2,065	2,065	2,065
TSA Inspection Search Rooms (square feet)		50	50	50	50
Supervisor Station Area (square feet)		550	550	550	550
Total Passenger Security Screening Area (square feet)	10,425	14,560	14,560	14,560	14,560

Source: RS&H, 2014.
Note: Numbers may not add exactly, due to rounding.

As illustrated in **Table 4.18**, future projections show the area required for the baggage screening / inspection and administration area to be 18,720 square feet by PAL 4. The existing 24,610 square feet of area for baggage screening and TSA administration area is adequate to accommodate demand through the planning horizon.

Table 4.18
Domestic Operations - Baggage Screening Area Requirements

		Planning Activity Level			
	Existing	1	2	3	4
Peak Hour Originating Passengers		681	681	681	681
Peak Hour Checked Baggage		613	613	613	616
TSA Surge Rate		1.20	1.20	1.20	1.20
Peak Hour Checked Baggage		734	734	734	738
Baggage Screening Area - Level 1					
Total Bags to Process through EDS Units		712	712	712	715
EDS Units		5	5	5	5
Level 1 Baggage Screening Area		8,000	8,000	8,000	8,000
Alarmed Baggage		93	93	93	93
Total Baggage Screening Area – Level 1 (square feet)		8,000	8,000	8,000	8,000
Baggage Screening Area - Level 2					
OSR Area (square feet)		300	300	300	300
Baggage Encoding Station Area (square feet)		3,600	3,600	3,600	3,600
EDS Maintenance / Storage Area (square feet)		400	400	400	400
Total Baggage Screening Area – Level 2 (square feet)		4,300	4,300	4,300	4,300
Baggage Screening Area - Level 3					
CBRA (square feet)		1,230	1,230	1,230	1,230
TSA Staff Support Area (@2x CBRA area; square feet)		2,460	2,460	2,460	2,460
Total Baggage Screening Area – Level 3 (square feet)		3,690	3,690	3,690	3,690
Baggage Inspection Support Facilities					
Conveyor Control Room and IT Area (square feet)		370	370	370	370
Conveyor Maintenance and Storage Area (square feet)		590	590	590	600
Total Baggage Support Area (square feet)		960	960	960	970
Administration and Support Offices					
TSA Agent Breakroom		960	960	960	1,280
Training Room		240	240	240	320
Storage Room		120	120	120	160
Total TSA Administration Area (square feet)	609	1,320	1,320	1,320	1,760
Total Baggage Screening / Inspection and Administration Area (square feet)	24,610	18,270	18,270	18,270	18,720

Source: RS&H, 2014.
Notes: CBRA = Checked Baggage Resolution Area, EDS = Explosive Detection System, IT = Information Technology, TSA = Transportation Security Administration. Numbers may not add exactly, due to rounding.

3.2.3 SUMMARY

Regional and domestic operation requirements were determined for the airline areas (ticketing, outbound baggage make-up area, baggage claim lobby and inbound baggage service area, and departure lounge area) and TSA areas (security screening checkpoint area, baggage screening / inspection, and TSA administration areas). In **Table 4.19** below, a summary of each terminal program space requirement for the South Terminal is listed along with the current space allocation. It should be noted that requirements were not determined for concession, circulation / restroom, airport administration, or building system areas. Of those functional areas where requirements were determined, by PAL 4, the requirement of 173,705 square feet is below the existing capacity of 182,437 square feet by 8,725 square feet. Any potential deficits associated with PAL 4 requirements for concession, circulation / restroom, airport administration, or building system areas are assumed to be resolved by the extra space. Prior to any expansion plans for the South Terminal, which may result from an action to move international traffic from the North Terminal to the South Terminal, advanced planning efforts are recommended to better define the terminal requirements and how, from a design perspective, the future South Terminal could be renovated or expanded to accommodate additional demand.

Table 4.19
Regional and Domestic Operations – Passenger Facility Requirements Summary (in square feet)

		Planning Activity Level			
	Existing	1	2	3	4
Airline Ticketing Area	15,648	11,640	13,210	13,565	13,985
Baggage Make-up Area	47,172	43,790	52,340	55,865	59,630
Baggage Claim Area	17,585	7,630	7,630	7,710	7,810
Inbound Baggage Service Area	17,160	11,800	11,800	11,900	12,100
Departure Lounge Area	49,837	41,600	45,200	46,200	46,900
Passenger Security Screening Checkpoint Area	10,425	14,560	14,560	14,560	14,560
Baggage Screening / Inspection and Administration Area	24,610	18,270	18,270	18,270	18,720
Total Area[1]	182,437	149,290	163,010	168,070	173,705

Source: RS&H, 2014.
Notes: Numbers may not add exactly, due to rounding.
1 - Does not include concession, circulation / restroom, airport administration, or building system areas.

3.3 INTERNATIONAL OPERATIONS REQUIREMENTS

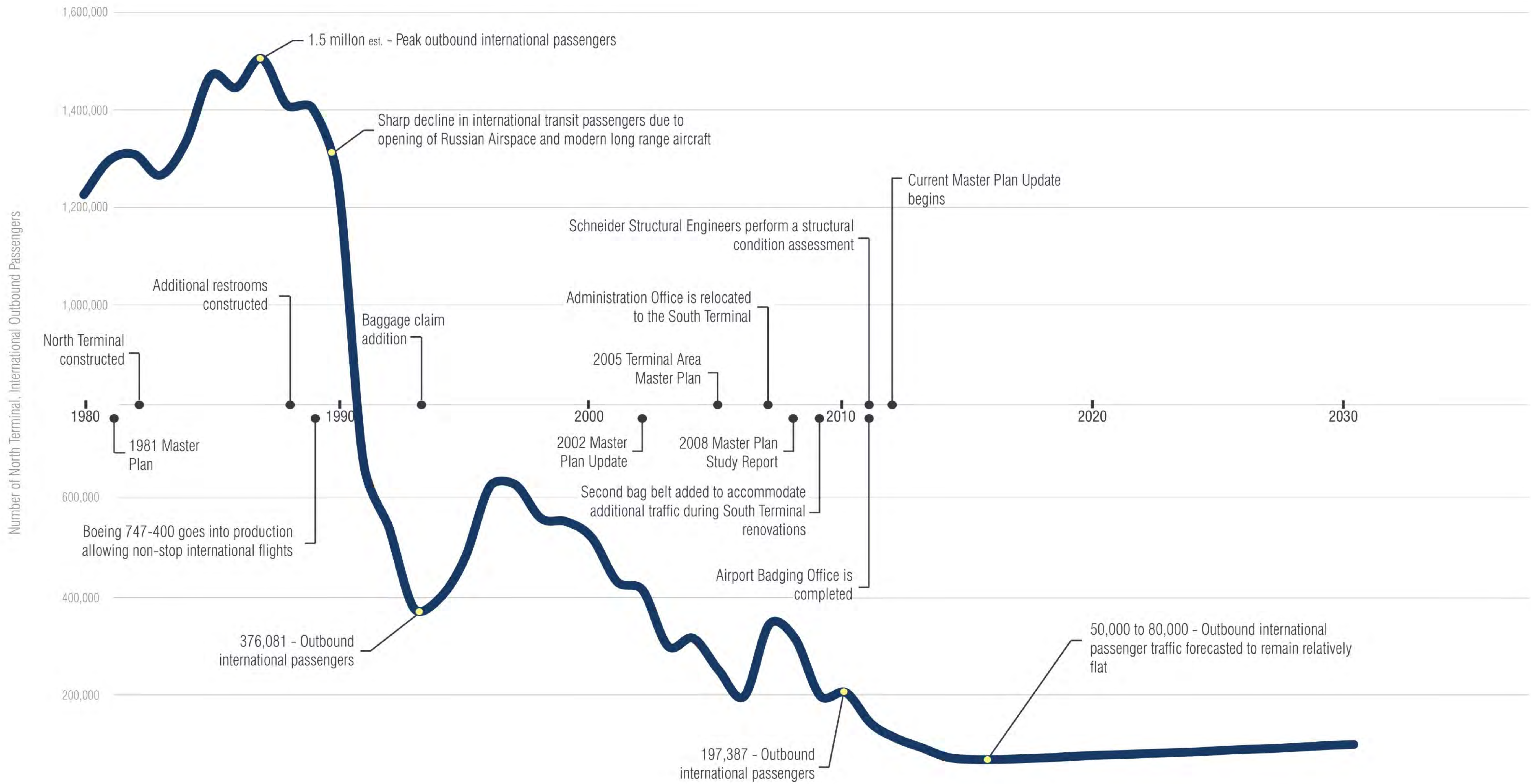
The North Terminal facility, which handles all international arrivals and most international departures, was identified by the Airport as being a major facility needing detailed evaluation concerning its future use. The analysis of the facility included evaluating the building's condition, the types of international operations the facility accommodates, and the functional space needed for those operations.

The North Terminal was built in 1982 in response to a significant increase in international travel through the Airport. At its peak, the building accommodated roughly 1.5 million annual outbound international passengers. After the North Terminal was in service for roughly 10 years, enplanements decreased dramatically in response to the opening of Russian airspace and increased use of new long-range passenger aircraft (namely the Boeing 747-400). As a result of these events, the North Terminal experienced a 90% drop in outbound international passengers by 2012, as reported in the AIAS Forecast. The timeline, shown in **Figure 4.8**, graphically portrays the impact of these events in regard to international outbound traffic. Today, the building sits largely underutilized with an operating expense ratio (OER) well above that of the South Terminal. This trend is expected to continue even though the forecast indicates international traffic will grow at an average of 3% annually through the planning horizon.

The North Terminal is more than 30 years old, and multiple studies have been conducted to evaluate its future structural and mechanical needs. In 2005, the State of Alaska Department of Transportation and Public Facilities completed a survey that inventoried the condition of the building's electrical and mechanical systems, their life expectancy, and their replacement costs. The survey identified components in need of replacement or upgrade. In 2011, a structural evaluation revealed the building was in need of structural strengthening to satisfy the 2009 International Building Code requirements for a design seismic and snow load event. These two reports illustrated the fact that the North Terminal is at the end of its intended service life and would need to be abandoned and demolished, or upgraded and renovated as necessary.

In summary, the building's use has been reduced to its core purpose: processing international passengers. The facility's poor performance, based on OER and utilization, and its need for mechanical and structural upgrades act as trigger points that signal the need to evaluate where international operations should take place in the future. Either the North Terminal must be renovated accordingly to accommodate international operations through the planning horizon, or international operations must be moved to a different facility.

Figure 4.8 Events Affecting International Passengers at Anchorage International Airport



Source: RS&H, 2014.

Page intentionally left blank

3.3.1 TYPES OF INTERNATIONAL FLIGHT OPERATIONS

There are four different types of international flights, and the North Terminal facility currently accommodates three different types of international flight operations. Each operation requires a unique hold room configuration and passenger routing, which is portrayed in **Figure 4.9** and **Figure 4.10**. The Airport's *Compendium of Operational Orders (August 2010*), describes each of these operations and its requirements. Note that Progressive Clearance Operations are now obsolete due to the introduction of long-range aircraft and their ability to deliver passengers directly to their destinations. Below is a summary of each type of operation.

International Arrivals and Departures

International operations include foreign inbound flights terminating in Anchorage, and outbound flights originating in Anchorage (or other U.S. points of origin) and terminating outside the United States. Arriving passengers must be segregated from all other passengers within the terminal until they clear customs, whereas outbound passengers have previously been screened by TSA and can mix with other outbound international and domestic passengers.

In-Transit Operations

In-transit operations consist of flights that originate from and will terminate at other airports. Their stop in Anchorage is typically for fuel or other services. These passengers may not have United States visas, are not entering the country in Anchorage, and must be segregated from all other types of passengers.

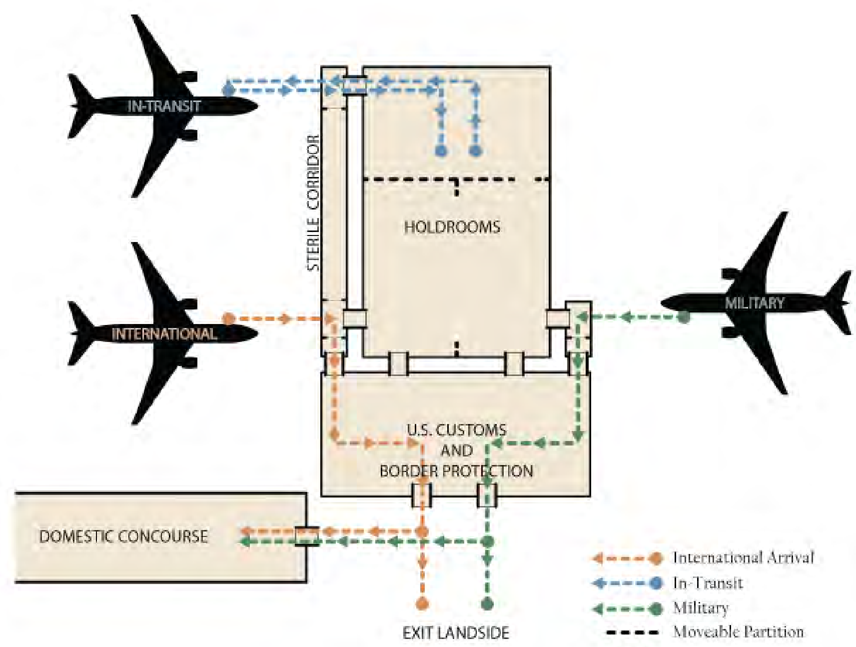
Military Operations

Military operations are required to clear customs upon arrival. These passengers have come into the United States from foreign installations and have not been screened by TSA. Military passengers cannot mix with any other type of passenger.

Progressive Clearance Operations

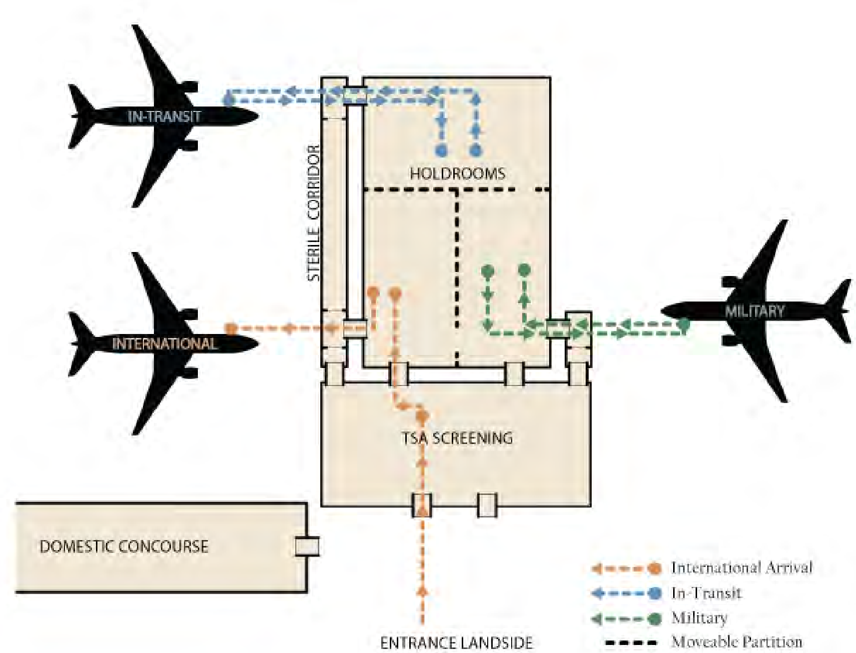
Progressive Clearance Operations no longer occur at the Airport. At one time, these operations included inbound international flights that would continue to another United States destination. Passengers would clear customs in the North Terminal; however, their baggage would stay on the aircraft and will be cleared at their final United States destination.

Figure 4.9
International Operations - Arrivals



Source: RS&H, 2014.

Figure 4.10
International Operations - Departures



Source: RS&H, 2014.

These types of international operations represent the core function of the North Terminal. The requirements to accommodate these operations must be met at and maintained throughout the planning horizon, though not necessarily at the North Terminal. Additionally, the North Terminal is currently required to accommodate all three of the described operations simultaneously.

During discussions with Airport staff, it was determined that the North Terminal is occasionally used by international flights that must divert or make emergency landings. In these instances the Airport, in effect, becomes a refuge for passengers until conditions allow them to continue to their final destination. Like military and other unscheduled operations, these operations can occur anytime. The unscheduled nature of these operations creates instances when three international, Boeing 747-sized aircraft use the terminal simultaneously.

Generally, scenarios such as this are not accounted for when estimating a facility's space requirements. However, the Airport's unique local and global position along the polar route creates a need for additional considerations. The Airport is the State of Alaska's primary United States point of entry, and its role is vitally important to the State's aviation system. The facility's capability to accommodate the occurrence of three international operations simultaneously must continue to exist throughout the planning horizon.

3.3.2 INTERNATIONAL PASSENGER PROGRAM REQUIREMENTS

The North Terminal's international facility is unique in regard to the type of operations it accommodates and its role within the United States and State of Alaska airspace system.

Based upon the considerations previously outlined, the North Terminal's facility requirements were formulated using specific planning factors. The planning factors were established upon the following facts:

- The *Alaska International Airports System (AIAS) 2012 Forecast Study* estimates international traffic to grow at a rate of 3% per year, from 36,874 in year 2015 to 57,908 by 2030.
- Each of the four types of international operations listed in the *Compendium of Operational Orders (August 2010*) requires different programmatic requirements.
    - International operations require every terminal component, including TSA, customs, and all secure (airside) and non-secure (landside) components.
    - In-transit operations require only a holdroom, secure circulation, concessions, and restrooms. These types of operations also account for any international diversion or emergency operation.

  - Military operations require holdrooms, customs, secure circulation, concessions, and restrooms. They also require non-secure circulation and restrooms.
  - Progressive Clearance Operations require holdrooms, customs facilities, secure circulation, concessions, and restrooms. However, these operations are currently not conducted and are thus not a factor.
- The North Terminal's functional areas will potentially need to accommodate one flight of 400 passengers per peak hour through the year 2025 (PAL 3). All operations are designed for a Boeing 747-400 or 777-300 holding roughly 400 passengers during peak times (equating to one wide-body or two narrow-body aircraft).
- Based on an annual projected rate of 3% growth in international traffic, it is estimated that by 2030 (PAL 4), 1.25 international operations will require accommodation within the peak hour. This assumption correlates to a need to plan for and size each functional area to accommodate 1.25 flights, or 500 passengers per peak hour.
- To accommodate the passenger load of three simultaneous international flights, certain functional areas must be larger. As previously discussed, the occurrence of three simultaneous operations is typically generated by In-transit Operations. In-transit passengers never require the use of non-secure areas. For this reason, only the In-transit holdrooms and their related components, such as restrooms, concession spaces, and circulation space, should be sized to accommodate three simultaneous flights of 400 passengers, or a peak hour of 1,200 passengers.

Taking into account these planning factors, the existing capacity of the North Terminal was analyzed, and the future facility requirements estimated. This analysis was based on the operational needs described above, as well as the aviation activity forecast and airport terminal planning guidelines. The methodologies used to assess terminal facility requirements are contained in the following documents and manuals:

- *Airport Passenger Terminal Planning and Design – Airport Cooperative Research Program Report 25, 2010, Volumes 1 and 2*
- *Checkpoint Design Guide, Revision 3, Transportation Security Administration (TSA), 2011*
- *Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5360-13, Planning and Design Guidelines for Airport Terminal Facilities, 1988*
- *Planning Guidelines and Design Standards for Checked Baggage Inspection Systems, Version 3.0, 2009*
- *The Apron and Terminal Building Planning Manual, Parsons, 1975*

- *The International Airport Terminal Association (IATA) Airport Development Reference Manual*, 2009
- *Airport Technical Design Standards – Passenger Processing Facilities, U.S. Department of Homeland Security, U.S. Customs and Border Protection, August 2009*

Analysis was performed for each of the planning activity levels (2015 – PAL 1, 2020 – PAL 2, 2025 – PAL 3, and 2030 – PAL 4). Requirements for each functional area were estimated using an additional set of planning factors relating to the space required to provide a determined Level of Service as defined by the *IATA Airport Development Reference Manual* (2009). Due to unavailable data, requirements for the baseline 2012 year were not determined. The manual refers to quantitative standards established by IATA that correspond to the stability of passenger flows, levels of delay, and levels of passenger comfort.

In this analysis, the space requirements to provide a Level of Service C during the peak hour were estimated. According to IATA, a Level of Service C will provide good service at acceptable levels of cost. Additionally, by planning to provide a Level of Service C during the peak hour, a Level of Service C or greater can be assured when passenger loads are less than peak. The areas indicated are the minimum net square footage requirements, and may be exceeded in the final recommended plan due to other considerations, including architectural design and tenant needs.

3.3.3 AIRLINE AREA

With the exception of the passenger holdroom area, the ticketing, outbound baggage, and inbound baggage areas are typically exclusively used by international operations. Because they are not used by any other type of operation occurring in the North Terminal, their space requirements were calculated based on the planning factor of 400 peak hour passengers in PAL 1, 2 and 3, and 500 peak hour passengers in PAL 4. Passenger holdrooms are used by all international operations and were therefore calculated with a planning factor of 1,200 in PAL 4 due to the operational requirements as previously outlined.

International Airline Ticketing Area

Future international airline ticketing area requirements are summarized in **Table 4.20** and described below. The North Terminal is comprised primarily of full-service, agent-staffed, conventional passenger ticketing and baggage check-in counters as international passengers must physically check in with an airline agent. A breakdown of the requirements determined for these conventional counters includes the ticket counter length, ticket counter area, ticket counter active area, ticket counter queuing, and ticket offices / administration areas.

Table 4.20
International Operations – Airline Ticketing Area Requirements

		Planning Activity Level			
	Existing	1	2	3	4
Peak Hour Passengers		400	400	400	500
Peak 30-Minute Passengers		240	240	240	300
Average Passenger Ticketing Processing Time (minutes)		2.25	2.25	2.25	2.25
Conventional Ticket Counter Positions		18	18	18	23
Conventional Ticket Counter Length (linear feet)		126	126	126	161
Ticket Counter Area (square feet)	4,748	1,260	1,260	1,260	1,610
Ticket Counter Active Area (square feet)	1,586	1,390	1,390	1,390	1,780
Ticket Counter Queuing Area (square feet)	3,162	3,150	3,150	3,150	4,030
Ticket Offices and Administration Area (square feet)	4,340	3,780	3,780	3,780	4,830
Total International Airline Ticketing Area (square feet)	60,572	9,580	9,580	9,580	12,250

Source: RS&H, 2014.
Note: Numbers may not add exactly, due to rounding.

Ticket Counter Length

At Anchorage International, electronic kiosks are not used to process international passengers, as all international passengers are currently required to physically check in for their flight. Full-service, conventional ticket counters are used to process international passengers. Through PAL 3, 18 conventional ticket counters, totaling 126 linear feet, are required. By PAL 4, 23 ticket counters, totaling 161 linear feet, are required.

Ticketing Area

For full-service ticketing, the area requirement comprises the ticket counter area, ticket counter active area, ticket counter queuing area, and ticket offices and administration area.

By PAL 3, 1,260 square feet of ticket counter area is required. This requirement grows to 1,610 square feet by PAL 4.

By PAL 3, 1,390 square feet of ticket counter active area is required. This requirement grows to 1,780 square feet by PAL 4.

By PAL 3, 3,150 square feet of queuing area is required. This requirement grows to 4,030 square feet by PAL 4. It should be noted that circulation areas are not considered part of the queuing area. Circulation areas in the ticketing lobby were determined separately and documented in **Section 3.3.7**.

By PAL 3, 3,780 square feet of ticket office and administration space is required. This requirement grows to 4,830 square feet by PAL 4.

The total ticketing area requirement by PAL 4 is 12,250 square feet.

International Outbound Baggage Make-up Area

The baggage make-up area in the North Terminal for international operations is used only for passenger bags on outbound international flights originating in Anchorage or other United States point of origin and terminating outside the United States. With approximately 500 passengers in the peak hour, two peak airline bank departures are assumed to accommodate these passengers. The resulting baggage make-up requirements are shown in **Table 4.21**. The TSA baggage screening area requirements are included in **Section 3.3.4**.

Through PAL 2, 800 square feet of baggage make-up area is required for one airline bank departure. This requirement doubles to 1,600 square feet by PAL 4.

Table 4.21
International Operations – Outbound Baggage Make-up Area Requirements

		Planning Activity Level			
	Existing	1	2	3	4
Peak Hour Passengers		400	400	400	500
Number of Peak Airline Bank Departure		1	1	2	2
Total Baggage Make-up Area (square feet)	12,143	800	800	1,600	1,600

Source: RS&H, 2014.
Note: Numbers may not add exactly, due to rounding.

International Baggage Claim Area and Inbound Baggage Service Area

In general, international passengers will check more luggage than domestic passengers, which necessitates additional baggage belts and service areas for all international baggage claims. Conversely, international passengers at the Airport have fewer meeters / greeters than domestic passengers, and thus require a smaller than typical area for meeters / greeters.

As shown in **Table 4.22**, the total area required to accommodate forecasted traffic levels in PAL 4 is a baggage claim device measuring 210 linear feet, a 5,800-square-foot baggage claim lobby, and a 4,200-square-foot inbound baggage service area.

Table 4.22
International Operations - Baggage Claim Area and Inbound Baggage Service Area Requirements

		Planning Activity Level			
	Existing	1	2	3	4
Peak Hour Terminating Passengers		400	400	400	500
Peak 20-Minute Passengers		200	200	200	250
Passengers Claiming Baggage		140	140	140	175
Meeter / Greeter		28	28	28	35
Baggage Claimed		127	127	127	159
Baggage Claim Lobby and Service Area					
Baggage Claim Device Frontage Length (linear feet)		170	170	170	210
Baggage Active Area & Passenger Access Area (square feet)		4,200	4,200	4,200	5,250
Baggage Claim Area (square feet)		840	840	840	1,050
Lost Baggage Service Area (square feet)		420	420	420	525
Total Baggage Claim Area (square feet)	11,856	4,700	4,700	4,700	5,800
Inbound Baggage Services Area					
Off-Loading Baggage Belt Frontage (linear feet)		84	84	84	105
Off-Loading Area (square feet)		1,680	1,680	1,680	2,100
Tug Bypass and Service Area (square feet)		1,680	1,680	1,680	2,100
Total Inbound Baggage Service Area (square feet)	4,884	3,400	3,400	3,400	4,200

Source: RS&H, 2014.
Note: Numbers may not add exactly, due to rounding.

International Passenger Departure Lounge Area

Passenger departure lounges include those areas beyond the passenger security checkpoint, located adjacent to departure gates where passengers enplane / deplane, and accessible to passengers awaiting a departing flight. This includes seating / standing area, check-in counter, enplanement / deplanement hall, and circulation and structure space. The departure lounge area excludes concessions space (see **Section 3.3.6**) and restrooms (see **Section 3.3.7**).

Passengers are free to come and go from the departure lounge to use the restrooms and explore concessions, as long as they do not leave the secure side of the terminal. In the North Terminal, some operations necessitate that passengers not mix with passengers from other flights. This requires the use of enclosed departure lounges constructed to segregate different groups of passengers. Up to three flights with 1,200 passengers are anticipated to accommodate all international operations, excluding in-transit operations, during the peak hour for PAL 4.

The industry standard for departure lounge design is 15 square feet for each seated passenger and 10 square feet for each standing passenger. This space accounts for both passenger bags and circulation. Additionally, to accommodate three simultaneous international operations, it is necessary to have three separate departure lounges, each with space for 400 passengers. It is assumed that 85% of the passengers are seated, while 15% are standing, to provide an adequate Level of Service.

Check-in counters are airline ticket counters located in the departure lounge. The check-in counter and queue area are considered at a depth of approximately 10 feet and 25 feet, respectively, of the counter length. Check-in counters are staffed by airline personnel. The deplaning / enplaning hall is the circulation space within the holdroom used to access the passenger boarding bridge and includes the podium used by the airline gate agent to scan enplaning passenger boarding passes. The deplaning / enplaning hall is planned at 350 square feet per gate. Circulation and structural space are considered 10% and 2%, respectively, of the seating / sitting area, check-in counter, and deplaning / enplaning hall area. A reduction in area is applied for common use facilities where resources, equipment, and functional areas are shared among multiple airlines.

The total departure lounge area requirement is approximately 22,700 square feet at PAL 4, as shown in **Table 4.23.** The required PAL 4 departure lounge area would accommodate 1,200 passengers.

Table 4.23
International Operations - Passenger Departure Lounge Requirements

		Planning Activity Level			
	Existing	1	2	3	4
Peak Hour Passengers (Secure)		1,200	1,200	1,200	1,200
Number of Aircraft at Peak Bank		3	3	3	3
Departure Lounge Seating / Standing Area					
Number of Sitting Passengers		1,020	1,020	1,020	1,020
Departure Lounge Seating Area (square feet)		15,300	15,300	15,300	15,300
Number of Standing Passengers		180	180	180	180
Departure Lounge Standing Area (square feet)		1,800	1,800	1,800	1,800
Total Departure Lounge Seating / Standing Area (square feet)		17,100	17,100	17,100	17,100
Departure Lounge Check-in Counters					
Number of Check-in Counter Positions		6	6	6	6
Check-in Counter Length (linear feet)		60	60	60	60
Check-in Counter Area (square feet)		600	600	600	600
Check-in Counter Queuing Area (square feet)		1,500	1,500	1,500	1,500
Total Check-in Counter Area (square feet)		2,100	2,100	2,100	2,100
Deplaning / Enplaning Hall (square feet)		1,050	1,050	1,050	1,050
Circulation (square feet)		2,030	2,030	2,030	2,030
Structure (square feet)		410	410	410	410
Total Departure Lounge Area (square feet)	25,664	22,700	22,700	22,700	22,700

Source: RS&H, 2014.
Note: Numbers may not add exactly, due to rounding.

3.3.4 INTERNATIONAL TRANSPORTATION SECURITY ADMINISTRATION AREA

All passengers and baggage boarding a commercial aircraft must be security screened prior to entering an aircraft. Security screening is intended to prevent hijackings and deter the transport of explosive, incendiary, or deadly and dangerous weapons on board a commercial aircraft. The TSA is responsible for all screening activities. TSA areas include passenger security screening checkpoints, baggage screening and inspection facilities, and administration offices.

Only international operations use the North Terminal TSA areas according to the *Compendium of Operational Orders* (August 2010). For this purpose, a peak hour demand of 400 passengers was used to estimate space requirements for PAL 1 through PAL 3, whereas a peak hour demand of 500 passengers was used for PAL 4.

International Security Screening Checkpoint Area

The SSCP is an area required, staffed, and regulated by the TSA. Its purpose is to deter and prevent aircraft hijackings and the passage of dangerous or illegal items onto aircraft. In the North Terminal, the SSCP is located on the second level between the first floor check-in lobby and the departure lounge area.

Within the security screening area itself, Advanced Imaging Technology (AIT) scanners are used for passenger screening and AIT X-rays are used for carry-on bag screening. The number of required walk-through detector lanes is estimated based on the peak 30-minute enplanements and the origin and destination (O&D) percentage for the Airport. A peak 30-minute period is the industry standard for computing checkpoint requirements per terminal planning guidelines, as it best captures the surge flow during the peak hour. Crew and staff personnel, who comprise approximately 10% of the peak hour passengers and who are required to pass through the SSCP, were included in the SSCP requirements.

Currently, the North Terminal SSCP at the Airport consists of two positions. The majority of the SSCP requirements are determined by applying various planning factors to the positions. The planning factors are shown in **Table 4.24**.

Based on future projections, the space required for the SSCP through PAL 3 is 9,200 square feet, which will accommodate 400 peak hour passengers. As illustrated in **Table 4.24**, by PAL 4, approximately 12,000 square feet will be required to accommodate the estimated 500 peak hour passengers.

Table 4.24
International Operations - Passenger Security Screening Checkpoint Area Requirements

	Existing	Planning Activity Level 1	2	3	4
Peak Hour Passengers		400	400	400	500
Peak 30-Minute Passengers		264	264	264	330
Crew and Staff Personnel		40	40	40	50
Passenger Security Screening Checkpoint					
Number of Inspection Positions / Lanes		3	3	3	4
Number of Secondary Inspection Positions		1	1	1	1
Number of Search Rooms		1	1	1	1
Queuing Area (square feet)		3,170	3,170	3,170	3,960
Divestiture Area (square feet)		1,200	1,200	1,200	1,600
Primary Inspection Area (square feet)		2,064	2,064	2,064	2,752
Secondary Inspection Area (square feet)		2,064	2,064	2,064	2,752
TSA Search Rooms (square feet)		240	240	240	320
Supervisor Station Area (square feet)		413	413	413	550
Total Passenger Security Screening Area (square feet)	3,389	9,200	9,200	9,200	12,000

Source: RS&H, 2014.
Note: Numbers may not add exactly, due to rounding.

International Baggage Screening / Inspection and Administration Areas

As illustrated in **Table 4.25**, future projections show the area required for the baggage screening / inspection and administration area to be 12,590 square feet through PAL 3 and 15,300 square feet by PAL 4.

Table 4.25
International Operations - Baggage Screening Area Requirements

	Existing	Planning Activity Level 1	2	3	4
Peak Hour Passengers		400	400	400	500
Peak Hour Checked Baggage		360	360	360	450
Baggage Screening Area - Level 1					
EDS Units		3	3	3	4
Level 1 Baggage Screening Area		4,800	4,800	4,800	6,400
Alarmed Baggage		47	47	47	59
Total Baggage Screening Area – Level 1 (square feet)		4,800	4,800	4,800	4,800
Baggage Screening Area - Level 2					
OSR Operators		2	2	2	3
OSR Area (square feet)		200	200	200	300
Baggage Encoding Station Area (square feet)		3,600	3,600	3,600	3,600
EDS Maintenance / Storage Area (square feet)		400	400	400	400
Baggage Screening Area – Level 2 (square feet)		4,200	4,200	4,200	4,300
Baggage Screening Area – Level 3					
ETD Units		2	2	2	3
CBRA (square feet)		600	600	600	750
TSA Staff Support Area (square feet)		1,200	1,200	1,200	1,500
Baggage Screening Area – Level 3 (square feet)		1,800	1,800	1,800	2,250
Baggage Inspection Support Facilities					
Conveyor Control Room and IT Area (square feet)		180	180	180	225
Conveyor Maintenance and Storage Area (square feet)		290	290	290	360
Total Baggage Support Area (square feet)		470	470	470	590
Administration and Support Offices					
TSA Agent Breakroom		960	960	960	1,280
Training Room		240	240	240	320
Storage Room		120	120	120	160
Total TSA Administration Area (square feet)		1,320	1,320	1,320	1,760
Total Baggage Screening / Inspection and Administration Area (square feet)	3,657	12,590	12,590	12,590	15,300

Source: RS&H, 2014.
Notes: CBRA = Checked Baggage Area, EDS = Explosive Detection System, ETD = Explosive Trace Detection, IT = Information Technology, OSR = On-screen Resolution, TSA = Transportation System Administration.
Numbers may not add exactly, due to rounding.

3.3.5 CUSTOMS AND BORDER PROTECTION

The North Terminal facility houses the Airport's U.S. Customs and Border Protection (CBP) facilities. CBP's primary role is homeland security through securing the nation's borders. At the Airport, CBP is responsible for securing the international port of entry currently located within the North Terminal. This function is carried out through CBP's Federal Inspection Service (FIS), and is critical to the Airport's ability to accommodate international operations. All passengers arriving in Anchorage from outside the United States must be processed into the country through the FIS.

At the Airport, the FIS area includes a Sterile Corridor System (SCS), primary and secondary passenger processing areas, an international baggage claim, CBP offices, and support and circulation areas. The FIS is used by international and military operations, and was analyzed using the 400 peak hour and 500 peak hour passenger planning factors.

The FIS area facility requirement, per CBP's *Airport Technical Design Standards – Passenger Processing Facilities 2012*, corresponds to the number of peak hour passengers. As shown in **Table 4.26**, the FIS area facility requirement is planned to accommodate forecasted demand of 400 peak hour passengers through PAL 3 and 600 peak hour passengers by PAL 4. The FIS area facility requirement through PAL 3 is 27,600 square feet. The FIS area facility requirement for PAL 4 is 40,000 square feet. However, the FIS area facility requirement may be evaluated by CBP representatives and a smaller FIS area may be considered acceptable.

Table 4.26
International Operations - Customs and Border Protection Area Requirements
(in square feet, except where indicated)

		Planning Activity Level			
	Existing	1	2	3	4
Number of Passengers Processed per Hour		400	400	400	600
Sterile Corridor System and Primary Processing Area (passengers – level 2)		6,269	6,269	6,269	8,909
Secondary Processing Area (baggage – level 1)		336	336	336	3,711
Secondary Operations and Support Area (level 1)		1,102	1,102	1,102	1,166
Offices and Administration Area (level 2)		1,421	1,421	1,421	1,569
International Baggage Claim Area (level 1)		840	840	840	1,050
Circulation Area (level 1 and level 2)		14,600	14,600	14,600	23,600
Total Customs and Border Protection Area (square feet)	39,772	27,600	27,600	27,600	40,000

Source: RS&H, 2014.
Note: Numbers may not add exactly, due to rounding.

3.3.6 INTERNATIONAL CONCESSIONS

Concessions are commercial services and amenities that are provided by merchants or other providers for the convenience of the passengers. Concessions may be permitted through a lease, rental agreement, or other arrangement with an airport operator that allows the service or product provider to offer that amenity on airport property. Concessions can be broken down into general categories of news / gift, food / beverage, specialty retail / duty free, and other concessions (e.g., services, etc.).

Concession space is derived based on annual enplanements. The *2013 Alaska International Airport System (AIAS) Planning Study* (AIAS Planning Study) forecasted 36,874 international enplanements in PAL 1, growing to 57,908 enplanements by PAL 4. As shown in **Table 4.27**, this equates to 1,100 square feet of concessions space needed in PAL 1, increasing to 1,600 square feet by PAL 4. The planning factors used to determine the requirements are as follows:

- Food and Beverage = 0.0067 square feet per annual enplaned passenger
- Offices and Administration = 0.0018 square feet per annual enplaned passenger
- Ground Transportation = 0.0035 square feet per annual enplaned passenger
- Other Revenues = 0.0118 square feet per annual enplaned passenger

Table 4.27
International Operations - Concession Space Requirements
(in square feet, except where indicated)

		Planning Activity Level			
	Existing	1	2	3	4
Number of Annual Enplaned Passengers	31,724	36,874	42,861	49,820	57,908
Concessions					
Food and Beverage	850	300	300	400	400
Offices and Administration Area	850	100	100	100	200
Ground Transportation		200	200	200	300
Other Revenues	15,742	500	600	600	700
Total Concessions Area	17,442	1,100	1,200	1,300	1,600

Source: RS&H, 2014.
Note: Numbers may not add exactly, due to rounding.

3.3.7 INTERNATIONAL PUBLIC SPACE

Public space includes the areas of the terminal not already discussed, including those areas where the general public is free to go, even if they are not ticketed passengers. While these areas include secure passenger areas, they also include areas where the majority of the people who are seeing passengers off on a flight (well-wishers) or people who are waiting for a passenger to arrive on a flight (meeters / greeters), will typically spend most of their time. Primarily, this includes public circulation space and restrooms.

International Public Circulation

International public circulation includes the areas within the terminals and concourses such as halls, lobbies, plazas, stairs, elevators, and escalators that allow passengers, employees, and terminal visitors to travel from one functional area to another. Public circulation is divided into non-secure (landside) circulation and secure (airside) circulation. Secure circulation is that which occurs after one passes through the security checkpoint or any areas that require special badging or keying requirements. Non-secure circulation occurs prior to the checkpoint in areas where the public is allowed to freely travel.

Like concessions space, circulation space is calculated based on the number of annual enplanements. As illustrated in **Table 4.28**, projections show that by PAL 4, 4,500 square feet of public circulation space will be required to accommodate international operations. The planning factors used to determine the requirements are as follows:

- **Airside Circulation** – 0.030 square feet per annual enplaned passenger
- **Landside Circulation** – 0.045 square feet per annual enplaned passenger

Table 4.28
International Operations - Public Circulation Space Requirements
(in square feet, except where indicated)

		Planning Activity Level			
	Existing	1	2	3	4
Number of Annual Enplaned Passengers		36,874	42,861	49,820	57,908
Public Circulation					
Airside Circulation (Secure)		1,200	1,300	1,500	1,800
Landside Circulation (Non-Secure)		1,700	2,000	2,300	2,700
Total Public Circulation Area	64,195	2,900	3,300	3,800	4,500

Source: RS&H, 2014.
Note: Numbers may not add exactly, due to rounding.

Restrooms

Public restrooms must be available on both the non-secure and the secure sides of the terminal. The non-secure restrooms should be centrally located between check-in and baggage claim areas unless the terminal is so large that separate facilities are warranted or when the areas are on different levels.

Numerous planning factors were used when calculating restroom space requirements. Secure side restrooms were calculated assuming the need to accommodate one holdroom completely separated from the other two, so as to maintain the passenger separation required for certain types of operations. Additionally, facilities were accounted for that would be shared between the other holdrooms.

Non-secure, or landside restrooms were planned with space to accommodate the forecasted peak hour passengers, meeters / greeters, and employees and staff. These facilities typically do not endure peak usage periods, such as when an aircraft boards. Instead, they have consistent usage through the day and do not require the additional space that airside restrooms require to accommodate large peaks in usage. Thus, the landside restroom requirement is roughly half of the space needed for airside restrooms.

As illustrated in **Table 4.29**, the total space requirements for restroom facilities account for approximately 5,100 square feet by PAL 4.

Table 4.29
International Operations - Restroom Area Requirements (in square feet)

		Planning Activity Level			
	Existing	1	2	3	4
Landside Restrooms					
Toilet Area		1,200	1,200	1,200	1,350
Family Room Area		100	100	100	100
Janitor Area		120	120	120	120
Total Landside Restroom Area		1,500	1,500	1,500	1,600
Airside Restrooms					
Toilet Area		2,850	2,850	2,850	3,000
Family Room Area		200	200	200	200
Janitor Area		240	240	240	240
Total Airside Restroom Area		3,300	3,300	3,300	3,500
Total Restroom Area	11,969	4,800	4,800	4,800	5,100

Source: RS&H, 2014.
Note: Numbers may not add exactly, due to rounding.

3.3.8 AIRPORT ADMINISTRATION SPACE

Airport administration space includes staff offices, maintenance / storage, police, and other support spaces. Airport administration offices are defined as public use areas, although the majority of passengers rarely take the opportunity to visit these offices. Because they are considered public space, the administrative offices should be accessible to the public. It is practical to have the administration offices within the terminal in order to facilitate the day-to-day operations of Airport staff. Support spaces such as break areas, locker rooms, and dedicated restrooms should also be provided.

Administration space was calculated as 15% of the total square footage making up the terminal building. As shown in **Table 4.30**, future projections show the need for 20,400 square feet by PAL 4.

Table 4.30
International Operations - Airport Administration Area Requirements (in square feet)

		Planning Activity Level			
	Existing	1	2	3	4
Total Functional Building Area		110,000	111,000	112,000	136,000
Total Administration Area	36,055	16,500	16,700	16,800	20,400

Source: RS&H, 2014.
Note: Numbers may not add exactly, due to rounding.

3.3.9 BUILDING SYSTEMS SPACE

Building systems, or utility spaces within an airport terminal, are necessary for the building's operations, and help provide a comfortable environment. Included in this category are mechanical spaces, electrical spaces, and telecommunication spaces.

These spaces are calculated as 10% of the total required square footage of the terminal building. As illustrated in **Table 4.31**, demand projections indicate that 11,000 square feet of space will be needed in PAL 1, and by PAL 4, the requirement will increase to 13,600 square feet.

Table 4.31
International Operations - Building System Requirements (in square feet)

		Planning Activity Level			
	Existing	1	2	3	4
Total Functional Building Area		110,000	111,000	112,000	136,000
Total Building Systems Area	20,145	11,000	11,100	11,200	13,600

Source: RS&H, 2014.
Note: Numbers may not add exactly, due to rounding.

3.3.10 JET BRIDGE ADEQUACY

The North Terminal facility currently has a total of seven passenger boarding bridges, two of which are currently out of service. All passenger boarding bridges used at the North Terminal were designed to accommodate the Boeing 747 series and similar size and type aircraft.

The boarding bridges at Gates N1, N3, N5, and N7 are Wallard fixed bridges. The N1 and N3 bridges are currently out of service. All four bridges are antiquated and are the least flexible of the North Terminal's bridges, as their design and construction are a fixed pedestal type that allows only vertical movements and extension to meet the aircraft door. Due to their age and design, which limits their ability to easily accommodate potential future aircraft, they will require replacement within the planning horizon.

Gates N4, N6, and N8 all have apron drive bridges, which allow them to extend, retract, and reposition. This provides flexibility to accommodate smaller aircraft with lower door sills than the Boeing 747, allowing a greater degree of flexibility for future international aircraft. The bridges at N4, N6, and N8 are in good working condition; however, the bridge at Gate N7 is an antiquated unit retrofitted to move with electric power as opposed to hydraulic. This bridge has reached its service life and will require replacement within the planning horizon.

Overall, the North Terminal has three passenger boarding bridges that are in working condition (those on Gates N4, N6, and N8) and are expected to last through the planning horizon. The other four should be phased out and replaced as they are nearing or have reached the end of their service life.

3.3.11 SUMMARY

International passenger facility requirements are summarized in **Table 4.32**. The program space requirements are listed along with the North Terminal's current space allocation. The analysis projects that a total of 161,350 square feet of space will be needed by PAL 4 to accommodate international passengers. This is more than 150,000 square feet *less than* the total area within the existing international passenger facility.

The North Terminal facility and its ability to accommodate international passenger operations were identified as the Airport's primary challenge for future terminal planning. As such, the functional areas that support international operations were analyzed, and corresponding facility requirements were determined.

Table 4.32
International Operations - Passenger Facility Requirements Summary (in square feet)

		Planning Activity Level			
	Existing	1	2	3	4
Airline Areas[1]	115,119	40,380	41,180	41,980	46,550
Transportation Security Administration [2]	7,046	24,090	24,090	24,090	29,600
Customs and Border Protection	39,772	27,600	27,600	27,600	40,000
Concessions	17,442	1,100	1,200	1,300	1,600
Circulation / Restroom	76,164	7,700	8,100	8,600	9,600
Airport Administration	36,055	16,500	16,700	16,800	20,400
Building Systems	20,145	11,000	11,100	11,200	13,600
Total Terminal Area	311,743	128,370	129,970	131,570	161,350

Source: RS&H, 2014.
Notes: Numbers may not add exactly, due to rounding.
1 - Airline areas include ticketing, baggage make-up, baggage claim lobby, inbound baggage service area, and departure lounge areas.
2 - Transportation Security Administration (TSA) areas include passenger security screening checkpoint, and baggage screening / inspection and TSA administration areas.

The analysis of the North Terminal facility indicates the building has a more than adequate amount of space to accommodate international passenger operations throughout the planning horizon. Additionally, the facility can accommodate three of the four types of operations listed in the *Compendium of Operational Orders* (August 2010) simultaneously, and will be able to continue to do so. Two jet bridges are expected to provide service throughout the planning horizon, and every programmatic element required for international operations is in place and adequate.

However, the facility's age, performance, and condition have been determined to prohibit its ability to provide adequate service throughout the planning horizon. Analysis of prior studies and evaluations of the facility indicate renovation is necessary if the building is expected to serve in its current role through the planning horizon. These factors will drive the evaluation of terminal facility alternatives.

SECTION 4
LANDSIDE REQUIREMENTS

Landside facility requirements were determined for the following airport elements:

- Airport access and terminal roadways
- Terminal curbside
- Commercial vehicle staging areas
- Employee and public parking facilities
- Rental car facilities

Landside facility requirements are presented in this section.

4.1 AIRPORT ACCESS AND TERMINAL ROADWAYS

Ted Stevens Anchorage International Airport (Airport) roadway requirements are typically determined by assessing the vehicle traffic volume demand against the capacity of the roadways during the peak hour. The demand / capacity ratio serves as a suitable indicator of the roadway Level of Service, which describes how effectively a road is able to handle traffic or congestion. When the Level of Service is beyond a certain threshold, traffic is deemed to have reached a poor or failed rating, and roadway improvements are typically required to alleviate roadway congestion. The threshold may vary depending on a given airport's Level of Service expectations. Industry standards for airport roadway Level of Service are shown in **Table 4.33**. Level of Service C represents stable traffic flows with moderate volumes, where the freedom to maneuver is noticeably restricted, and represents the industry standard target for airport roadway Level of Service.

To determine the Level of Service for airport roadways, and specifically the Airport loop road servicing the South Terminal, historic traffic volume counts collected by the Alaska Department of Transportation and Public Facilities (DOT&PF) Central Region at specific airport roadway locations were used. The most recent annual average daily traffic (AADT) volume counts were collected and documented in the *2011 Annual Traffic Volume Report*. AADT volumes were obtained from a sample adjusted for seasonality, assuming roads were open year-round. Future traffic volumes were projected based on an estimated average daily originating passenger growth rate as determined in the *2013 Alaska International Airport System (AIAS) Forecast Technical Report* (AIAS Forecast). The average daily originating passenger and average daily terminating passenger annual growth rates are about the same at approximately 1.4% between the forecast baseline year (2010) and Planning Activity Level (PAL) 4 (2030). The resulting traffic volume forecasted for the Airport loop road is presented in **Table 4.34**.

Table 4.33
Level of Service Criteria for Airport Roadways

Level of Service Rating	Demand / Capacity Ratio	Description
A	0.00 – 0.60	EXCELLENT – Free flow, light volumes
B	0.61 – 0.70	VERY GOOD – Free to stable flow, light to moderate volumes
C	0.71 – 0.80	GOOD – Stable flow, moderate volumes, freedom to maneuver is noticeably restricted
D	0.81 – 0.90	FAIR – Approaches unstable flow, moderate to heavy volumes, limited freedom to maneuver
E	0.91 – 0.99	POOR – Extremely unstable flow, heavy volumes, maneuverability and psychological comfort extremely poor
F	≥ 1.00	FAILURE – Forced or breakdown conditions, slow speeds, tremendous delays with continuously increasing queue lengths

Source: *2000 Highway Capacity Manual.*

Table 4.34
Annual Average Daily Traffic Volume Forecast for Airport Loop Road

		Planning Activity Level			
	Baseline[1]	1	2	3	4
Airport Entrances					
South Aircraft Drive to Airport Return Ramp	10,097	10,311	11,053	11,912	13,032
Airport Return Ramp to Rental Car Parking Entrance	12,074	12,330	13,217	14,244	15,583
Terminal Roadway					
South Terminal Private Vehicle Arrivals Curbside (Lower Level)	2,074	2,118	2,271	2,447	2,677
South Terminal Private Vehicle Departures Curbside (Upper Level)	4,150	4,238	4,543	4,896	5,356
South Terminal Commercial Vehicle Curbside (Lower Level)	2,967	3,030	3,247	3,500	3,829
Airport Exits					
Terminal Curbside to Airport Return Ramp	12,218	12,477	13,375	14,414	15,769
Airport Return Ramp to South Aircraft Drive	9,305	9,502	10,185	10,977	12,009
Other					
Airport Return Ramp	2,205	2,252	2,414	2,602	2,846

Source: RS&H, 2014; Alaska Department of Transportation and Public Facilities, *2011 Annual Traffic Volume Report*.
Note:
1 - Interpolated 2012 values based on *2013 Alaska International Airport System Forecast Technical Report* baseline year and growth rate.

Peak hour traffic volume estimates were estimated based on a 10% share of vehicles during the peak hour as determined in the *2008 Master Plan Study*. This share was derived based on traffic counts conducted at rental car entrances and parking exits in September 2006. The peak hour share is anticipated to remain constant through the planning horizon. Peak hour traffic volume estimates, representing vehicular demand, are shown in **Table 4.35**.

Roadway capacities typically used in airport roadway analysis assume a particular throughput which reflects a particular Level of Service and vehicle speed. The capacity per lane, determined based upon procedures described in the *2000 Highway Capacity Manual* and *Federal Aviation Administration (FAA) Advisory Circular (AC) 150 / 5360-13, Planning and Design Guidelines for Airport Terminal Facilities* (AC 150 / 5360-13), is as follows:

- Entrance and exit roadway segments = 1,200 vehicles per hour
- Terminal curbside roadway segment = 900 vehicles per hour
- Airport return ramp = 700 vehicles per hour

This capacity, multiplied by the number of lanes for each roadway segment, was reduced to represent a Level of Service C capacity, or 71% - 80% of the maximum roadway capacity.

With the roadway demand and capacity data, a demand or volume / capacity ratio was calculated and an overall resulting Level of Service rating determined. Analysis results are summarized in **Table 4.35**. The resulting volume / capacity ratios indicate the Airport loop road will be able to accommodate demand at a Level of Service A (free flow conditions) at most roadway segments during the peak hour, and will operate at a slightly lower Level of Service (B) for the South Aircraft Drive to Airport Return Ramp roadway segment starting at PAL 3 and for the Airport Return Ramp to South Aircraft Drive roadway segment starting at PAL 4.

Technical analysis of traffic data was not conducted to determine requirements for other on-airport or off-airport roadways. However, it is recognized that previous master planning efforts did identify potential roadway realignments or construction of new roadways.

West Airpark Access

Access to the West Airpark is provided by Northern Lights Boulevard / Point Woronzof Drive. This roadway, in its current configuration, would be incapable of accommodating traffic demands if further development of the West Airpark occurs. Expansion and realignment of portions of Northern Lights Boulevard / Point Woronzof Drive or a new West Airpark access road would likely be required to adequately serve West Airpark development.

Table 4.35
Peak Hour Traffic Volume, Capacity, and Level of Service for Various Airport Loop Roadway Segments

		Planning Activity Level			
	Baseline[1]	1	2	3	4
Airport Entrances					
South Aircraft Drive to Airport Return Ramp					
Peak Hour Traffic Volume	1,010	1,030	1,105	1,190	1,305
LOS C Roadway Capacity (2 lanes)	1,920	1,920	1,920	1,920	1,920
Resulting Level of Service	A	A	A	B	B
Airport Return Ramp to Rental Car Parking Entrance					
Peak Hour Traffic Volume	1,205	1,230	1,320	1,425	1,560
LOS C Roadway Capacity (3 lanes)	2,880	2,880	2,880	2,880	2,880
Resulting Level of Service	A	A	A	A	A
Terminal Roadway					
South Terminal Private Vehicle Arrivals Curbside (Lower Level)					
Peak Hour Traffic Volume	205	210	225	245	270
LOS C Roadway Capacity (1 lane)	720	720	720	720	720
Resulting Level of Service	A	A	A	A	A
South Terminal Private Vehicle Departures Curbside (Upper Level)					
Peak Hour Traffic Volume	415	425	455	490	535
LOS C Roadway Capacity (2 lanes)	1,440	1,440	1,440	1,440	1,440
Resulting Level of Service	A	A	A	A	A
South Terminal Commercial Vehicle Curbside (Lower Level)					
Peak Hour Traffic Volume	295	305	325	350	385
LOS C Roadway Capacity (2 lanes)	1,440	1,440	1,440	1,440	1,440
Resulting Level of Service	A	A	A	A	A
Airport Exits					
Terminal Curbside to Airport Return Ramp					
Peak Hour Traffic Volume	1,220	1,250	1,335	1,440	1,575
LOS C Roadway Capacity (4 lanes)	2,880	2,880	2,880	2,880	2,880
Resulting Level of Service	A	A	A	A	A
Airport Return Ramp to South Aircraft Drive					
Peak Hour Traffic Volume	930	950	1,020	1,100	1,200
LOS C Roadway Capacity (2 lanes)	1,920	1,920	1,920	1,920	1,920
Resulting Level of Service	A	A	A	A	B
Other					
Airport Return Ramp					
Peak Hour Traffic Volume	220	225	240	260	285
LOS C Roadway Capacity (1 lane)	560	560	560	560	560
Resulting Level of Service	A	A	A	A	A

Source: RS&H, 2014; Alaska Department of Transportation and Public Facilities, *2011 Annual Traffic Volume Report*; *2008 Master Plan Study*.
Note: LOS = Level of Service
1 - Interpolated 2012 values based on *2013 Alaska International Airport System Forecast Technical Report* baseline year and growth rate.

Postmark Drive

The construction of a new public roadway, east of and parallel to Postmark Drive, was proposed in the *2002 Anchorage International Airport Master Plan Study*. The purpose of the new road—Logistics Drive—was to accommodate potential expansion of the North Airpark and still remains a viable option.

Another alternative that will be explored further in **Chapter 5**, Alternatives Development and Evaluation, is to realign Postmark Drive to or near the potential Logistics Drive. Moving Postmark Drive to the east side of the U.S. Post Office would reduce or possibly eliminate the need for tugs to cross Postmark Drive to transit between the U.S. Post Office and cargo facilities currently located west of Postmark Drive. This enhanced access would also allow for expanded airside access in the North Airpark, allowing North Airpark tenants to expand eastward, adjacent to their existing leaseholds.

4.2 TERMINAL CURBSIDE / COMMERCIAL VEHICLE STAGING

Terminal curb length requirements in linear feet were determined for the North Terminal and South Terminal. Curb length requirements are typically based on knowledge of the existing curbside infrastructure, passenger characteristics, and patterns of vehicles using the terminal curbside. These data can be collected through passenger surveys, employee surveys, and observations. Curbside requirements were determined by applying consultant expertise of standard passenger and vehicular characteristics supplemented with data gathered through interviews with Airport staff. Curb length requirements were also determined based on originating and terminating passenger volumes and their forecasted growth throughout the planning horizon.

4.2.1 SOUTH TERMINAL

As documented in **Chapter 2**, Inventory of Existing Conditions, the South Terminal curbside consists of two levels, an upper and a lower level.

The upper level is the departures level. The upper-level road is used for dropping off passengers by private and commercial vehicles, as well as tour and charter buses. The upper-level curb measures 950 feet long. Of the four available lanes, two 12-foot-wide lanes are used as bypass lanes, one 12-foot-wide lane is used for vehicle maneuvering, and one approximately 16-foot-wide curb lane is used for passenger drop-off.

The lower level inner curb is used for picking up arriving passengers by private vehicles. The curb is 825 feet long. Of the three available lanes, one 12-foot-wide lane is used as a bypass lane, one 12-foot-wide lane is used for vehicle maneuvering, and one 12-foot-wide curb lane is used for passenger pick-up.

The lower level outer curb, or the commercial vehicle curb, is used primarily for picking up passengers by commercial vehicles, but is also used to drop off passengers by Airport shuttles, the People Mover bus, and charter buses. The curb is 970 feet long. Of the four available lanes, two 12-foot-wide lanes are used as bypass lanes, one 12-foot-wide lane is used for vehicle maneuvering, and one 12-foot-wide curb lane is used for passenger pick-up / drop-off.

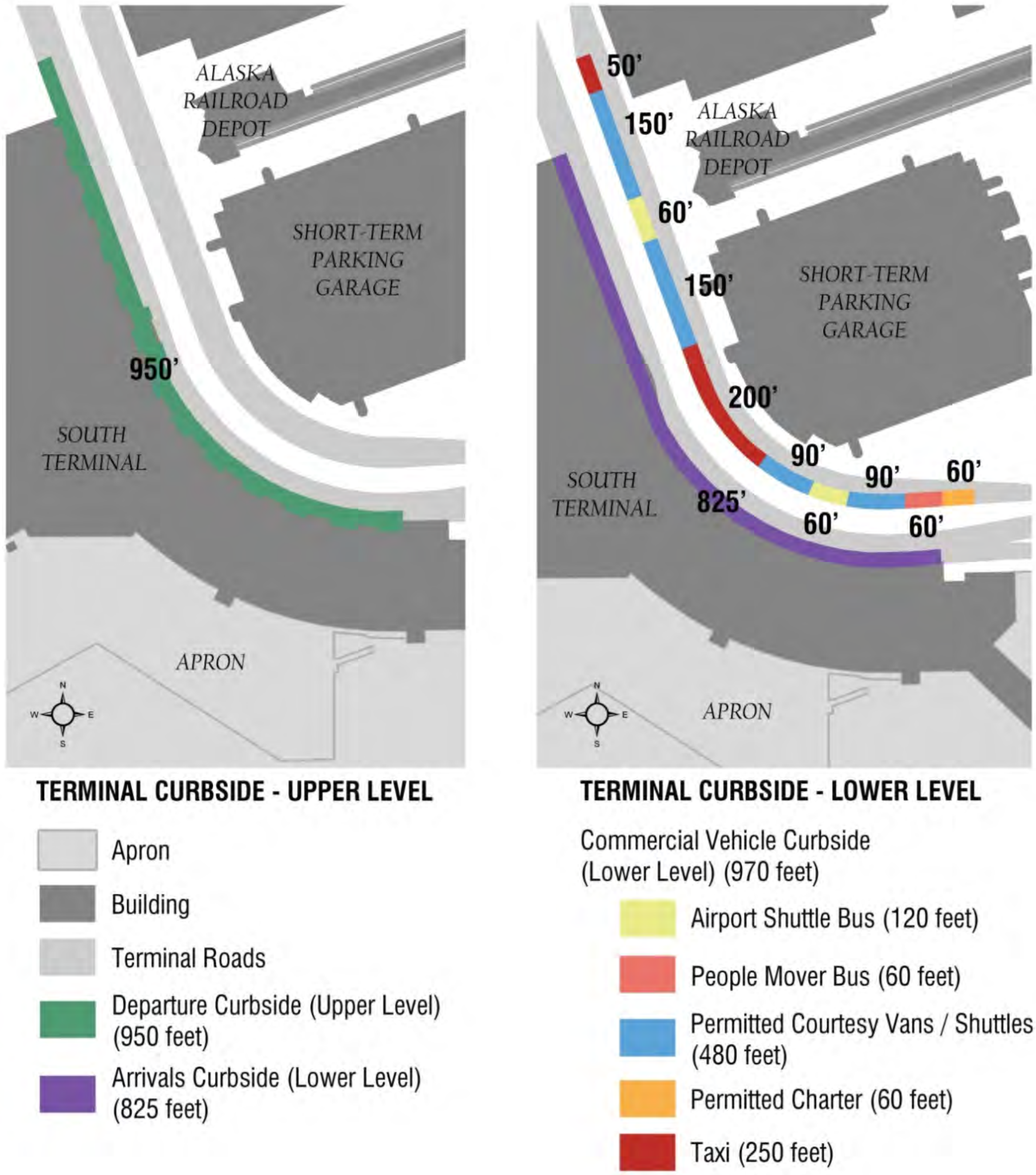
The terminal curbside allocation for the South Terminal, including a breakdown of the existing curb lengths, is shown in **Figure 4.11**.

Information about vehicle usage, characteristics, and curb utilization is necessary to determine terminal curb length requirements. The estimated peak hour traffic volumes during the average day of the peak month for each mode on the upper and lower levels and curb areas are shown in **Table 4.36**. Peak hour traffic volumes for each mode using the curb were estimated by multiplying the curbside mode splits by an estimated peak hour vehicle volume. Mode splits were estimated based on consultant experience of curbside operations and from interviews with Airport personnel. Peak hour vehicle volumes were derived based on peak hour originating or terminating passengers during the average day of the peak month (July).

To estimate peak hour vehicle volumes, it was assumed that 60% of the total peak hour originating and terminating passengers were dropped off or picked up at the terminal curbside, and that 50% of those passengers were dropped off or picked up in a private vehicle. It was also assumed that the average party size for a private or commercial vehicle, excluding shuttles and buses, was 1.2 and 1.0 passengers, respectively. For some modes, the peak hour traffic volumes were not determined because these modes operated at scheduled times throughout the day or infrequently. For these modes, such as the People Mover bus, a number of vehicles during the peak hour were estimated based on the schedule.

Several assumptions about passenger characteristics and vehicle curb usage were made to derive peak hour vehicle volumes. These assumptions were made based on the best available data. However, no new data were collected to support this analysis. It should be noted that although actual passenger characteristics may differ at the Airport, at higher percentages of passenger curbside utilization, the resulting curbside Level of Service provided does not change drastically. This is because peak hour passenger originations and terminations in the planning horizon, which is used as the basis for determining curbside demand, is forecasted to grow slowly. Based on the AIAS Forecast, peak hour originations are estimated to grow from 812 to 912 passengers (≈0.6% annual average growth rate) from the baseline year (2012) to PAL 4 (2030). With ample room or capacity provided at the curbside today during the peak hour of the peak month average day, a small increase in demand will not substantially increase the demand / capacity ratio.

Figure 4.11
South Terminal Curbside Allocation



Source: RS&H and HDR Alaska, 2014.

Finally, existing peak hour traffic volumes reported in the *2011 Annual Traffic Volume Report*, as shown in **Table 4.36**, were used in the roadway analysis. It should be noted that the data reported in the *2011 Annual Traffic Volume Report* are based on sample data collected throughout the year and adjusted for seasonality to get the average day of the year (10% of which reflects the peak hour). These traffic volumes may be slightly low, as the peak hour of the average day of the peak month actually occurs in July. For greater accuracy in future curbside requirements, the Master Plan Update team recommends the Airport collect updated traffic counts data.

Table 4.36
South Terminal Vehicle Mode Splits and Estimated Peak Hour Traffic Volumes by Level and Curb Area

			Planning Activity Level			
	Mode Splits	Baseline[1]	1	2	3	4
Upper Departures Level	100%					
Private Vehicle Drop-off	65%	265	260	265	280	295
Commercial Vehicle Drop-off	35%	170	165	170	175	190
Tour / Charter Bus Drop-off	< 1%	2	2	2	3	3
Lower Arrivals Level – Inner Curb Area	100%					
Private Vehicle Pick-up	100%	270	275	295	310	330
Lower Arrivals Level – Outer Curb Area	100%					
Taxi Staging	4%	14	14	15	16	17
Taxi Pick-up	60%	195	200	210	225	235
Permitted Courtesy Van, Off-Airport Shuttle, Limos < 28 Feet Long	36%	115	120	125	130	140
Airport Shuttle Drop-off / Pick-up	< 1%	5	5	5	5	5
People Mover Bus Drop-off / Pick-up	< 1%	2	2	2	2	2
Tour / Charter Bus Pick-up	< 1%	13	13	14	15	17

Source: RS&H, 2014; *2013 Alaska International Airport System Forecast Technical Report* (AIAS Forecast); *2008 Master Plan Study*.
Note:
1 - Interpolated 2012 values based on AIAS Forecast baseline year and growth rate.

For each PAL, curb stall requirements were determined for each mode or vehicle type by multiplying the peak hour traffic volumes by the dwell time for each mode at the curb. A Poisson distribution[4] was applied to account for randomness in vehicles arriving and departing the curb during the peak hour. For some commercial vehicles that run on a schedule, such as the People Mover bus, an estimate of the number of stalls was determined and maintained throughout the planning horizon. The number of required stalls for each mode was multiplied by the stall length for each vehicle and added to get the required curb length. Stall length and dwell time data were based upon consultant experience and are shown in **Table 4.37**.

Table 4.37
Vehicle Characteristics by Level and Curb Area

	Standard Stall Length (feet)	Dwell Time (minutes)
Upper Departures Level		
Private Vehicle Drop-off	25	1.9
Commercial Vehicle Drop-off	30	1.5
Tour / Charter Bus Drop-off	60	15.0
Lower Arrivals Level – Inner Curb Area		
Private Vehicle Pick-up	25	1.7
Lower Arrivals Level – Outer Curb Area		
Taxi Staging	25	N/A
Taxi Pick-up	25	1.5
Permitted Courtesy Van, Off-Airport Shuttle, Limos ‹ 28 Feet Long	30	1.5
Airport Shuttle Drop-off / Pick-up	35	5.0
People Mover Bus Drop-off / Pick-up	60	10.0
Tour / Charter Bus Pick-up	60	45.0

Source: RS&H, 2014.

[4] A Poisson distribution is a discrete probability distribution that expresses the probability of a given number of events occurring in a fixed interval of time and/or space if these events occur with a known average rate and independently of the time since the last event.

To determine the terminal curbside Level of Service, the required curb length (demand) was divided by the maximum capacity of the terminal curbside, which was calculated by multiplying the existing curb length by the utilization rate of the curb. The innermost lane used for passenger drop-off and pick-up on all curbs is slightly wider than the standard 12-foot lane width, which allows for effectively 1.3 lanes that can be used for passenger drop-off or pick-up. Similar to the capacity adjustment made for the roadway requirements, a Level of Service C capacity was determined. The required curb length was then divided by the Level of Service C capacity to determine a demand / capacity ratio representing a specific Level of Service of the terminal curbside throughout the planning horizon. The results of the analysis are shown in **Table 4.38**.

Table 4.38
South Terminal Curbside Length Requirements and Level of Service

		Planning Activity Level			
	Baseline[1]	1	2	3	4
Upper Departures Level					
Required Curb Length	530	530	530	580	630
Existing Curb Length	950	950	950	950	950
LOS C Curbside Capacity	990	990	990	990	990
Level of Service	A	A	A	A	B
Lower Arrivals Level – Inner Curb Area					
Required Curb Length	300	325	325	350	375
Existing Curb Length	825	825	825	825	825
LOS C Curbside Capacity	860	860	860	860	860
Level of Service	A	A	A	A	A
Lower Arrivals Level – Outer Curb Area					
Required Curb Length	585	585	585	615	615
Existing Curb Length	970	970	970	970	970
LOS C Curbside Capacity	1,010	1,010	1,010	1,010	1,010
Level of Service	A	A	A	B	B

Source: RS&H, 2014.
Note: LOS = Level of Service
1 - Interpolated 2012 values based on *2013 Alaska International Airport System Forecast Technical Report* baseline year and growth rate.

Throughout the planning horizon, the South Terminal curb length is adequate to accommodate peak hour traffic volume demands at a Level of Service A, representing free flow conditions. When traffic volumes become light to moderate, representing Level of Service B, efforts should be taken to reassess the terminal curbside. Continuous assessment of volumes allows the Airport to act proactively on any traffic issues. The evaluations should include collecting passenger characteristics via a passenger survey and vehicle utilization of the curb. With this additional data, terminal curbside plans can be refined to address any future curb length deficiencies.

4.2.2 NORTH TERMINAL

As documented in **Chapter 2**, Inventory of Existing Conditions, the North Terminal curbside consists of one level, split into an inner and outer curb area. The inner curb area is approximately 200 feet wide and is used primarily by private vehicles to drop-off and pick-up passengers. However, permitted courtesy vans, off-airport shuttles, limousines, charter buses, and taxis with a length less than approximately 28 feet may drop off passengers at the inner curb area. The outer curb area is used to drop off and pick up passengers by commercial vehicles longer than 28 feet. The outer curb area is also used by the People Mover bus to drop off and pick up passengers. Finally, to the north and south of the inner curb area is another curb area used by airport shuttles and charter buses to drop off and pick up passengers.

Curb length requirements for the North Terminal were calculated in a similar manner as the South Terminal requirements. However, vehicle counts were used as the basis, with an assumption made based upon interviews with Airport personnel that 50% of all vehicles entering the North Terminal are passengers and the remaining 50% are employees who may park at the North Terminal. In comparing the vehicle counts with international passenger data, adjusted to account for the average party size, the baseline year numbers were similar. The mode splits and vehicle characteristics for the North Terminal are shown in **Table 4.39**. The utilization of the drop-off / pick-up curb is 1.0. Results of the North Terminal curbside analysis are shown in **Table 4.40**. Throughout the planning horizon, the North Terminal curbside is adequate to accommodate peak hour traffic volume demands at a Level of Service A, representing free-flow conditions. These requirements do not consider reuse of the North Terminal or its site. Any reuse of the North Terminal or its site would require an analysis to determine curbside requirements, if any.

Table 4.39
International Mode Splits and Vehicle Characteristics

	Mode Splits	Standard Stall Length (feet)	Dwell Time (minutes)
Inner Curb Area			
Private Vehicle Drop-off	30%	25	2.5
Private Vehicle Pick-up	30%	25	2
Permitted Courtesy Van / Shuttle, Off-Airport Shuttle, Limos < 28 Feet Long, Charter Bus	19%	30	2
Outer Curb Area			
Permitted Courtesy Van / Shuttle, Off-Airport Shuttle, Limos < 28 Feet Long, Charter Bus	19%	30	2
People Mover Bus Drop-off / Pick-up	1%	60	10
Outside Curb			
Airport Shuttle Drop-off / Pick-up	1%	35	5
Charter Bus Drop-off / Pick-up	1%	60	45

Source: RS&H, 2014.

Table 4.40
International Curbside Length Requirements and Level of Service

		Planning Activity Level			
	Baseline[1]	1	2	3	4
Inner Curb Area					
Required Curb Length	80	80	105	105	105
Existing Curb Length	400	400	400	400	400
LOS C Curbside Capacity	320	320	320	320	320
Level of Service	A	A	A	A	A
Outer Curb Area					
Required Curb Length	120	120	120	120	120
Existing Curb Length	330	330	330	330	330
LOS C Curbside Capacity	265	265	265	265	265
Level of Service	A	A	A	A	A
Outside North Terminal Curbside Area					
Required Curb Length	95	95	95	95	95
Existing Curb Length	200	200	200	200	200
LOS C Curbside Capacity	160	160	160	160	160
Level of Service	A	A	A	A	A

Source: RS&H, 2014.
Note: LOS = Level of Service
1 - Interpolated 2012 values based on *2013 Alaska International Airport System Forecast Technical Report* baseline year and growth rate.

4.2.3 COMMERCIAL VEHICLE STAGING

Commercial vehicle (for taxis and charter buses) staging requirements were determined by extrapolating the curbside analysis demand to overflow into the staging areas. Currently, commercial vehicle staging areas consist of:

- Taxi staging area (equivalent to 70 taxi stalls) located just east of the Airport Traffic Control Tower
- Taxi staging stall (one stall) along the South Terminal commercial vehicle curb, where a taxi parked in the large taxi staging area can wait before proceeding to the taxi pick-up area near the center of the same curb
- Charter bus staging area (nine stalls) adjacent to the C Concourse and loading dock
- Charter bus staging area (three stalls) near the north end of the North Terminal

These staging areas are considered in addition to the existing areas set aside for taxi and charter bus drop-offs and pick-ups, including:

- Taxi pick-up area (nine stalls) located along the center of the South Terminal commercial vehicle level curb
- Charter bus pick-up stall (one stall) located at the south end of commercial vehicle curb and diagonal stalls (three stalls) between the lower level curbs (under the upper level roadway) at the South Terminal
- Charter bus drop-off area along the inner curb (three stalls), along the outer commercial curb (three stalls), and at the north end of the Terminal Connector (two stalls) at the North Terminal.

Requirements for these overflow areas were determined by assessing the curbside results and identifying where demand exceeded supply during the peak hour of the average day of the peak month. It was assumed that the taxi staging area located at the terminal curb would remain throughout the planning horizon.

At the South Terminal, by PAL 4, a total of 12 taxi staging stalls and nine charter bus staging stalls are required in addition to the existing stalls used for pick-ups. The approximately 70 stalls in the commercial vehicle hold lot area are adequate to accommodate the overflow of taxicabs. The nine stalls used for charter bus staging at the South Terminal are adequate to accommodate charter bus requirements through PAL 4.

At the North Terminal, three dedicated stalls are used for charter bus staging. There is no requirement for additional charter bus staging stalls throughout the planning horizon. This is because the existing charter bus drop-off and pick-up area is already adequate to meet demand levels through PAL 4, and therefore, no overflow parking areas are necessary.

4.3 PARKING

4.3.1 PUBLIC PARKING

Public parking stall and acreage requirements were determined based on the average daily parking transactions during the peak month. Due to the unavailability of current parking transaction records, data from the *2008 Master Plan Study* were used as a basis to estimate future parking requirements. Hourly and daily parking data collected from 2006 for each of the parking lots / garages were extrapolated based on the forecasted growth in passenger originations. The extrapolated daily parking transactions are summarized in **Table 4.41**. Historical transaction data were unavailable for the South Terminal's oversized vehicle lot, cell phone lot, and the Park, Ride & Fly economy lot.

Table 4.41
Public Parking Daily Parking Transactions

	Average Parking Duration	Baseline[1]	Planning Activity Level			
			1	2	3	4
South Terminal Short-Term Parking Garage	-	1,479	1,511	1,609	1,722	1,869
Hourly	1.63	1,376	1,405	1,497	1,602	1,739
Daily	2.84	104	106	113	121	131
South Terminal Short-Term Parking Lot	-	107	109	116	124	135
Hourly	4.33	51	52	55	59	64
Daily	4.25	56	57	61	65	71
North Terminal Short-Term Parking Lot	-	256	261	278	298	323
Hourly	1.28	250	255	271	290	315
Daily	5.13	6	6	7	7	8

Source: RS&H, 2014; *2008 Master Plan Study*.
Note:
1 - Interpolated 2012 values based on *2013 Alaska International Airport System Forecast Technical Report* baseline year and growth rate.

Public parking stall requirements were determined using hourly and daily transaction data, the average parking duration, and various peak time surge factors. Average parking durations are shown in **Table 4.41** and were determined in the *2008 Master Plan Study* efforts based on data collected between January 29 and September 28, 2006. For the hourly parking areas, a peak hour number of transactions were estimated from the daily transactions shown in **Table 4.41**. Based on traffic data collected as part of the *2008 Master Plan Study* between August and September 2006 during the peak hour (3 p.m.) at the South Terminal public parking lot exit, it was determined that the peak hour represents about 15% of the daily traffic. For the daily parking areas, a peak period was not considered, as the transactions from day to day during the peak month do not fluctuate as greatly as the transactions from hour to hour in the hourly parking areas.

To estimate the hourly public parking demand, an extra surge factor of 1.4 to account for increased volumes during peak times, and a 1.1 search factor to account for extra time during the peak times to search for a stall were also applied. For daily public parking requirements, a surge factor of 1.1 and a search factor of 1.05 were used. The resulting public parking stall requirements are shown in **Table 4.42**. Requirements for the baseline year 2012 were adjusted to reflect actual current utilizations as observed by Airport staff. Acreage requirements were determined using a planning factor of 350 square feet per stall and are shown in **Table 4.43.**

Table 4.42
Public Parking Stall Requirements

	Existing		Planning Activity Level			
	Stall Count	Baseline[1]	1	2	3	4
South Terminal Short-Term Parking Garage	1,172	858	876	933	999	1,084
Hourly	-	518	529	564	603	655
Daily	-	340	345	370	395	430
South Terminal Short-Term Parking Lot	1,082	785	800	855	915	990
Hourly	-	120	125	135	140	155
Daily	-	660	675	720	770	835
North Terminal Short-Term Parking Lot	205	110	115	120	130	140
Hourly	-	75	75	80	85	95
Daily	-	35	40	40	45	45
South Terminal Oversized Vehicle Lot	85	20	20	25	25	30
Cell Phone Lot	15	4	4	4	5	5
Park, Ride & Fly Economy Parking Lot	325	150	185	225	280	350

Source: RS&H, 2014.
Note:
1 - Interpolated 2012 values based on *2013 Alaska International Airport System Forecast Technical Report* baseline year and growth rate.
This analysis does not consider the impact to parking supply / demand if the North Terminal site is reused. These impacts would need to be determined if / when the North Terminal site is reused.

Table 4.43
Public Parking Acreage Requirements

	Existing		Planning Activity Level			
	Acreage	Baseline[1]	1	2	3	4
South Terminal Short-Term Parking Garage	10.80	6.89	7.04	7.50	8.02	8.71
South Terminal Long-Term Parking Lot	8.70	5.20	5.31	5.66	6.05	6.57
North Terminal Short-Term Parking Lot	2.21	0.89	0.91	0.97	1.03	1.12
South Terminal Oversized Vehicle Lot	0.69	0.17	0.18	0.19	0.21	0.22
Cell Phone Lot	0.48	0.03	0.03	0.03	0.04	0.04
Park, Ride & Fly Economy Parking Lot	3.48	1.21	1.47	1.81	2.24	2.81

Source: RS&H, 2014.
Note:
1 - Interpolated 2012 values based on *2013 Alaska International Airport System Forecast Technical Report* baseline year and growth rate.
This analysis does not consider the impact to parking supply / demand if the North Terminal site is reused. These impacts would need to be determined if / when the North Terminal site is reused.

All public parking facilities are adequate through PAL 4 with the exception of the Park, Ride & Fly economy parking lot, which will have a 24-stall deficit prior to PAL 4. Despite the surplus associated with the public parking facilities through PAL 4, it is recommended that plans to increase or address public parking be started as early as PAL 3 to address potential deficits that will appear beyond the planning horizon. These requirements do not consider reuse of the North Terminal or its site. Any reuse of the North Terminal or its site would require parking demand analysis to determine if the existing parking facilities can accommodate the parking demand.

4.3.2 EMPLOYEE PARKING

Parking stall and acreage requirements were determined for employee-only lots in the passenger terminal complex and the FAA Airport Traffic Control Tower lot. **Figure 2.31** in **Chapter 2**, Inventory of Existing Conditions, illustrates the location of the parking lots in the passenger terminal complex. The existing employee parking stall supplies were determined by conducting manual counts on the ground and by using aerial photographs, as well as through interviews with Airport staff. Baseline year 2012 employee parking requirements were determined by interviewing Airport staff regarding existing usage of the lots. The industry standard for determination of employee parking is to directly correlate employee parking demand to passenger demand. Therefore, future employee parking stall requirements were determined based on the forecasted growth in annual originating passengers. Future employee parking stall requirements are summarized in **Table 4.44**. Future employee parking acreage requirements are shown in **Table 4.45**.

Table 4.44
Employee Parking Stall Requirements

	Existing		Planning Activity Level			
	Stalls	Baseline[1]	1	2	3	4
North Terminal Employee Lot (includes 65 spaces in the public parking lot)	255	150	155	165	180	195
North Terminal Auxiliary Lot	80	80	80	80	80	80
South Terminal Employee Lot	891	535	565	605	645	700
Parking Revenue Gate Employee Lot	13	7	7	7	8	9
Airport Administrative Offices Lot (end of C Concourse)	20	20	20	20	20	20
FAA Tower Lot	72	72	72	72	72	72

Source: RS&H, 2014.
Note: Airport = Ted Stevens Anchorage International Airport, FAA = Federal Aviation Administration
1 - Interpolated 2012 values based on *2013 Alaska International Airport System Forecast Technical Report* baseline year and growth rate.
This analysis does not consider the impact to parking supply / demand if the North Terminal site is reused. These impacts would need to be determined if / when the North Terminal site is reused.

Table 4.45
Employee Parking Acreage Requirements

	Existing		Planning Activity Level			
	Stalls	Baseline[1]	1	2	3	4
North Terminal Employee Lot	2.48	1.19	1.26	1.34	1.43	1.56
North Terminal Auxiliary Lot	0.94	0.64	0.64	0.64	0.64	0.64
South Terminal Employee Lot	7.52	4.31	4.56	4.85	5.19	5.64
Parking Revenue Gate Employee Lot	0.12	0.05	0.06	0.06	0.06	0.07
Airport Administrative Offices Lot (Concourse Connector)	0.16	0.16	0.16	0.16	0.16	0.16
FAA Tower Lot	0.58	0.58	0.58	0.58	0.58	0.58

Source: RS&H, 2014.
Note: Airport = Ted Stevens Anchorage International Airport, FAA = Federal Aviation Administration
1 - Interpolated 2012 values based on *2013 Alaska International Airport System Forecast Technical Report* baseline year and growth rate.
This analysis does not consider the impact to parking supply / demand if the North Terminal site is reused. These impacts would need to be determined if / when the North Terminal site is reused.

4.4 RENTAL CAR

The number of stalls and the geographic area required to accommodate rental car operations for ready / return, quick turnaround, and vehicle storage were determined. Baseline year 2012 rental car requirements were determined by interviewing Airport staff, evaluating aerial photographs, conducting tenant interviews, and performing on-the-ground observations. Presently, there are 660 ready / return rental car stalls encompassing an area of about 300,640 square feet. In addition, the quick turnaround area, where returning vehicles are washed and fueled before being returned to the rental supply, encompasses approximately 105,665 square feet. Future rental car requirements were estimated based on the proportionate growth in non-resident enplaned passengers. Rental car transaction data and revenue data were unavailable. Based upon consultant observations, it was assumed that 50% of all enplanements were visitor enplanements. An updated passenger survey is recommended to determine more accurate passenger characteristics.

Starting around PAL 3, the capacity of the ready / return and quick turnaround facilities will need to be assessed in order to avoid deficits that may occur as PAL 4 is reached. A deficit could potentially be addressed by moving rental car storage stalls, currently located on the roof of the rental car facility, to other storage locations such as the storage and maintenance facilities in the East Airpark or off-Airport. Regarding rental car customer service facilities, it is assumed the existing space used as a customer service facility will be adequate throughout the planning horizon. Rental car facility requirements are shown in **Table 4.46**.

Table 4.46
Rental Car Facility Requirements

			Planning Activity Level			
	Existing	Baseline[1]	1	2	3	4
Ready / Return Stalls						
Requirement	660	530	560	595	635	680
Surplus (Deficit)	-	130	100	65	25	(20)
Ready / Return Area (square feet)[2]						
Requirement	300,640	237,600	252,620	267,890	285,165	306,330
Surplus (Deficit)	-	63,040	48,020	32,750	15,475	(5,690)
Quick Turnaround Area (square feet)						
Requirement	105,665	83,510	88,790	94,155	100,225	107,665
Surplus (Deficit)	-	22,155	16,875	11,510	5,440	(2,000)
Storage Area (square feet)						
Requirement	433,115	237,600	252,620	267,890	285,165	306,330
Surplus (Deficit)	-	195,515	180,495	165,225	147,950	126,785
Equivalent Storage Stalls[3]						
Requirement	1,969	1,080	1,150	1,220	1,295	1,390
Surplus (Deficit)	-	890	820	750	675	575

Source: RS&H, 2014.
Notes:
1 - Interpolated 2012 values based on *2013 Alaska International Airport System Forecast Technical Report* baseline year and growth rate.
2 - The ready / return area is assumed to comprise 450 square feet per stall based on existing space utilizations. This includes vehicle circulation and landscaping areas.
3 - Storage stalls assumed to comprise 220 square feet per stall.

SECTION 5
CARGO FACILITY REQUIREMENTS

Cargo facility requirements were determined for cargo buildings, apron areas, and landside areas.

5.1 AIR CARGO ACTIVITY FORECAST

Air cargo facility requirements were determined primarily based on cargo operations and tonnage as forecast by the Alaska International Airport System (AIAS) Planning Study team and documented in the *2013 AIAS Forecast Technical Report* (AIAS Forecast).

Cargo is classified into three distinct categories in the 2013 AIAS Forecast: International, Intrastate, and Other U.S. Similar terminology is used within this Ted Stevens Anchorage International Airport Master Plan Update (Master Plan Update). The matrix below presents the relationship between the terms used in the Master Plan Update compared to those used in the AIAS Forecast.

Master Plan Update Terminology	AIAS Forecast Terminology
International Cargo	International Cargo
Regional Cargo	Intrastate Cargo
Other Domestic Cargo	Other U.S. Cargo

The term "international cargo" is not modified for use in the Master Plan Update. "Regional cargo" and "other domestic cargo" are synonyms to their respective categories used within the AIAS Forecast. The term "domestic cargo" is specific to the Master Plan Update and encompasses both regional cargo and other domestic cargo.

The peak month for all aviation activity at Ted Stevens Anchorage International Airport (Airport) is July. Historically there has been a surge in cargo throughput in fall during the run-up to the holiday shopping season. The AIAS Forecast notes that this trend appears to have "moderated." Thus, all cargo facility requirements are based on activity during the Airport's overall peak month of July.

Air Cargo Operations

Air cargo operations were forecasted and documented in the AIAS Forecast.

Cargo aircraft landing data, which represent roughly half of total air cargo operations, were used to determine apron requirements. Air cargo operations are projected to increase at 2.1% per year, which is shown in **Table 4.47.**

Belly cargo operations are not considered in the cargo requirements. Belly cargo is defined as cargo carried in the belly of passenger airline aircraft. As stated in the AIAS Forecast, the national trend has been for the belly cargo share of freight to decline as integrated carriers have gained market share. The decline in belly cargo is also affected by passenger airlines' emphasis on quick turnaround times and high passenger load factors, which limits their ability to transport cargo in the belly of their aircraft.

Table 4.47
Cargo Operations Forecast Summary

		Planning Activity Level			
	Baseline[1]	1	2	3	4
Air Cargo Operations Forecast	74,871	82,680	95,812	107,262	118,714

Source: RS&H, 2014; *2013 Anchorage International Airport System (AIAS) Forecast Technical Report* (AIAS Forecast).
Note:
1 - Interpolated 2012 values based on AIAS Forecast baseline year and growth rate.

Air Cargo Tonnage

In the AIAS Forecast, cargo tonnage was forecast for regional cargo and international / other domestic cargo activity. For the purpose of estimating cargo facility requirements, and in particular cargo building requirements, only origin / destination cargo activity was used. International cargo and other domestic cargo activity were split and treated separately. These cargo activities are described below and summarized in **Table 4.48**.

Regional Cargo

Regional cargo includes all cargo that is transported within the State of Alaska. This includes both combi aircraft with passenger airlines, as well as all freight aircraft. Regional cargo represents 2% of the total freight at the Airport.

Other Domestic Cargo

Other domestic cargo includes all cargo that 1) originates in the State of Alaska and is transported to destinations in another U.S. state, as well as 2) originates in a U.S. state outside Alaska and is unloaded at the Airport. This does not include any international cargo with a stopover in Anchorage. Other domestic cargo represents the smallest percentage of total cargo, at 0.3%.

International Cargo

International cargo includes all cargo that originates from an international airport or is destined to an international airport. This includes cargo that arrives at the Airport from an international airport and would be transported to a United States destination, as well as cargo that originates at the Airport and is transported to an international airport. Transit cargo that stops at the Airport and continues on to either a domestic or international destination is also included. International cargo represents the majority of cargo traffic at the Airport, at 98% of all cargo traffic in 2012. A large portion of international cargo is transit, representing 84% of all international cargo in 2012.

Table 4.48
Air Cargo Tonnage Forecast (in tons)

			Planning Activity Level			
		Baseline[1]	1	2	3	4
Regional	Enplaned	91,889	97,215	100,195	102,455	104,220
	Deplaned	21,747	22,700	23,100	23,405	23,665
	Transit[2]	14	15	15	16	16
	Total	113,665	119,950	123,325	125,890	127,915
Other Domestic	Enplaned	7,910	8,460	10,910	13,820	16,875
	Deplaned	8,916	9,535	12,295	15,580	19,000
	Transit[2]	29	29	29	29	29
	Total	16,884	18,050	23,265	29,460	35,935
International	Enplaned	371,262	391,750	514,820	664,635	826,945
	Deplaned	418,478	441,570	580,295	749,160	931,010
	Transit[2]	2,096,315	2,199,260	2,687,475	3,070,690	3,441,530
	Total	4,982,378	5,231,840	6,470,065	7,555,175	8,641,015
	Total	5,112,928	5,369,840	6,616,654	7,710,525	8,804,865

Source: RS&H, 2014; 2013 Anchorage International Airport System (AIAS) Forecast Technical Report (AIAS Forecast).
Notes:
1 - Interpolated 2012 values based on AIAS Forecast baseline year and growth rate.
2 - Transit tonnage doubled to indicate arriving and departing traffic.

5.2 CARGO BUILDING

Today, the Airport has over one million square feet of cargo building space, located primarily in the North and East Airparks. Future cargo building space requirements were determined for regional, other domestic, and international cargo activity.

To develop cargo building requirements, a future Level of Service, expressed as a building utilization rate, was determined. Utilization rate compares the square footage of building space available to the total cargo tonnage processed and is expressed in terms of square feet per ton of cargo. For master planning purposes, this is a common metric. A standard industry rule of thumb suggests that cargo building utilization rates typically range between 1.0 and 2.0 square feet per ton of cargo. For planning purposes, 1.0 square foot per ton typically indicates that the facility is more efficiently utilized, and 2.0 square feet per ton typically indicates that the facility has some capacity for near-term growth. Typically, for master planning purposes, the building utilization rate is determined by assessing peer airports with similar cargo activity levels and identifying the building utilization rates. A target building utilization rate is then selected to serve as the future target Level of Service.

However, the Airport is unique in its cargo operations and does not have a peer airport. The Airport is home to large international hubs for integrated carriers FedEx and United Parcel Service (UPS). The Airport's most unique cargo characteristic, however, is its large number of international cargo airlines that perform tech-stops. Air cargo tech-stops consist of international, wide-body cargo aircraft that land at the Airport for refueling and crew changes, but do not enplane or deplane any cargo. The high volume of tech-stop operations means that Anchorage has a high cargo tonnage throughput rate but a relatively modest amount of cargo handling. For this reason, historical building utilization rates at the Airport were used to determine future cargo utilization rates.

Historic building utilization rates at the Airport are provided in **Table 4.49** and show how cargo tenants use space and how the utilization rates have changed over time since 1997. Historic regional / other domestic and international building utilization rates were documented in previous master plan reports and the AIAS Forecast. Due to the differences in how cargo data were differentiated in previous documents, regional data were combined with other domestic cargo activity data.

In general, the rates for international cargo activity tend to be lower, as these carriers do not need an abundance of space to process the cargo. In addition, the majority of the cargo that is processed, particularly by integrated express cargo carriers, is handled quite efficiently. This is true of most integrated express cargo carriers, whose building utilization rates are closer to the 1.0 square foot per ton of cargo rate. Building utilization rate for regional / other domestic activity tends to be higher. In interviews with cargo tenants, several tenants expressed a growing need for additional cargo space, particularly to store outbound cargo and transport cargo on aircraft once there is a full load available. Some also expressed a need for additional space to sort and store mail that is picked up from the U.S. Post Office through the bypass mail program.

Historical data reveal there were two points in time since 1997 when a large amount of cargo building space was added and building utilization rates were high. As shown in **Table 4.49**, additional building space was added in 2000. Over time, cargo tonnage grew and building utilization rates trended downward until the next point in time when additional cargo building space was constructed. From 2001 to 2007, regional / other domestic building utilization rates decreased from 2.15 square feet per ton to 1.90 square feet per ton, and the international building ratio decreased from 1.26 square feet per ton to 1.06 square feet per ton. In 2008, a substantial amount of space was again added, which raised the building utilization rates. It is anticipated that the building utilization rates will decrease again once a point of efficiency is reached where space available for processing and storing cargo is balanced or handled efficiently. The three years following cargo building expansion is considered a “settling” period and were not considered reflective of a balanced / efficient cargo operation where there is adequate space or capacity to process the cargo tonnage demand. Assessing the historical building utilization data, the point at which operations are considered efficient, given the space needs for processing and storing cargo, is closer to the building utilization rates that occurred in 2006. Therefore, for future cargo building requirements, the planning factor used for regional and other domestic cargo activity was set at 1.75 square feet per ton. The planning factor used for international cargo activity was set at 1.00 square foot per ton.

Table 4.49
Historical Building Utilization Rates (in square feet per ton)

Year	Regional / Other Domestic Building Utilization Rates	International Building Utilization Rates	Overall Cargo Building Utilization Rate
1997	1.85	1.23	1.56
1998	1.93	1.22	1.56
1999	1.99	1.21	1.55
2000[1]	2.14	1.27	1.60
2001	2.15	1.26	1.56
2002	2.10	1.24	1.49
2003	1.99	1.23	1.42
2004	1.80	1.22	1.35
2005	1.54	1.21	1.26
2006	1.81	1.13	1.25
2007	1.90	1.06	1.21
2008[1]	2.99	1.38	1.68
2009	3.75	1.54	1.96
2010	4.35	0.96	1.44
2011	4.10	1.03	1.52
Planning Factors	1.75	1.00	-

Source: Airport staff and RS&H, 2014.
Note:
1 - Indicates when cargo building space was added.

5.2.1 REGIONAL CARGO

Approximately 522,951 square feet of existing cargo facilities are allocated to serve regional cargo carriers such as Alaska Airlines Cargo, Era Alaska Cargo, Northern Air Cargo, TransNorthern Aviation, and Lynden Air Cargo. The area allocated for regional cargo represents approximately 41% of total cargo facilities. Regional operators tend to fly smaller aircraft and will sometimes stage cargo for longer periods of time while waiting for a full cargo shipment.

The baseline building utilization rate is 4.60 square feet per ton. This high utilization rate is reflective of the settling period that follows recent regional cargo building expansion / acquisition, as previously mentioned. For planning purposes, a total of 1.75 square feet per ton of cargo was used to determine future building space for regional cargo activity because this building utilization rate more appropriately represents a balanced and efficient operation that follows the settling period. This reflects a breakdown of 1.50 square feet per ton of cargo for warehouse space and 0.25 square foot per ton of cargo for support space. The total building space requirement increases slightly from Planning Activity Level (PAL) 1 to PAL 4. As shown by the baseline building utilization, which is 4.60 square feet per ton of cargo, there is sufficient building space today to process and store forecasted regional cargo demand. **Table 4.50** presents the regional cargo building requirements.

Table 4.50
Regional Cargo Building Requirements

Year	Cargo (tons)[1]	Warehouse Area (square feet)	Warehouse Utilization Rate (square feet per ton)	Support Area (square feet)	Support Utilization Rate (square feet per ton)	Total Building Area (square feet)	Total Building Utilization Rate (square feet per ton)
Baseline[2]	113,636	-	-	-	-	522,951	4.60
PAL 1	119,918	179,877	1.50	29,980	0.25	209,857	1.75
PAL 2	123,293	184,940	1.50	30,823	0.25	215,763	1.75
PAL 3	125,860	188,790	1.50	31,465	0.25	220,255	1.75
PAL 4	127,884	191,826	1.50	31,971	0.25	223,797	1.75

Source: RS&H, 2014.
Notes:
1 - Includes only Origin and Destination (O&D) Cargo.
2 - Interpolated 2012 values based on *2013 Anchorage International Airport System Forecast Technical Report* baseline year and growth rate.

5.2.2 OTHER DOMESTIC CARGO

Approximately 30,126 square feet of cargo facilities are allocated for other domestic cargo carriers or indirect air carriers / air freight forwarders such as Matheson Flight Extenders and Commodity Forwarders. Other domestic cargo activity represents the smallest share of total cargo activity at the Airport. The area allocated for other domestic cargo represents approximately 2% of all cargo facilities.

In the baseline year, utilization of other domestic cargo buildings was 1.79 square feet per ton of cargo. This indicates adequate utilization of these facilities. For planning purposes, a total of 1.75 square feet per ton of cargo was used to determine future building space for other domestic cargo activity. This reflects a breakdown of 1.50 square feet per ton of cargo for warehouse space and 0.25 square foot per ton of cargo for support space. Other domestic cargo is forecasted to double over the planning horizon from 16,826 tons in the baseline year to 35,877 tons at PAL 4. Correspondingly, the requirement for other domestic cargo buildings will double from the 30,126 existing square feet to approximately 62,784 square feet. Reallocation of building uses on the Airport may reduce the requirement for other domestic cargo building space. Other domestic cargo building requirements are presented in **Table 4.51**.

Table 4.51
Other Domestic Cargo Building Requirements

	Cargo (tons)[1]	Warehouse Area (square feet)	Warehouse Utilization rate (square feet per ton)	Support Area (square feet)	Support Utilization Rate (square feet per ton)	Total Building Area (square feet)	Total Building Utilization Rate (square feet per ton)
Baseline[2]	16,826	-	-	-	-	30,126	1.79
PAL 1	17,993	26,990	1.50	4,498	0.25	31,488	1.75
PAL 2	23,206	34,809	1.50	5,801	0.25	40,610	1.75
PAL 3	29,401	44,101	1.50	7,350	0.25	51,451	1.75
PAL 4	35,877	53,815	1.50	8,969	0.25	62,784	1.75

Source: RS&H, 2014.
Notes:
1 - Includes only Origin and Destination (O&D) Cargo.
2 - Interpolated 2012 values based on *2013 Anchorage International Airport System Forecast Technical Report* baseline year and growth rate.

5.2.3 INTERNATIONAL CARGO

Approximately 732,405 square feet of existing cargo facilities are used by international cargo carriers such as UPS, FedEx, Kalitta, Atlas, Polar, and others. The area allocated for international cargo represents approximately 57% of total cargo facilities. The largest portion of the international cargo traffic at the Airport is transit cargo. Transit cargo requires little to no building space because the cargo does not leave the aircraft; therefore, transit cargo was not included in the international cargo building requirements. The international cargo building requirements include only origin and destination (O&D) cargo.

In the baseline year, utilization of international cargo was 0.93 square foot per ton of cargo. This indicates very efficient utilization of these facilities. For planning purposes, a total of 1.00 square foot per ton of cargo was used to determine future building space for international cargo activity. This reflects a breakdown of 0.75 square foot per ton of cargo for warehouse space and 0.25 square foot per ton of cargo for support space. International cargo facility requirements are projected to more than double during the planning horizon – from 732,405 square feet required in the baseline year – to more than 1.7 million square feet required in PAL 4. During this same period, international cargo tonnage is expected to increase two-and-one-half (2.5) times to approximately 1.8 million tons. **Table 4.52** shows the international cargo building requirements.

Table 4.52
International Cargo Building Requirements

	Cargo (tons)[1]	Warehouse Area (square feet)	Warehouse Utilization rate (square feet per ton)	Support Area (square feet)	Support Utilization Rate (square feet per ton)	Total Building Area (square feet)	Total Building Utilization Rate (square feet per ton)
Baseline[2]	789,740	-	-	-	-	732,405	0.93
PAL 1	833,320	624,990	0.75	208,330	0.25	833,320	1.00
PAL 2	1,095,118	821,338	0.75	273,779	0.25	1,095,118	1.00
PAL 3	1,413,791	1,060,343	0.75	353,448	0.25	1,413,791	1.00
PAL 4	1,757,957	1,318,468	0.75	439,489	0.25	1,757,957	1.00

Source: RS&H, 2014.
Notes:
1 - Includes only Origin and Destination (O&D) Cargo.
2 - Interpolated 2012 values based on *2013 Anchorage International Airport System Forecast Technical Report* baseline year and growth rate.

5.2.4 CARGO BUILDING REQUIREMENTS SUMMARY

Overall cargo building facility requirements increase almost one–and-one-half (1.5) times from just over 1 million square feet currently to just over 2 million square feet by the end of the planning horizon. Given cargo tonnage growth as forecasted, approximately 66,000 square feet of cargo building space will need to be added as early as PAL 2. This requirement will grow to approximately 760,000 square feet by PAL 4. The largest increase in cargo building requirements will occur with international cargo activity. **Table 4.53** summarizes the cargo building requirements.

For both other domestic and international cargo activity, additional building space will need to be added to meet forecast demand. Some of the existing space used for regional cargo, which has a large surplus of approximately 300,000 square feet throughout the planning horizon, may be used and the space reconfigured to accommodate the extra area needed for processing and storing other domestic and international cargo through PAL 2. However, as demand grows beyond PAL 2, the deficit of total cargo building space will also grow to 66,000 square feet.

As the deficit continues to grow to approximately 400,000 square feet in PAL 3, cargo buildings will need to be expanded or operations changed to increase the building utilization rate. By PAL 4, a total of approximately 760,000 square feet of cargo building space Airport-wide would need to be added.

Transfer cargo is cargo that is off-loaded from one aircraft and reloaded onto another aircraft. Transfer cargo can be both international and other domestic. This type of cargo often remains in the container and is moved from "tail-to-tail" without being sorted. Transfer cargo was previously predicted to grow at an accelerated rate compared to other cargo operations. However, transfer cargo has declined over the years and now represents little to no cargo operations at the Airport. Generally, transfer cargo requires minimal building space because the cargo is not usually sorted but instead transferred from one plane to the next. The Airport should monitor transfer cargo activities to determine future needs.

Table 4.53
Total Cargo Building Requirements Summary (in square feet)

			Planning Activity Level			
		Existing / Baseline[1]	1	2	3	4
Regional	Warehouse	522,951	179,877	184,940	188,790	191,826
	Support		29,980	30,823	31,465	31,971
	Total		209,857	215,763	220,255	223,797
Other Domestic	Warehouse	30,126	26,990	34,809	44,101	53,815
	Support		4,498	5,801	7,350	8,969
	Total		31,488	40,610	51,451	62,784
International	Warehouse	732,405	624,990	821,338	1,060,343	1,318,468
	Support		208,330	273,779	353,448	439,489
	Total		833,320	1,095,118	1,413,791	1,757,957
Total Building Area Requirement		1,285,482	1,074,665	1,351,491	1,685,497	2,044,539
Total Building Area Surplus (Deficit)			210,817	(66,009)	(400,015)	(759,057)

Source: RS&H, 2014.
Note:
1 - Interpolated 2012 values based on *2013 Anchorage International Airport System Forecast Technical Report* baseline year and growth rate.

5.3 CARGO APRON

The requirements for air cargo apron can vary considerably based on the size of aircraft projected to use the ramp as well as the tenant's operational requirements. For planning purposes, cargo apron facility requirements were based on the maximum number of aircraft that are forecasted to be on the ground at any one time on the average day during the peak month. This was determined from the gated design day flight schedule.

The number of aircraft on the ground was further subdivided into the following operational categories: transit cargo carriers, FedEx, UPS, and other cargo carriers. The category of other cargo carriers includes all cargo carriers that are not considered transit, FedEx, or UPS. This methodology was used because each of the operational tenants has unique apron space requirements at the Airport.

Cargo apron facility requirements include areas needed for aircraft parking, circulation, and ground support equipment (GSE) storage areas. GSE storage areas were estimated to be 10% of the overall apron requirement based on existing conditions at the Airport. It was determined that existing GSE storage area requirements are based on tenant operational needs. Future requirements assume that carriers will continue to operate in the future as they do today. For FedEx, UPS, and other cargo carriers, circulation areas generally include a single taxiway system behind the aircraft parking position so that aircraft can be pushed back.

For transit cargo, Airport-managed apron requirements include a taxiway system in front of and behind the aircraft to allow flow-through circulation. This is consistent with current transit carrier operations. Dual circulation allows the transit aircraft to pull straight into a parking position and pull straight out without needing to be pushed back by a tug; this allows for more efficient transit operations because of the short duration that transit aircraft are on the ground. Transit operators typically require less than one hour to refuel. Transit parking operators also regularly utilize four parking positions on the north side (Gates N1, N3, N5, N7) of the North Terminal, so this apron area was included in the analysis.

Cargo apron requirements are expected to double during the planning horizon. However, only transit aircraft (i.e., Aircraft Design Group (ADG)-V, Boeing 747-8, and ADG-VI) demand will exceed the existing available apron. For FedEx, UPS, and other cargo operations, current apron areas can meet demand through the planning horizon. A summary of cargo apron requirements is shown in **Table 4.54.** The same requirements broken down by aircraft size and type, but shown for the baseline year, PAL 2, and PAL 4, are presented in **Table 4.55**.

To develop specific apron requirements for each tenant category, the ADG or size of aircraft represented in the forecast was used. For the purposes of this analysis, the following aircraft groupings were used: turbo prop, ADG-III, ADG-VI, ADG-V, Boeing 747-8F, and ADG-VI. Although the Boeing 747-8F falls within the lowest wingspan range of the ADG-VI classification, it was split out from the overall ADG-VI category to avoid overestimating apron requirements in the near term. The forecast suggests that the Airbus A380 is not expected to operate at the Airport until late in the planning horizon, near PAL 4, when one A380 and eight Boeing 747-8Fs are projected during the peak period. Since relatively few operations of full-size ADG-VI aircraft, such as the Airbus A380, occur in the forecast, apron requirements were based on the specific needs for the Boeing 747-8F aircraft. This analysis takes into account the parking positions that could be up-gauged to accommodate larger aircraft, with reduction in the number of positions, where possible.

Table 4.54
Cargo Apron Requirements (in square yards)

				Planning Activity Level			
		Existing	Baseline[1]	1	2	3	4
Airport Managed Parking	Parking	243,415	258,800	100,319	105,200	121,185	139,600
	Circulation			165,914	173,900	199,339	228,500
	Total			266,233	279,100	320,525	368,100
FedEx Parking	Parking	163,238	75,200	46,649	64,800	70,223	76,100
	Circulation			44,962	62,500	66,191	70,100
	Total			91,611	127,300	136,414	146,200
UPS Parking	Parking	127,190	93,000	53,885	64,000	71,330	79,500
	Circulation			48,760	57,000	61,752	66,900
	Total			102,645	121,000	133,082	146,400
Other Cargo Tenant Parking	Parking	277,139	68,900	39,469	62,000	73,823	87,900
	Circulation			40,410	83,200	64,884	101,000
	Total			79,878	145,200	138,707	188,900
Subtotal Apron Area		-	-	540,367	672,600	728,728	849,600
GSE Requirement at 10%		-	-	54,037	67,260	72,873	84,960
Total Apron Area		810,981	545,490	594,404	739,860	801,600	934,560
Total Apron Area Surplus (Deficit)		-	-	216,577	71,121	9,381	(123,579)

Source: RS&H, 2014.
Note: GSE = Ground Service Equipment, UPS = United Parcel Service
1 - Interpolated 2012 values based on *2013 Anchorage International Airport System Forecast Technical Report* baseline year and growth rate.

There are 810,981 square yards of existing apron available for cargo operations, which exceeds the baseline apron requirement (see **Table 4.55** for aircraft type breakdown). Anecdotal evidence suggests that this is accurate because the northern most portions of the North Airpark appear to be underutilized today. However, cargo apron facility requirements are expected to almost double during the planning horizon. Additional cargo apron is required to meet demand at PAL 2. The majority of the additional apron area is required to accommodate transit cargo operations during peak hours. A total of 18 Airport-managed parking positions are required to accommodate transit cargo demand, based on the average day peak month. However, the gated design day schedule represents operations in the Airport's peak operational month of July, whereas cargo demand peaks in October. As such, additional cargo parking positions may be required. The accommodation of these Airport-managed parking positions will be further addressed in **Chapter 5**, Alternatives Development and Evaluation.

Table 4.55 Detailed Cargo Apron Facility Requirements

		Baseline[1]				PAL 2				PAL 4			
Functional Area	Aircraft Type	Peak Hour Operations	Apron Space (Parking)	Apron Space (Circulation)	Total Apron Space	Peak Hour Operations	Apron Space (Parking)	Apron Space (Circulation)	Total Apron Space	Peak Hour Operations	Apron Space (Parking)	Apron Space (Circulation)	Total Apron Space
Airport-Managed Parking	ADG-IV	1	5,100	10,100	15,200	1	5,100	10,100	15,200	0	0	0	0
	ADG-V	12	92,400	151,200	243,600	11	84,700	138,600	223,300	13	100,100	163,800	263,900
	Boeing 747-8	0	0	0	0	2	15,400	25,200	40,600	4	30,800	50,400	81,200
	ADG-VI	0	0	0	0	0	0	0	0	1	8,700	14,300	23,000
				Airport-Managed Apron Space Requirement	258,800			Airport-Managed Apron Space Requirement	279,100			Airport Managed Apron Space Requirement	368,100
FedEx Parking	Turbo Prop	0	0	0	0	1	900	2,800	3,700	2	1,800	5,600	7,400
	ADG-IV	6	30,600	30,600	61,200	8	40,800	40,800	81,600	4	20,400	20,400	40,800
	ADG-V	1	7,700	6,300	14,000	3	23,100	18,900	42,000	7	53,900	44,100	98,000
				FedEx Apron Space Requirement	75,200			FedEx Apron Space Requirement	127,300			FedEx Apron Space Requirement	146,200
UPS Parking	ADG-IV	5	25,500	25,500	51,000	5	25,500	25,500	51,000	2	10,200	10,200	20,400
	ADG-V	3	23,100	18,900	42,000	5	38,500	31,500	70,000	9	69,300	56,700	126,000
				UPS Apron Space Requirement	93,000			UPS Apron Space Requirement	121,000			UPS Apron Space Requirement	146,400
Other Cargo Tenant Parking	Turbo Prop	4	3,600	11,200	14,800	10	9,000	28,000	37,000	8	7,200	22,400	29,600
	ADG-III	3	6,000	9,900	15,900	6	12,000	19,800	31,800	7	14,000	23,100	37,100
	ADG-IV	1	5,100	5,100	10,200	2	10,200	10,200	20,400	1	5,100	5,100	10,200
	ADG-V	2	15,400	12,600	28,000	4	30,800	25,200	56,000	4	30,800	25,200	56,000
	Boeing 747-8	0	0	0	0	0	0	0	0	4	30,800	25,200	56,000
				Other Tenant Apron Space Requirement	68,900			Other Tenant Apron Space Requirement	145,200			Other Tenant Apron Space Requirement	188,900
				Subtotal	495,900			Subtotal	672,600			Subtotal	849,600
				GSE Apron Requirement	49,590			GSE Apron Requirement	67,260			GSE Apron Requirement	84,960
								Total Apron Requirement				Total Apron Requirement	
				Total Apron Requirement	545,490			Total Cargo Apron Requirement	739,860			Total Cargo Apron Requirement	934,560

Source: RS&H, 2014; *2013 Anchorage International Airport System (AIAS) Forecast Technical Report* (AIAS Forecast).
Notes: ADG = Airplane Design Group, GSE = Ground Services Equipment, UPS = United Parcel Service
1 - Interpolated 2012 values based on AIAS Forecast base year and growth rate.

Page intentionally left blank

The UPS apron provides the required number of aircraft parking positions to meet forecasted demand. However, total apron area would need to be increased by approximately 19,000 square yards by PAL 4 to accommodate GSE storage needs and additional circulation.

5.4 CARGO LANDSIDE

In addition to the buildings and aprons used by cargo carriers, numerous landside facilities are needed to support cargo operations. Landside facilities that support cargo operations include employee and truck parking, cargo loading, unloading and staging areas, access roads, other functions, and landscaping. Approximately 10% to 20% of all space leased by cargo / cargo-related tenants at the Airport is used for landside functions.

Currently, several deficiencies exist with landside facilities needed to support cargo operations. For example, insufficient employee parking causes employees to park on the side of Lockheed Avenue, partially obstructing the road.

A cargo landside planning factor of 30% of cargo apron requirements (excluding GSE) was used to estimate landside facility requirements. The planning factor was determined by evaluating current landside usage and factoring in tenant landside constraints. Projections indicate that cargo landside requirements will more than double over the planning horizon from 120,008 to more than 250,000 square yards. **Table 4.56** shows the total cargo landside requirements.

Table 4.56
Total Cargo Landside Requirements (in square yards)

		Planning Activity Level			
	Baseline[1]	1	2	3	4
Total Landside Area	120,008	162,110	201,780	218,618	254,880
Total Landside Area Surplus (Deficit)	-	(42,100)	(81,770)	(98,610)	(134,870)

Source: RS&H, 2014.
Note:
1 - Interpolated 2012 values based on *2013 Anchorage International Airport System Forecast Technical Report* base year and growth rate.

5.5 TOTAL CARGO ACREAGE SUMMARY

Table 4.57 shows the total cargo acreage summary. This table combines the cargo apron, building, and landside requirements into a total cargo area to understand the total space that cargo operations will require during the planning horizon. During the planning horizon, cargo acreage requirements will increase from approximately 181 acres to nearly 293 acres. Ratios of the area required for buildings compared to the areas needed for apron and landside are provided for reference. Within the planning horizon, the area needed for buildings will increase slightly from 14% to 16% of the total cargo area requirement.

Table 4.57
Total Cargo Acreage Summary

		Planning Activity Level			
	Baseline[1]	1	2	3	4
Area (square yards)	808,329	875,920	1,091,805	1,207,495	1,416,610
Area Surplus (Deficit) (square yards)		(67,591)	(283,475)	(399,165)	(608,280)
Area (acres)	167.0	181.0	225.6	249.5	292.7
Area Surplus (Deficit) (acres)	-	(14.0)	(58.6)	(82.5)	(125.7)
Cargo Building to Total Area Ratio	18%	14%	14%	16%	16%
Cargo Apron / Landside to Total Area Ratio	82%	86%	86%	84%	84%

Source: RS&H, 2014.
Note:
1 - Interpolated 2012 values based on *2013 Anchorage International Airport System Forecast Technical Report* base year and growth rate.

SECTION 6
GENERAL AVIATION REQUIREMENTS

General aviation facility requirements were determined for general aviation buildings, apron, and landside areas. General aviation includes all aviation activity outside of those air carriers that operate under Part 121, Part 129, or Part 135 of Chapter 14 of the Code of Federal Regulations. General aviation facility requirements include the based and transient general aviation aircraft operating at Ted Stevens Anchorage International Airport (Airport). Facility requirements for the Lake Hood Airport are not directly addressed in this document. The general aviation facilities for Lake Hood Airport and the Airport are jointly discussed in the 2006 *Lake Hood and Anchorage International Airport General Aviation Master Plan*.

6.1 GENERAL AVIATION ACTIVITY FORECAST

The *2013 Alaska International Airport System (AIAS) Forecast Technical Report* (AIAS Forecast) included a forecast of general aviation activity at the Airport. **Table 4.58** presents the forecasted general aviation activity through the planning horizon. The general aviation forecast includes the Airport's general aviation activity and does not reflect operations at Lake Hood Airport.

General aviation operations are forecasted to grow at an average annual rate of 1.4% through Planning Activity Level (PAL) 4. General aviation jet operations are forecasted to grow at a faster rate than overall general aviation, approximately 5% annually.

Table 4.58
Annual General Aviation Operations at the Airport

		Planning Activity Level				Average Annual
	Baseline[1]	1	2	3	4	Growth Rate
Single Engine	4,304	4,094	4,021	4,368	4,866	0.5%
Multi-Engine	4,305	3,970	3,634	3,599	3,750	-0.9%
Turboprop	22,977	23,511	24,162	25,569	27,215	0.9%
Jet	4,988	6,577	8,046	9,788	11,882	5.0%
Total	38,069	38,152	39,863	43,324	47,713	1.4%

Source: RS&H, 2014; *2013 Anchorage International Airport System (AIAS) Forecast Technical Report* (AIAS Forecast).
Note:
1 - Interpolated 2012 values based on AIAS Forecast baseline year and growth rate.

6.2 EXISTING GENERAL AVIATION FACILITIES

General aviation facilities at the Airport are primarily located in the East and South airparks. The Airport's general aviation facilities include three fixed-base operators, a State-owned 30-small-aircraft tie-down area, and several other air-taxi and medevac providers. Airfield access between the Airport and the Lake Hood Airport is provided via Taxiway V. A detailed description of the existing general aviation facilities at the Airport is presented in **Chapter 2**, Inventory of Existing Conditions.

6.3 GENERAL AVIATION BUILDING

General aviation buildings include aircraft hangars, fixed-base operator terminals, administrative offices, building support space for operations and maintenance, fueling, and ground support equipment storage areas. Building areas for general aviation facilities differ based on the type of activity and aircraft. Requirements were determined for based aircraft facilities, transient aircraft facilities, and general aviation terminals.

6.3.1 BASED AIRCRAFT BUILDINGS

Building space requirements for based aircraft are greater than for transient aircraft. A greater proportion of based aircraft demand hangar space for long-term storage than do transient aircraft that may be at the Airport only for a short period of time. Hangar areas include aircraft storage, aircraft maintenance equipment storage, general storage, and administrative office.

In determining based aircraft building requirements, it was assumed that all helicopters, all jet aircraft, and half of the turboprop aircraft were stored in conventional hangars. These aircraft types are typically more expensive than single- and multi-engine piston aircraft, so it is reasonable to assume that more protective storage accommodations would be used for these aircraft types. This assumption generally aligns with the observations and assumptions in the *2006 Lake Hood and Anchorage International Airport General Aviation Master Plan*. Single-engine piston, multi-engine piston, and the remaining half of the turboprop aircraft are assumed to be stored on the apron using tie-downs.

Planning factors for the aircraft storage hangar area are as follows:

- Turboprop aircraft = 1,900 square feet
- Jet aircraft = 3,500 square feet
- Helicopters = 1,800 square feet

Turboprop and jet aircraft space requirements are based on the 2006 Lake Hood and Anchorage International Airport General Aviation Master Plan assumptions. The helicopter storage space planning factor is based on general helicopter dimensional requirements. The forecasted number of based aircraft is multiplied by the corresponding planning factor to determine based aircraft storage space requirements.

Based aircraft storage space requirements are as follows:

- Baseline (2012) = 108,550 square feet
- PAL 4 (2030) = 184,320 square feet

Support space needed for based aircraft was estimated from the proportion of hangar space dedicated to aircraft storage and support space as documented in the *2006 Lake Hood and Anchorage International Airport General Aviation Master Plan*. In that Master Plan, 33% of the total hangar space was used for support functions, while the remaining 67% was allocated for aircraft storage. When these ratios are applied, the based aircraft support space requirements are anticipated to increase from 53,465 square feet in the baseline year to 90,785 square feet in PAL 4. The total based aircraft hangar space is anticipated to increase from 162,015 in the baseline year to 275,105 by PAL 4.

6.3.2 TRANSIENT AIRCRAFT BUILDINGS

Transient building requirements were determined based on the observations and assumptions from the *2006 Lake Hood and Anchorage International Airport General Aviation Master Plan*. The analysis assumes that transient aircraft are stored in hangars during the winter months to protect the aircraft from harsh weather.

To determine transient aircraft hangar requirements, transient arrival operations during the average day of the peak winter month were used. The peak winter month was estimated to be 8.8% of the annual transient operations based on the data collected in the *2006 Lake Hood and Anchorage International Airport General Aviation Master Plan*. Transient aircraft arrival operations during the average day of the peak winter month are projected to grow from 11 to 14 operations between the baseline year and PAL 4. It is assumed that most transient aircraft use conventional hangars during the winter.

A planning factor of 10,800 square feet per transient aircraft was used to determine space requirements for transient aircraft. This planning factor is similar to the average area planned for transient aircraft apron areas in the *2006 Lake Hood and Anchorage International Airport General Aviation Master Plan*. This area includes space for support activities such as maintenance and storage of ground support equipment. This planning factor is higher than the based aircraft planning factors because it accounts for a higher Level of Service for transient aircraft storage. The total transient aircraft hangar space is anticipated to increase from 119,050 square feet in the baseline year to 150,465 square feet by PAL 4.

6.3.3 GENERAL AVIATION TERMINALS

General aviation terminals are building facilities that offer general aviation pilot services. This area accounts for pilot lounges, waiting areas, management offices, and circulation space. The existing terminal building utilization rate was evaluated to calculate the projected general aviation terminal building requirements. Terminal building utilization was estimated based on the ratio between the existing square feet of terminal space compared to the number of general aviation operations during the average day peak month. The terminal building utilization rate was then applied to the forecasted average day peak month operations for each of the forecast years. The general aviation terminal requirement is anticipated to increase from 33,400 square feet in the baseline year to 43,315 square feet in PAL 4.

6.3.4 TOTAL BUILDING REQUIREMENTS

The based aircraft building area, transient aircraft building area, and general aviation terminal building area were summed and are presented as the total building area required. The analysis, as shown in **Table 4.59**, indicates that in order to accommodate general aviation demand, additional building space is currently required and that building requirements will steadily increase through PAL 4. General aviation buildings today comprise approximately 358,000 square feet of building space. By PAL 4, the building requirement will grow to approximately 469,000 square feet, which will require the addition of nearly 111,000 square feet of building space.

Table 4.59
Total General Aviation Building Area Requirements (in square feet)

			Planning Activity Level			
	Existing	Baseline[1]	1	2	3	4
Based Aircraft Building	324,873	162,015	188,505	210,095	239,455	275,105
Transient Aircraft Building	-	119,050	119,425	124,880	136,105	150,465
Terminal Building	33,400	33,400	34,565	36,270	39,260	43,315
Total Building Area Required	358,273	314,465	342,500	371,250	414,820	468,880
Total Building Area Surplus (Deficit)	-	43,810	15,775	(12,975)	(56,545)	(110,605)

Source: RS&H, 2014; *2013 Anchorage International Airport System (AIAS) Forecast Technical Report* (AIAS Forecast).
Note:
1 - Interpolated 2012 values based on AIAS Forecast baseline year and growth rate.

6.4 GENERAL AVIATION APRON REQUIREMENTS

General aviation apron requirements, shown in **Table 4.60**, were determined for based aircraft, transient aircraft, and apron circulation areas. Total based and transient aircraft apron requirements were determined from a top-down approach, meaning that total apron requirements were first calculated, after which the individual requirements for based and transient portions were identified.

6.4.1 BASED AND TRANSIENT APRON AREA

Total based and transient apron requirements were calculated by applying a utilization rate to the forecasted number of operations. The utilization rate is estimated based on the total existing apron area compared to the 2012 average day peak month operations. The total existing apron space for all general aviation facilities is 99,530 square yards. Based on the current level of operations during the average day of the peak month, the current utilization rate is calculated to be 634 square yards per operation. Assuming the existing utilization is the desired Level of Service in the future, the current utilization rate was applied to the forecasted average day peak month general aviation aircraft operations to determine the total based and transient apron requirements for the four PALs.

The amount of apron space needed for based aircraft was calculated for single-engine piston, multi-engine piston, and half of the total amount of turboprop aircraft. This generally aligns with the observations and assumptions in the *2006 Lake Hood and Anchorage International Airport General Aviation Master Plan* in that more expensive aircraft (i.e., turboprops, jets, and helicopters) are likely to be stored in more protective facilities, while relatively less expensive aircraft are likely to be stored on the apron.

Forecasts of the number of individual based aircraft by aircraft type were applied to average storage area planning factors to determine the apron requirements for each aircraft type. As a result, single-engine piston aircraft will require 1,200 square feet of additional apron, multi-engine piston aircraft will require 1,500 square feet, and turboprop aircraft will require 1,900 square feet. Apron space to support based aircraft was also calculated, assuming 33% of the total required apron space would be allocated for general support storage and 67% of the total apron space would be used for aircraft storage. The requirement for based aircraft increases from 8,445 square yards in the baseline year to 9,505 square yards by PAL 4.

The apron space required for transient aircraft was calculated by comparing the total apron requirement with the apron requirement for based aircraft. The requirement for transient aircraft increases from 78,045 square yards in the baseline year to 87,805 square yards in PAL 4.

6.4.2 HANGAR CIRCULATION APRON

The hangar circulation apron provides an outdoor area for staging and accessing general aviation aircraft stored in hangars, and is typically located immediately outside hangar doors. The hangar circulation apron is in addition to taxiways and taxilanes used for general movement on the airfield. Hangar circulation apron requirements were calculated based on observations that approximately 15% of total general aviation hangar area is required for hangar circulation apron space. This observation was similar to the 10% cited in the *2006 Lake Hood and Anchorage International Airport General Aviation Master Plan*. Apron circulation area requirements are shown in **Table 4.60**.

The total apron area requirement includes the apron area required for based and transient aircraft plus apron circulation space. Analysis indicates that the existing apron area is adequate to meet the forecasted demand through PAL 3, but will result in a deficit by PAL 4. The requirement for apron circulation area increases from 3,795 square yards in the baseline year to 5,580 square yards in PAL 4.

6.4.3 TOTAL APRON REQUIREMENTS

Total apron requirements, as shown in **Table 4.60**, indicate that additional capacity may be needed prior to PAL 4 when apron requirements of 102,890 square yards slightly exceed the baseline year requirement. An additional 3,360 square yards of general aviation apron area will be required by Planning Activity Level 4.

Table 4.60
Total General Aviation Apron Requirement (in square yards)

			Planning Activity Level			
	Existing	Baseline[1]	1	2	3	4
Based Aircraft Apron		8,445	8,525	8,420	8,845	9,505
Transient Aircraft Apron		78,045	77,055	78,190	82,070	87,805
Hangar Circulation Apron		3,795	4,095	4,425	4,940	5,580
Total Apron Area Required	99,530	90,280	89,675	91,040	95,860	102,890
Total Apron Area Surplus (Deficit)		9,250	9,850	8,490	3,670	(3,360)

Source: RS&H, 2014; *2013 Anchorage International Airport System (AIAS) Forecast Technical Report* (AIAS Forecast).
Note:
1 - Interpolated 2012 values based on AIAS Forecast baseline year and growth rate.

6.5 GENERAL AVIATION LANDSIDE

Landside space needed to support general aviation operations includes vehicle parking lots, general landscaping, and undeveloped side-lots that are part of tenant lease lots. In some cases, tenants use their landside area for overflow snow storage in the winter, indicating that landside areas serve multiple purposes.

The existing area allocated for general aviation landside facilities was estimated based on space takeoffs and aerial photography. Current use indicates that landside facilities represent approximately 18% of all leased areas used for general aviation activities.

Tenant interviews indicated widespread belief that existing general aviation landside area is inadequate. Therefore, the existing general aviation landside area was increased by 20% for the baseline requirements to resolve the existing deficit. The general aviation landside and vehicle parking requirements for PAL 1 through PAL 4 were calculated using the same proportion of annual general aviation operational growth through the planning horizon.

General aviation landside requirements are presented in **Table 4.61**. The analysis indicates that additional landside area may be required immediately. An additional 13,910 square yards of general aviation landside area would be required by PAL 4.

Table 4.61
General Aviation Landside Requirements (in square yards)

			Planning Activity Level			
	Existing	Baseline[1]	1	2	3	4
Total Landside Area	27,597	33,115	33,190	34,680	37,690	41,505
Total Landside Area Surplus (Deficit)		(5,520)	(5,595)	(7,085)	(10,095)	(13,910)

Source: RS&H, 2014; *2013 Anchorage International Airport System (AIAS) Forecast Technical Report* (AIAS Forecast)..
Note:
1 - Interpolated 2012 values based on AIAS Forecast baseline year and growth rate.

6.6 GENERAL AVIATION SUMMARY

The total general aviation land area is expressed as the sum of the building footprint area, apron area, and landside area. The total general aviation area requirements are summarized in **Table 4.62**. Additional general aviation area is required as early as PAL 2. An additional 6.1 acres of general aviation area will be required by PAL 4.

Table 4.62
Total General Aviation Area Requirement Summary

			Planning Activity Level			
	Existing	Baseline[1]	1	2	3	4
Area (square yards)	166,935	158,335	160,920	166,970	179,640	196,495
Area Surplus (Deficit) (square yards)	-	8,600	6,015	(35)	(12,705)	(29,560)
Area (acres)	34.5	32.7	33.2	34.5	37.1	40.6
Area Surplus (Deficit) (square yards)	-	1.8	1.2	0	(2.6)	(6.1)

Source: RS&H, 2014.
Note:
1 - Interpolated 2012 values based on *2013 Anchorage International Airport System Forecast Technical Report* baseline year and growth rate.

Page intentionally left blank

SECTION 7
AIRPORT / AIRLINE SUPPORT REQUIREMENTS

Requirements were determined for various airport / airline support functions including the Airport Traffic Control Tower (ATCT), Aircraft Rescue and Fire Fighting (ARFF) / police and fire, airport security, airport maintenance, snow disposal sites, ground handlers, deicing facilities, ground support equipment storage, fueling facilities, and utilities.

Future airport / airline support area requirements were determined by growing the existing airport / airport support area proportionate with the growth in aircraft operations at Ted Stevens Anchorage International Airport (Airport). The existing area used for airport / airline support operations is 195 acres. It is assumed this area is efficiently utilized. By Planning Activity Level (PAL) 4, the total area required for airport / airline support would be approximately 250 acres. This corresponds to a requirement for approximately 55 acres of additional airport / airline support area.

7.1 AIRPORT TRAFFIC CONTROL TOWER

The existing ATCT has been in its current location since 1977. The *2002 Airport Traffic Control Tower Siting Study for Anchorage International Airport* explored alternatives to replace the existing ATCT. The study concluded that the existing ATCT would continue to adequately serve the Airport in the foreseeable future. However, the current facility and location present some limitations that would need to be considered in future improvement plans.

- The existing tower does not have full visibility of key movement areas on the airfield, specifically portions of Taxiway K and Taxiway R. The visual obstructions are caused by the existing terminal facilities, the Alaska Airlines hangar, and large aircraft parked at positions along Taxiway E. The location and tower cab elevation could hinder long-term airfield development if visibility continues to be an issue. Therefore, future airfield development should consider the potential impact on ATCT visibility. Options include relocating the tower to a different location or reconstructing the tower with a higher cab elevation at or near its existing location.
- The ATCT base and cab are space-constrained. This presents a significant hurdle as there is limited space to upgrade the facility with new and / or larger equipment in the tower structure.
- The tower's location within the passenger terminal complex is also identified as a constraint. The *2002 Airport Traffic Control Tower Siting Study for Anchorage International Airport* cited security concerns with the proximity of the tower to active public roadways. Ideally, the ATCT would be somewhat isolated on a site large enough to provide an adequate security buffer.

Additionally, the presence of the tower in the vicinity of the passenger terminal complex may compromise the long-term ability for the terminal and / or landside to be redeveloped.

7.2 AIRCRAFT RESCUE AND FIRE FIGHTING / POLICE AND FIRE

The Police and Fire Department at the Airport is unique for airports because their services are combined jointly in one department. All personnel are dual-certified to provide police and firefighting services and all department resources are shared. The main building, Station No. 1, was constructed in 1991. Other facilities used by police and fire personnel include Fire Station No. 2 in the South Airpark, which is used to store out-of-service ARFF vehicles, Hangar 46, which is used to temporarily store two water tender vehicles, and fire training / shooting range facilities in the South Airpark west of Taxiway Z.

ARFF operations at the Airport are classified at Index E based on the types of aircraft and number of aircraft in operation. Except as provided in Part 139.319(c), the longest air carrier aircraft with an average of five or more daily departures determines the ARFF Index required for an airport, which in turn determines the specific ARFF standards. Index E applies to airport facilities under which air carrier aircraft are at least 200 feet in length. Based on the *2013 Alaska International Airport System (AIAS) Forecast Technical Report* (AIAS Forecast), it is expected that the Airport will remain classified as an Index E facility.

Through discussions with Airport personnel, police and firefighting needs were identified. It should be noted that today, the ARFF facility meets all requirements mandated by Federal Aviation Regulation (FAR) Part 139, including the required number of vehicles and firefighting capabilities. Vehicle response times also comply with and meet the minimum requirements. Overall, the ARFF facilities conform to guidance provided in applicable Federal Aviation Administration (FAA) Advisory Circulars (ACs) and FAR Part 139. Minimum response times, fire training facilities, and firefighting vehicle capabilities are discussed within this section and reflect the requirements mandated by regulations in FAR Part 139 and guidance in FAA ACs and Orders. Improvements to Station No. 1 are also discussed based on Airport staff interviews.

7.2.1 MINIMUM RESPONSE TIMES

As previously mentioned, minimum response times are met today. However, in discussions with Airport personnel, it was noted that maintaining minimum response times has been more challenging after the westward extension of Runway 7R in 2010. For future planning efforts, if any airfield improvements are made, particularly near the southeast end of the Airport, minimum response times should be considered. It should be noted that runway extensions, shifts, and relocations will also affect the runway midpoint and response times. If necessary, ARFF facilities should be relocated or a secondary facility identified or constructed. One possible solution would be the activation of the existing ARFF Station No. 2 (located in the Kulis Business Park).

Any future airport expansion will generally not require additional ARFF response vehicles. As such, expansion of the Airport will not affect the size of the ARFF facility. However, additional vehicles and personnel may be required to man satellite stations in the event the minimum response times cannot be maintained from a single facility. The minimum response time required to access the midpoint of the farthest runway needs to be assessed as the Airport grows.

7.2.2 ANNUAL LIVE FIRE TRAINING

FAR Part 139 operational requirements oblige ARFF personnel at the Airport to engage in annual live fire training. The Airport's existing hydrocarbon fuel pit allows ARFF personnel to meet that requirement, but it is about 20 years old and needs replacement. The liner has also exceeded its lifespan and needs to be replaced before it fails.

The current fire training facility design also does not meet current environmental regulations regarding discharge of fluids from the facility. A planning effort is underway, and three alternatives are being evaluated to address the existing problems. The three alternatives are 1) constructing an upgraded, open, liquid fuel ARFF pit; 2) installing a propane ARFF training simulator; or 3) using an offsite training facility. If the training facility is changed, an appropriate location should be identified that allows on-duty fire fighters to easily access the airfield from the new training facility in case of an Alert 3 emergency. ARFF personnel have also mentioned a desire for an aircraft mock-up area and room for vehicle accessibility and maneuverability around the trainer.

7.2.3 STATION NO. 1 IMPROVEMENTS

Station No. 1 is the main building that houses police and firefighting operations and is located near the Field Maintenance Facility. In discussions with Airport personnel, concerns regarding space deficiencies were raised. Space deficiency can be attributed largely to the requirements of the combined police and fire departments. The two departments are able to share some facility resources, but their facility requirements are largely dissimilar since they serve different missions. This makes it difficult to accommodate all the required vehicles, equipment, and personnel in a single facility.

Currently, non-essential water tender vehicles are temporarily stored at Hangar 46 in the South Airpark because of insufficient space at Station No. 1. In the event of an Alert 3 emergency, the water tenders need to be retrieved before they can respond to the scene of the incident. Additionally, the entire police patrol vehicle fleet cannot be stored in the station vehicle bays. There is only enough space for a handful of vehicles to be rotated in and out of the station during the winter months.

Additional storage space is needed for firefighting response vehicles and police patrol vehicles near the station. One solution is to man a satellite or auxiliary ARFF station (i.e., Station No. 2 in the South Airpark). This would provide additional space for personnel and equipment as well as benefit ARFF response times. A larger, consolidated facility could also be built to replace the existing station. The present ARFF facility at Station No. 1 is unable to expand on its existing site without significant modifications to the site (e.g., land grading). Relocating the police department to another facility may be another potential solution to address space constraints.

Additional station improvements can be made to benefit operational safety and efficiency. Vehicle drive-through bays are recommended per *FAA Advisory Circular 150 / 5210-15A, Aircraft Rescue and Firefighting Station Building Design*, to facilitate vehicle parking. The AC also recommends heating the apron in cold climates. This would prevent slippery surfaces that could slow down vehicles and affect vehicle response times.

7.2.4 VEHICLES

From discussions with Airport personnel, it was reported that some additional vehicles could improve the ARFF operational capability. A hazardous material vehicle may be required in the future to meet changing environmental regulations. An interior access vehicle may be considered to assist ARFF personnel with emergency passenger evacuation and firefighting. The addition of these vehicles should be considered.

7.3 AIRPORT ACCESS AND SECURITY

The Air Operations Area (AOA) is a portion of the Airport that includes aircraft movement areas, aircraft parking areas, loading ramps, and safety areas. As defined in the *Anchorage International Airport Compendium of Operational Orders (August 20, 2010)*, the AOA is any area of the Airport used or intended to be used for the taxiing, landing, taking off, or surface maneuvering of aircraft and any contiguous area enclosed within the perimeter fence of the Airport. The security measures for the AOA are specified in Title 29 – Transportation, Part 1542 – Airport Security of the Code of Federal Regulations. The Airport does have an established Airport Security Program. Access to the AOA is controlled by the Airport and enforced through the use of an 8-foot-high security fence encompassing a boundary that only permitted personnel and their vehicles may access from specific gates or tenant facilities. At the Airport, the AOA marks the boundary of the Security Identification Display Area (SIDA). The only exception is with a portion of the SIDA that extends beyond the AOA fence located south of Runway 7R-25L. A separate Airport perimeter fence restricts public access to SIDA areas that are outside the AOA fence line.

Only vehicles necessary for airport operations and support are authorized to access the AOA. Within airfield movement areas, which generally include the runway and taxiway system, all vehicles must be equipped with a radio capable of communicating with ATCT or be escorted by a vehicle with that capability. Any vehicle entering the general AOA through designated gates or tenant leaseholds must be marked with a clearly visible company decal / logo or name affixed on each side of the vehicle, be licensed, and have the appropriate airport registration decal or temporary ramp permit prominently displayed. One of the tasks within the Airport Master Plan Update process was to review the AOA access issues relative to FAA and Transportation Security Administration (TSA) requirements, as well as tenant convenience and levels of service. FAA, TSA, and Airport requirements were considered and an effort was made to identify AOA access and security issues through interviews with Airport staff and tenants. There were several issues raised.

One of the concerns raised at the start of the master planning process was that in the East Airpark, several service providers are currently without direct access to the AOA, although they provide services within the AOA. There is currently only one access gate for vehicles in the East Airpark, thus creating a situation where licensed and unlicensed service vehicles drive on public streets to access one gate. This is an inconvenience and can create congestion on public streets, besides the fact that operating unlicensed vehicles on a public road is illegal. A potential solution to this could be to install more access gates. However, to minimize the frequency at which these vehicles operate in public areas, another potential solution could be to increase the airfield frontage by reconfiguring or deepening the existing lots to create more airfield access points via connected ramp areas. This change would increase available airfield access and most likely the value of the lots that currently do not have airfield access. However, additional security measures would need to be employed, such as additional ramp patrolling and challenge procedures within controlled areas, scissor gates to separate public and secure sides of tenant buildings, and use of electronic control devices such as a security camera and identification badging system.

Another concern raised by tenants in the North Airpark was the convenience of tug carts or service vehicles traveling to and from the U.S. Post Office. Many tenants located north of Lockheed Avenue use the North Tug Road to access the U.S. Post Office to pick up mail. The North Tug Road is a restricted, non-public roadway leading from Gate N10 that runs parallel to Postmark Drive. The only way to access the North Tug Road today is to either 1) go around on Northern Lights Boulevard and enter North Tug Road near Postmark Drive or 2) go south and interact with large aircraft near the United Parcel Service (UPS) and FedEx leaseholds. Both routes are inconvenient for delay and safety reasons. A solution would be to create another service road going through the tenant leaseholds located north of Lockheed Avenue. However, the land areas north of Lockheed Avenue are constrained, and adding a service road would most likely require decreasing or reconfiguring the leaseholds of existing tenants. These same tenants also expressed a desire for safer access to the U.S. Post Office, particularly when crossing Postmark Drive. These concerns will be addressed in the alternatives development process.

7.4 AIRPORT MAINTENANCE

Airport maintenance requirements were determined for airfield and landside areas and focus on snow storage areas, pavement and aircraft deicing areas, and storage for materials used to remove snow and ice, as well as Airport-owned equipment.

The requirements for airport maintenance facilities and activity cannot be tied to aviation activity metrics such as operations, passenger counts, or cargo tonnage. Requirements for equipment and materials storage are more closely correlated to the amount of maintained land area (pavement and grassy area). For example, as airfield pavement area increases, the amount of equipment required to perform snow removal and pavement deicing operations will need to increase relatively. This includes airport-maintained airside pavement as well as landside pavement.

Due to Alaska's cold weather climate, peak operations for Airport field maintenance personnel occur during the winter months. Therefore, the winter season, which generally extends from October through April, was the focus of the analysis.

7.4.1 SNOW STORAGE

Facility requirements for snow storage areas are generally based on several variables: the annual amount of snow precipitation, the total area of pavement being cleared, and the number of snowmelt days between storms.

The Airport has unique weather characteristics that contribute to requiring large areas of snow storage. The Airport has an average winter snowfall of 75.5 inches, with average daytime winter temperatures ranging between 5 and 30 degrees Fahrenheit. Snow fall as well as freezing rain can be expected from October through April, with November through January yielding the greatest snowfall. These conditions offer limited opportunities for snow to melt between storms, and snow therefore needs to be plowed, moved, and stored until warmer temperatures return in the spring and summer months.

Snow storage facility requirements were determined by calculating a planning factor based on the ratio of existing snow storage areas compared to the amount of pavement being cleared. This method assumes that existing snow storage areas are adequate to handle the annual snowfall amount and the total area of pavement being cleared. Discussions with Airport maintenance personnel indicate that existing snowfall areas are adequate to store snow, although the snow storage areas may not be in the most convenient areas.

Separate planning factors were determined for landside and airside facilities so that snow storage facilities can be planned for the individual needs in each of those areas. Snow storage facilities are best located in close proximity to the facilities being cleared, both to minimize the time and travel distance between the areas and to avoid snow removal vehicles needing to pass through security gates. Also, snow gathered from the airside areas is often contaminated with urea and deicing agents and must be handled separately from non-contaminated snow.

Snow storage facility requirements assume that historic weather patterns will continue into the future. Therefore, only the expansion or addition of new pavement areas will increase the snow storage area requirements. Airport field maintenance maintains more than 800 acres of pavement area. The areas of pavement currently being cleared of snow are shown in **Table 4.63.**

Table 4.63
Existing Pavement Areas Applicable to Snow Removal Operations

Airport Areas[1]	Airport Areas including Lake Hood Airport (square feet)[2]	Airport Areas (acres)
Runways	9,842,968	246
Taxiways	13,461,815	307
General Aviation[3]	1,509,055	35
Landside	3,928,320	90
Apron	5,574,521	128
Total[4]	34,316,700	806

Source: Alaska Department of Transportation and Public Facilities, *2012 Snow Removal Plan*.
Notes:
1 - Includes Lake Hood Airport.
2 - Figures taken from *Anchorage International Airport Snow Removal Plan 2012/2013 Winter Season*. Numbers may not sum exactly due to rounding.
3 - Assumed to be all inclusive of Lake Hood Airport except Taxiway V.
4 - Includes 14,756,773 square feet of AOA pavement west of Taxiway R.

Pavement within the runways, taxiways, general aviation, and apron areas were combined into a single airfield category for simplification. The total airfield pavement area is approximately 34,316,700 square feet (roughly 806 acres).

Numerous snow storage areas at the Airport are designated for use by Airport airfield maintenance crews and tenants. The Airport airfield maintenance section uses both temporary and permanent snow storage areas. Temporary snow storage areas are used during high-volume storms to store snow for short time periods when there is not enough time to remove snow to a permanent storage area. During heavy snowfall periods, temporary snow storage areas may include aircraft parking spots, R2, R3, R4, R14, P1, and Gate N2. A determination must be made of whether snow is considered clean "landside snow" or dirty "AOA airside snow," which may include deicing chemicals, so that dirty snow can be stored in locations farthest from Lakes Hood and Spenard. Once a storm has subsided, the accumulated snow can be relocated to a permanent disposal site. The total area available for snow storage is shown in **Table 4.64.**

Table 4.64
Snow Storage Areas (in square feet)

Airport Areas	Landside	Airside	Total
Temporary Snow Storage Sites	215,217	236,187	451,404
Snow Disposal Site Maintained by Field Maintenance	779,540	915,734	1,695,274
Snow Disposal Site Maintained by Lease Tenants	80,482	446,715	527,197

Source: Alaska Department of Transportation and Pubic Facilities, *2012 Snow Removal Plan*.

Planning factors were determined based on the existing ratio between snow storage areas and pavement area. Separate planning factors were established for snow storage requirements for both landside and airside areas. Temporary and permanent snow storage area requirements were combined to identify the maximum area that would be needed, yet to allow for future flexibility to allocate the amount of temporary and permanent areas desired. The planning factor for airfield disposal sites is 0.038, which represents the ratio between the airfield disposal sites and total pavement area from which snow is removed. The planning factor for landside snow storage sites is 0.25. Where snow storage sites accommodate airside and landside facilities, the planning factor is 0.063. These planning factors assume that all landside snow storage areas are used only for landside snow. If airside snow is placed on the landside, then the planning factor changes and the amount of storage space needed in the future will be greater.

Future snow storage area requirements can be affected by several potential events that would increase the pavement areas needing to be cleared of snow. Three hypothetical growth scenarios were developed to simulate the increased pavement area from which snow must be removed for the purposes of this **Chapter 4**, Facility Requirements. No years or demand levels are associated with the hypothetical scenarios to suggest when the pavement areas might be added. In addition, there may be other scenarios with pavement additions not currently planned for that would trigger the need for additional snow storage areas.

Hypothetical Growth Scenario 1 would add the helicopter apron area in the Kulis Business Park. The existing pavement in this area would become the responsibility of airport field maintenance under this hypothetical scenario.

Hypothetical Growth Scenario 2 would construct additional apron area adjacent to the "Papa" spots in the Postmark Bog.

Hypothetical Growth Scenario 3 would construct a portion of the West Airpark as apron and taxiway area.

The hypothetical pavement quantities for each of the three growth scenarios are identified in **Table 4.65**.

Table 4.65
Hypothetical Growth Scenarios

Hypothetical Growth Scenario	Additional Pavement Area (square feet)
1 - Kulis apron addition	185,732
2 - Papa spots addition	847,705
3 - West Airpark addition	4,596,820

Source: RS&H, 2014.

It is recognized that these scenarios are independent of one another and that over time, all are possible. Therefore, future snow storage area requirements reflect the needs for each scenario separately as well as the combined total requirement. The additional snow storage area requirements in the future are summarized in **Table 4.66**.

Table 4.66
Snow Storage Requirements (in square feet)

	Existing Storage Area	Scenario 1	Scenario 2	Scenario 3
Area Requirement	2,146,680	2,153,780	2,178,980	2,321,380
Area Surplus (Deficit)	-	(7,100)	(32,300)	(174,700)

Source: RS&H, 2014.

Whether or not environmental regulations affecting stormwater discharges increase in the future is uncertain. Likewise, the possible methods to contain, collect, and treat contaminated snow and stormwater in the future are also uncertain. Therefore, the individual requirements for dirty and clean snow storage areas would need to be determined once the containment and collection processes are selected.

As pavement area grows, the need for additional snow storage areas should be evaluated. Currently field maintenance personnel use apron areas at R2, R3, R4, R14, P1, and Gate N2 at the North Terminal as temporary snow storage areas during the winter months. As demand for aircraft parking positions increases, these positions may not be available for snow storage needs. Demand for aircraft parking positions during the winter months should be monitored, and alternate snow disposal sites should be identified as conflicts arise.

A snow storage requirement for the preferred Airport alternative is described in **Chapter 5**, Alternatives Development and Evaluation.

7.4.2 DEICING

Aircraft deicing and anti-icing operations are conducted to prevent or remove frozen accumulations of snow and ice from aircraft to ensure safe flight operations. Deicing is performed when snow, ice, or any frozen accumulations are occurring or are likely to occur. The deicing season at the Airport generally occurs from October through April.

Aircraft deicing activities at the Airport are the responsibility of the air carriers, fixed-base operators (FBOs), and aircraft ground support equipment providers. Airport passenger and cargo aircraft are deiced prior to taxiing from a hardstand, or at or near the departure gate. Technical stop hardstand R7 and Taxiway L are occasionally used for deicing when holdover times require an immediate departure after completion of deicing. The primary chemicals used for aircraft deicing at the Airport are propylene and ethylene glycols. Airport service providers have adequate manpower and equipment to deice aircraft.

The Airport operates under a U.S. Environmental Protection Agency (USEPA) National Pollutant Discharge Elimination System (NPDES) multi-sector general permit (MSGP) for stormwater discharges associated with industrial activities. The current permit expired in October 2013. However, the Alaska Department of Environmental Conservation (ADEC) has administratively extended the permit until a new permit can be issued. The new permit is anticipated to have few, if any, changes. The existing permit covers discharges into Lakes Hood and Spenard and into Cook Inlet. Lakes Hood and Spenard were listed on the USEPA 303d list for impaired water bodies due to the low dissolved oxygen (DO) levels in the lakes. The low DO levels were attributed to glycol runoff.

The water quality in the lakes has improved because deicing in the East Airpark was disallowed. The Airport plans to implement stormwater diversions to support this process. A majority of runoff from deicing activities around the main terminals now drains into Cook Inlet. Glycol-contaminated snow is removed to a site at the west end of the Airport between Taxiway K and Runway 7R.

The USEPA published proposed Effluent Limitation Guidelines on August 28, 2009 that contained numerous provisions with which the Airport would have had to comply regarding discharges of waste from deicing operations. The Airport would have been required to collect and treat 60% of applied Aircraft Deicing Fluid prior to discharge into receiving waterbodies. Numeric limits would have been imposed for chemical oxygen demand (COD) of the discharged stormwater runoff. The proposed Effluent Limitation Guidelines would have applied to all existing primary airports and any new construction of runways at those airports (Federal Register 2012, 40 CFR 449).

The final ruling published May 16, 2012, as it applies to the Airport and existing operations, is less prescriptive than the proposed rule. Aircraft deicing operations must comply with effluent limitations represented by the application of the best available technology (BAT) economically feasible. The definition of BAT requirements is based on site-specific conditions, best professional judgment, and the discretion of the permit writer (Federal Register 2012, 40 CFR 449). The final ruling will not have any immediate impact on aircraft deicing operations at the Airport. The Airport should, however, be prepared for increased regulation of aircraft deicing within the planning horizon.

Drainage improvements (trench drains) were recently made on the South Terminal apron to facilitate the collection of used glycol. The improvements include options for moving the contaminated fluid to a proposed central equalization basin and treatment facility. Implementation of an equalization basin and treatment facility would require 2 to 8 acres depending on the drainage management strategy used. The Airport investigated the feasibility of centralized deicing stations in 2004. Based on SIMMOD (airfield / airspace simulation software) analysis, the Airport will need capacity to deice up to 30 aircraft during the peak hour of the average day of the peak month in 2020. To date, centralization has not been pursued because the traffic analysis suggests that unacceptable delays would result. UPS and FedEx also indicated a preference for continuing to manage their own deicing operations. A range of future drainage management strategies is possible depending upon the intended level of efficiency for the collection of spent deicing fluid. Each strategy has different equipment needs, operational demands, space requirements, and capital costs. However, if the Airport were to opt for a strictly centralized deicing system, seven centralized wide-body deicing pads may be required to accommodate peak hour traffic with minimal delays.

The Airport should continue to work with air carriers and operators toward the implementation of aircraft deicing management strategies that emphasize source reduction and the treatment of collected wastes. Strategies may include the following:

- Work with air carriers and operators and continue to evaluate new application technologies.
- Continue to integrate separate deicing collection systems with new drainage system improvements, with the overall goal of increasing collection efficiencies.
- Set aside land for future storage basins and potential pre-treatment or treatment facilities.
- As the Airport plans for future expansion of aprons, terminals, and capacity, include deicing management practices with expansion projects.

These strategies and recommendations should be considered to allow flexibility for the Airport, air carriers, and operators to meet the ever-changing regulatory requirements while providing safe conditions for passengers and cargo.

Deicing Pad

As part of the *2013 Alaska International Airport System (AIAS) Planning Study* (AIAS Planning Study), a deicing pad study was completed to determine the number of hardstands needed through the planning horizon. Based on completed SIMMOD analysis, the Airport would need to deice up to 30 aircraft during the peak hour of the average day of the peak month by PAL 2 (2020). Should centralized deicing be implemented to accommodate future USEPA deicing requirements, a total of 10 wide-body deicing pads for 30 wide-body departures during the peak hour or wide-body pads for 30 narrow-body departures during the peak hour would be needed. Given the forecasted fleet mix at the Airport, seven pads would be needed as well as space to accommodate 16 to 18 trucks.

Anti-Icing Material Storage

Requirements for pavement deicing / anti-icing materials are similarly correlated to the amount of maintained pavement area at the Airport. The aforementioned three hypothetical growth scenarios in the snow storage requirements were used for this analysis since the anti-icing material storage requirements are also dependent on pavement additions. Quantity and storage area requirements for the preferred airport alternative are described in **Chapter 5**, Alternatives Development and Evaluation.

Deicing materials (sand, liquid deicer, and solid deicer pellets) are normally applied simultaneously with snow removal operations in order to maintain adequate braking characteristics. In some areas, this is dependent on pavement icing conditions. Much of the materials are stored in the Airport's field maintenance quick-turnaround facility. A majority of the material is purchased in bulk in advance of the winter season. Therefore it is desirable that storage requirements are sufficient for an entire winter season's worth of material.

The ratio of pavement area that is served with each square foot of stored material (pavement area / material storage area) was determined. This includes areas at Lake Hood Airport (which are maintained by Airport field maintenance personnel).

Increases in pavement area would require increases in material storage requirements. This refers to construction / extension of runways and taxiways but also conversion of runways and taxiways to Airplane Design Group VI standards.

Sand

Sand is used as a deicing and anti-icing agent to improve aircraft braking and turning capabilities. Airfield sand is applied to runways, taxiways, and aprons. Airfield sand storage occupies a 10,000-square-foot area within the quick-turnaround facility. There is additional storage space at the Old Fire Station and the Kulis Sand Shed. Airport field maintenance operations require a 6,000-ton supply of airfield sand, annually, to serve the Airport. Only about 75% (4,500 tons) of the required sand volume is stored inside the facility, while the remaining 1,500 tons are stored outdoors because of space limitations inside the building.

Sand stored outside freezes together in the winter and must be thawed before it can be used. Guidance provided in *FAA Advisory Circular 150 / 5220-18A, Buildings for Storage and Maintenance of Airport Snow and Ice Control Equipment and Materials*, recommends that dry materials (i.e., sand and solid deicing / anti-icing materials) should be stored in a sheltered structure or conditioned environment to prevent material deterioration. Dry and warm storage conditions prevent material caking so that the sand can be used as needed without chipping.

The quick-turnaround facility would require an additional 3,335 square feet of storage area to accommodate the sand stored outside. The three hypothetical growth scenarios increase the additional sand storage requirement from 5,595 square feet in Scenario 1 to 7,845 square feet in Scenario 3 – about 6,035 tons to 6,910 tons of sand, respectively. It is assumed that the application rate for sand stays constant and any additional required sand would be stored in a similar way to the existing material. **Table 4.67** describes the storage requirement for each deicing material and **Table 4.68** describes the required weight of each deicing material.

Solid Deicer (Sodium Acetate / Sodium Formate)

Airport airfield maintenance personnel apply solid deicer (sodium acetate or sodium formate) to runways, taxiways, and aprons. However, solid deicer is not used on taxiways west of Runway 15-33 or on apron areas unless safety dictates its use. Therefore, for the purposes of the analysis, it is assumed that solid deicer would be applied to all runways and only taxiways east of Runway 15-33.

Currently, 10,000 square feet of space is allocated for storage of solid deicer in the quick-turnaround facility. This area is used to store the required 2,000 tons of material. The assumption was made that the storage space for solid deicer is at capacity and any additional material that needs to be stored exceeds the storage capacity. That said, all of the hypothetical growth scenarios include additional taxiway areas west of Runway 15-33 or additional apron area – all areas where solid deicer would not be applied except in cases where safety dictates its use. Therefore, Hypothetical Growth Scenarios 1, 2, and 3 maintain the existing quantity and storage area for solid deicer.

Table 4.67
Deicing and Anti-icing Material Storage Requirement (in square feet)

		Existing Storage Area	Baseline Requirement	Scenario 1	Scenario 2	Scenario 3
Sand	Requirement	10,000	15,500	15,595	15,930	17,845
	Surplus (Deficit)		(5,500)	(5,595)	(5,930)	(7,845)
Solid	Requirement	10,000	10,000	10,000	10,000	10,000
Deicer	Surplus (Deficit)		0	0	0	0
Liquid	Requirement	1,475	1,275	1,965	1,965	1,965
Deicer	Surplus (Deficit)		200	(490)	(490)	(490)

Source: RS&H, 2014.
Note: Values in parentheses indicate excess quantity and ability to meet projected demand.

Table 4.68
Deicing and Anti-icing Material Volumes / Weights

		Baseline Requirement	Scenario 1	Scenario 2	Scenario 3
Sand	Requirement (tons)	6,000	6,035	6,165	6,910
	Surplus (Deficit) (tons)	(2,130)	(2,165)	(2,295)	(3,035)
Solid	Requirement (tons)	2,000	2,000	2,000	2,000
Deicer	Surplus (Deficit) (tons)	0	0	0	0
Liquid Deicer	Requirement (gallons)	160,175	185,925	190,325	212,935
	Surplus (Deficit) (gallons)	25,125	(630)	(5,025)	(27,640)
	Requirement (no. of tanks)	3	4	4	4
	Surplus (Deficit) (no. of tanks)	0	(1)	(1)	(1)

Source: RS&H, 2014.
Note: Values in parentheses indicate quantity deficit and inability to meet projected demand.

Liquid Deicer

Liquid deicer is applied to runways, taxiways, and apron areas to prevent ice buildup. It is also applied to public roadways in some situations. Liquid deicer is stored in three tanks outside the quick-turnaround facility. The three tanks have a combined capacity of 185,000 gallons of liquid deicer and they occupy approximately 1,475 square feet of area. Currently the existing average annual demand for liquid deicer is 160,000 gallons.

It is assumed that any additional liquid deicer would be stored in tanks of a similar size as the existing tanks. Any requirement for additional liquid deicer storage beyond the capacity of the existing tanks would require additional tanks, regardless of the amount by which the capacity threshold is exceeded. Storage requirements for liquid deicer increase to four tanks to accommodate the demand presented in all of the hypothetical growth scenarios. Total storage area for the four tanks is approximately 1,965 square feet. This assumes that the application rate for liquid deicer stays constant. **Table 4.67** and **Table 4.68** describe the storage requirement and the required material volume, respectively, for each deicing material used at the Airport.

Material Storage Summary

Interviews with field maintenance personnel indicated a deficiency in deicing and anti-icing material storage. Deicing and anti-icing material quantity and storage needs should continually be assessed as the Airport pavement area expands.

7.4.3 EQUIPMENT STORAGE

Field maintenance equipment is stored and serviced in the Field Maintenance Facility at the south end of the North Airpark. The facility is approximately 10 years old. The older facilities east of the U.S. Post Office are used primarily to store supplemental and backup equipment.

Field maintenance personnel indicated that there was sufficient equipment storage space to meet existing demand, but the facilities are near capacity. The buildings in the older facility are undersized and not capable of accommodating large vehicles.

Equipment storage needs should continually be assessed as the Airport-maintained area increases and as larger vehicles are acquired. Field maintenance staff indicated a desire to develop additional equipment storage space in the wetland area north of the old maintenance facility and south of Lake Hood Drive. This location is centrally located to serve existing and potential future airport development. An inventory of Airport field maintenance vehicles was not conducted. Therefore, specific requirements for field maintenance equipment storage and servicing are not available.

7.5 GROUND SUPPORT EQUIPMENT (GSE) STORAGE

Ground support equipment (GSE) is used in nearly all locations of the Airport. This section focuses on GSE that is stored on the apron in the passenger terminal area. This area includes both passenger terminals and reflects the storage area required for GSE serving passenger aircraft operations. Storage requirements for GSE serving cargo and general aviation operations are discussed in the respective sections.

Alaska Airlines has a fleet of GSE and generally stores the equipment within their leased apron area. Many of the other passenger airlines are served by one of the private aircraft handling operators. Pegasus Aviation Services, F&E Ground Services, and Swissport International are the three largest private aircraft handlers operating at the Airport.

They each have respective leaseholds around the Airport, but much of the active GSE is stored on the apron for easy access.

In the passenger terminal area, existing GSE storage requirements are estimated through observation to be 34,300 square yards. This represents roughly 10% of the total apron area, which is approximately 332,200 square yards. This 10% was the same percentage allocated for GSE equipment for other functional areas such as cargo and general aviation facilities. Analysis determined that there is sufficient space to accommodate existing GSE storage needs. Currently, there is approximately 61,300 square yards of space available to accommodate GSE storage. That said, as passenger aircraft operations increase, the demand for more GSE storage will likely also increase. It is assumed that GSE storage area requirements will increase proportionately to passenger terminal operations at an average rate of 1.01% annually. With approximately 61,300 square yards of potential space available to accommodate GSE, it is not likely that additional space will be needed. However, the need for additional GSE storage space should be continually evaluated, particularly with any major changes to the terminal.

7.6 FUELING FACILITIES

Aviation fuel used at the Airport is provided by five private entities. Fuel providers assume responsibility for operating and expanding their facilities, as warranted. This section describes the facility requirements for fuel storage and delivery infrastructure in order to anticipate the future land area that might also be needed.

The vast majority (90%) of aviation fuel needs for the Airport is provided by Anchorage Fueling and Service Company (AFSC). The existing AFSC facilities accommodate an approximate 14-day supply of fuel for normal aviation operations. Total jet fuel storage capacity is approximately 56 million gallons or 1.5 million barrels, including the large fuel tank farm in the West Airpark and an additional storage facility at the Port of Anchorage.

Fuel infrastructure in Alaska is entirely disconnected from fuel infrastructure within the continental United States and Canada. Fuel is delivered to the AFSC fuel storage facilities via ship, train, and pipeline from the Tesoro Alaska Refinery. Therefore, additional capacity is needed to safeguard against fuel supply interruptions and permit delivery of large quantities of fuel in a single shipment. Currently a tanker ship delivers 300,000 barrels of fuel from Asia once per month, but AFSC anticipates a need for weekly deliveries. More than half of the storage capacity at the Port of Anchorage would need to be available to accommodate the fuel off-loaded from ship; therefore, the displaced fuel would need to be moved to the on-Airport storage facility to accommodate the deliveries by ship.

Additionally, aviation fuel must settle for a minimum of 24 hours prior to use; i.e., the fuel must settle in the tanks at the Port of Anchorage prior to being transferred to the tanks at the Airport. The fuel must be allowed to settle again at the Airport prior to being used in aircraft. Therefore, some fuel in storage is unavailable for in-to-plane fueling so the quantity of stored fuel does not always represent available fuel that can be used immediately.

Ultimately, AFSC has sufficient capacity to accommodate existing fueling demand. However, future requirements are not solely predicated on fuel distribution quantities, but are also based on bulk fuel delivery modes. To accommodate this need, it is anticipated that AFSC will require a 50% increase in land area adjacent to the existing fuel tank farm in the West Airpark for future fuel storage infrastructure by the end of the planning horizon. This amounts to roughly 10 acres of additional land area.

Four private entities provide the remaining 10% of aviation fuel needs at the Airport. International Aviation Services supplies 8% of the fueling needs with the remaining 2% split between general aviation fixed-base operators Million Air, Signature Flight Support, and Great Circle Flight Services. International Aviation Service, which stores its fuel in several above-ground fuel tanks, has land area to expand fuel storage infrastructure on existing leaseholds. Therefore, specific land area requirements were not determined for International Aviation Service. The three fixed-base operators store their fuel in underground fuel tanks. These underground storage tanks have limited impact on above-ground facilities. As such, facility requirements were not determined for the fixed-base operators. Additionally, the fueling operations for the three fixed-base operators are not expected to increase significantly over the planning horizon.

7.7 UTILITIES

Utility services at the Airport are provided primarily by off-Airport organizations. Utility organizations include Chugach Electric Association; Enstar Natural Gas Company; Asplund Wastewater Treatment Facility, owned and operated by the Anchorage Water and Wastewater Utility (AWWU); and Alaska Communications Systems. The existing utility infrastructure systems meet the current needs and demand of Airport users.

Growth in existing developed areas may require additional utility infrastructure enhancements. Future development of the North, South, and West airparks will require coordination with the respective utility organizations. In both cases, consultation and coordination with utility organizations should be conducted to ensure efficient upgrade of utility infrastructure. Specific attention should be paid to further development that may occur in the South Airpark. Should the South Airpark grow westward, the water and sewer infrastructure in that area will need to be expanded.

In many cases, all involved parties (i.e., Airport, tenant, and utility representatives) should participate in the coordination effort. Coordination would ideally be conducted in the early stages to help ensure that Airport users are sufficiently served by utility services as the need materializes.

Coordination efforts should also focus on the appropriate preservation of land areas for the implementation of utility infrastructure (e.g., above-ground equipment shelters or subterranean utility easements) and also provide adequate land use compatibility. For example, should the AWWU facility need to be expanded, early coordination would help ensure amicable compatibility between the Airport and the expanded wastewater facility.

A detailed description of the existing utility infrastructure and services at the Airport can be found in **Section 6.10** of **Chapter 2**, Inventory of Existing Conditions.

SECTION 8
ENVIRONMENTAL CONSIDERATIONS

This section summarizes some of the environmental conditions present at the Ted Stevens Anchorage International Airport (Airport) that should be considered as facility requirements and alternatives are developed. In this section, environmental considerations are presented in four broad geographic directions (northeast, east, south, and west), in addition to environmental resources to be considered on an Airport-wide level.

8.1 AIRPORT-WIDE

Some of the Airport-wide environmental considerations include water quality of nearby waterbodies; proximity of contaminated sites; jet fuel smells; noise impacts; general bird and wildlife management; and adjacent land uses.

Water quality considerations at the Airport extend to both 1) the Airport's primary receiving waters (Turnagain Arm and Knik Arm of Cook Inlet, and Lakes Spenard and Hood) and 2) waterbodies that could be indirectly impacted via stormwater runoff. Lakes Hood and Spenard are currently listed as impaired waterbodies. However, the Airport has requested they be reclassified based on recent sampling. Nonetheless, development may affect the balance and cause water quality to deteriorate. Water quality in Cook Inlet is less of a concern, as the assimilative capacity is greater. Even so, future discharge limits and endangered species could limit stormwater discharge, which can affect what and where development occurs.

In addition, while not primary receiving waters of industrial stormwater from Airport operations, Meadow Lake, Delong Lake, and Connor's Lake currently receive non-industrial stormwater flows from the surrounding community. Future development that could degrade the water quality of nearby receiving waters or have the potential to increase the pollution level and magnitude of stormwater runoff would require further evaluation.

Another environmental consideration is the presence of open and conditionally closed contaminated sites and leaking underground storage tank (LUST) sites within or near the Airport. Contaminated sites and LUST sites can limit what is developed in an area due to risk-based impacts on users. In addition, these sites can increase costs from dealing with contaminated soils and water as well as increased engineering controls for new or renovated buildings.

General consideration would also need to be given to jet fuel smells, shifted air traffic flow, and altered noise patterns due to runway closures. During routine runway closures, the air traffic flow changes, which results in altered noise patterns. For instance, in the event that the North / South Runway is closed for routine maintenance (such as snow removal), the number of heavy jets flying over the eastern portion of Anchorage increases. This can result in additional short-term noise impacts to nearby residents. Long-term closures for repaving or reconstruction of runways will result in extended changes in air traffic. Changes in air traffic flow and noise patterns have been the topic of previous public complaints and should be considered as alternatives are developed.

Any development on Airport property also needs to consider general management implications for birds and wildlife, due to their relative abundance in the area. In addition, the listing of the Cook Inlet beluga whales under the Endangered Species Act may affect any development that increases or changes stormwater discharges.

Depending on the location of proposed Airport development, the type and severity of environmental constraints would vary.

8.2 NORTH AREA

Environmental considerations associated with the northeast area of the Airport property include bald eagle nests, coastal erosion, floodplains, wetlands, culturally significant sites, and undeveloped Airport land that is temporarily publically accessible.

Bald eagle nests have been previously identified south of Point Woronzof Drive and adjacent to the east end of Taxiway Q. Development in this section would therefore have to avoid any clearing within 300 feet of nest activity and would be subject to activity restrictions within 660 feet of any nests if they are determined to be active, per *U.S. Fish and Wildlife Service National Bald Eagle Management Guidelines*.

The bluff along Point Woronzof is slowly eroding. The Airport has made a request to the Army Corps of Engineers to study bluff erosion, its causes, and possible mitigations. Proposed development in this area would require consideration of erosion as well as measures to stabilize the slope and prevent further erosion from impacting Airport facilities.

While most of the Airport lies outside the 100-year floodplain, the pond located within the southern portion of Turnagain Bog, north of the snow storage area, is subject to 100-year floods. Development in this area would have to consider the potential of inundation and flooding, and therefore, would likely need to meet all applicable flood hazard construction standards. The Municipality of Anchorage's (MOA) Anchorage Wetlands Management Plan (AWMP) identifies the following wetlands as being located in the northeast area: Turnagain Bog and Postmark Bog. If development were to occur in this area, permitting requirements and mitigation measures would need to be considered.

In addition to the on-Airport environmental constraints listed above, consideration should also be given to the temporarily publically accessible areas on and adjacent to the Airport. Point Woronzof Overlook and portions of the Tony Knowles Coastal Trail (Coastal Trail) are located within the Airport's boundaries. In addition, the Airport abuts other sections of the Coastal Trail and Earthquake Park. The Airport has allowed portions of its property to be used so a continuous Coastal Trail could be developed. In addition, the northern access route for the Anchorage Coastal Wildlife Refuge is via Point Woronzof Overlook. Should development occur in this area, impacts to such land uses and its users would need to be considered.

8.3 EAST AREA

Development in the eastern portion of the Airport's property would require consideration of both native and invasive plant species, wetlands, cultural resources, and undeveloped Airport land that is temporarily publically accessible.

Waterbodies, such as Lakes Hood and Spenard, have been known to support aquatic vegetation. Such vegetation, located in waterbodies used by floatplanes, can be problematic for aircraft. An overgrowth of vegetation and weeds can affect navigation by catching on the floats and water rudders. There is currently no Federal Aviation Administration guidance on when aquatic vegetation poses an issue. The vegetation does generally help promote and maintain water quality, so there is a balancing of water quality and development / operations when dealing with aquatic vegetation.

Invasive aquatic vegetation has recently become a topic of discussion for Lake Hood Airport users. Although not presently identified in Lakes Hood or Spenard, a common invasive species of concern identified in Delong and Sand lakes is Nuttall's waterweed (*Elodea nutallii*). Any development should consider minimizing the risk of allowing such invasive species to spread via float plane.

Another environmental constraint located within the eastern portion of the Airport is the presence of wetlands. The MOA's AWMP identifies wetlands in the eastern area, particularly near Lake Spenard and the Connor's-Strawberry Bog (also known as Connor's Bog). Permits and mitigation may need to be pursued if development affects these resources.

Adjacent land uses need to be considered if development is identified for this area. An example of this is where the Airport abuts Connor's Lake Park (Connor's Bog) at the far east end of the property. The Airport-owned land adjacent to Connor's Lake Park is often frequented by park users and is used as one means of accessing the park. Because a portion of Connor's Bog is located on Airport property the MOA designates this parcel as a park even though it is not municipal land. Should this property be developed for Airport use, the potential public controversy that would accompany such development would need to be considered.

Another consideration for the area is the possible historic properties. There is the possibility that buildings and areas in the Lake Hood Airport may qualify under the National Historic Preservation Act (NHPA). In addition, the eastern portion is the oldest part of the Airport, and resources in this area could also quality under various sections of the NHPA. Any development in this area would likely require consultation with the State Historic Preservation Officer and other interested parties, required pursuant to Section 106 of the NHPA.

8.4 SOUTH AREA

Development in the southern area of the Airport's property has the potential to impact undeveloped Airport land that is temporarily publically accessible, wetlands, and historic property.

The Airport has two parcels that are undeveloped and are temporarily accessible to the public: Little Campbell Lake and parts of Delong Lake Park. Little Campbell Lake is adjacent to the MOA-owned Kincaid Park and its respective trails. Due to the proximity of the two, Airport-owned Little Campbell Lake and its parking spaces provide one of many access points to Kincaid Park. Conversely, the Delong Lake Park parcel, while also being owned by the Airport, has a temporary park designation and is included in the MOA parks inventory, despite the fact that its lease / permit granting use has expired. The Airport will consider the potential for significant public interest that would accompany development of these properties.

The following wetlands have also been identified in this area of the Airport: South Airpark Pond, Northwest Air Guard / Raspberry Road (located near the northwest corner of Raspberry Road and Air Guard Road), and the Meadow Lakes area adjacent to Delong Lake. Development in this area may require permits and mitigation.

There is historic property located within the southern portion of the Airport property in the Kulis Business Park. Hangar 3 of the former Kulis Air National Guard Base is eligible for the National Register of Historic Places.

8.5 WEST AREA

Environmental considerations in the western area of the Airport include bald eagle nests, historic properties, and undeveloped Airport land that is temporarily publically accessible.

Should development occur to the west, impacts to bald eagles would have to be considered. This is especially important should development occur in the area west of Runway 7R or Point Woronzof Drive near Taxiway Y, where bald eagle nests have been sighted. Development in these sections would have to avoid any clearing within 300 feet of nest activity and would be subject to activity restrictions within 660 feet of nests during the spring and potentially the summer if the nests are determined to be active.

Another environmental consideration for the western portion of the Airport's property is its inclusion of temporarily publically accessible facilities both on and near the Airport. Kincaid Park, the Coastal Trail, and the Anchorage Coastal Wildlife Refuge all abut, or are partially encompassed within, the Airport's boundaries. Due to the proximity of these publically accessible lands, further analysis and consideration would be required to determine any impacts associated with potential development.

Kincaid Park adjoins the Airport at its southwest boundary. While the park itself does not cross onto Airport property, some of its trails (such as the Sisson Loop trial) extend outside the park boundaries and north onto Airport or Heritage Land Bank property. Another such trail is the Coastal Trail, which runs adjacent to the northern and western boundaries of the Airport property, crossing onto Airport property in three sections as it connects Kincaid Park with Point Woronzof and Earthquake parks. The MOA's 2012 *West Anchorage District Plan* cites the possibility for potential land trades in the future; for instance, between the MOA and the Airport.

The Anchorage Coastal Wildlife Refuge, a State game refuge, is located along the entire western edge of the Airport and extends south of Kincaid Park. The Anchorage Coastal Wildlife Refuge encompasses coastal wetlands, mudflats, and some forested areas. This area is used by the public, including hunters. In the fall, access issues have arisen from hunters wanting to access the area via Airport property.

Several cultural resource surveys have been conducted in the proposed project study area, beginning in the 1930s. Point Woronzof, particularly, has been a focus of survey and research. Two prehistoric Dena'ina sites are located within or adjacent to this area. Any development in this area would likely require consultation with SHPO, tribal entities, and other interested parties required pursuant to Section 106 of the NHPA.

Page intentionally left blank

SECTION 9
PLANNING REQUIREMENTS SUMMARY

Facility requirements for Ted Stevens Anchorage International Airport (Airport) were determined using methods that will accurately represent future needs. Facility requirements correspond to the forecast of aviation activity, which is summarized below in **Table 4.69**.

Table 4.69
Forecast of Aviation Activity Summary

	Baseline Year (2012)	PAL 1 (2015)	PAL 2 (2020)	PAL 3 (2025)	PAL 4 (2030)
Total Passengers (in million annual passengers)	5.03	5.12	5.43	5.78	6.22
Total Operations	219,350	225,000	242,280	261,740	281,940
Cargo Tonnage (in millions of tons)	5.13	5.37	6.64	7.75	8.87

Source: *2013 Anchorage International Airport System Forecast Technical Report*.
Note: PAL = Planning Activity Level

The desired Level of Service and the corresponding requirements are described in detail in **Sections 1** through **9** and displayed in tabular and graphical form in **Table 4.70**, and **Figure 4.12**, respectively. In **Table 4.70**, for each major functional component of the Airport, the space or equipment requirements throughout the planning horizon, as well as the space or equipment surplus or deficit amounts for each Planning Activity Level (PAL) are shown. Total area requirements at PAL 4 are shown in **Table 4.71**.

Figure 4.12 is a graphical representation of **Table 4.70**. The bars shown for each major functional component indicate the general Level of Service experienced by tenants and users throughout the planning horizon. They also give an indication of when capacity-enhancing efforts should be initiated to accommodate demand. Three main colors are shown in the figure. The green-shaded areas indicate that facility space and equipment are adequate to meet demand and desired service expectations. Yellow- / orange-shaded areas indicate where demand is nearing capacity. Red-shaded areas indicate the facilities in which capacity deficit exists. Capacity-enhancing planning efforts should generally start when demand is nearing capacity.

The stoplight chart takes into account the level of action necessary at the different activity levels. For example, the gates for the regional passenger carriers reach a deficit in PAL 1; however, since it is expected that the deficit can be accommodated within the existing envelope and without major capital costs, the deficit is shown in orange instead of red.

Finally, **Figure 4.12** is organized in the order of the most-constrained to least-constrained functional component. This will help the Airport prioritize future development. Note that each facility deficiency is not dependent on the others, and some metrics may be reached sooner than others. For example, if cargo operations grow faster than passenger enplanements, then cargo parking positions may need attention before the capacity deficit in the passenger terminal needs to be addressed.

In consideration of necessary advanced planning, environmental, and design efforts, the following activities are recommended to address deficiencies as demand grows.

9.1 BASELINE YEAR (2012)

- Address current non-standard airfield areas to meet Airplane Design Group (ADG)-V aircraft needs (blast pads, taxiway shoulder width, Taxiway Object Free Area width for Taxiways G and H, distance from Taxiway U centerline to a fixed / movable object)
- Start to plan for upgrades to runway / airfield areas to accommodate ADG-VI aircraft (shoulder widths, Taxiway Object Free Area width, Taxiway Safety Area width, and distance from taxiway centerlines to fixed / movable object). Upgrades are needed by PAL 1
- Address Level of Service concerns within the North Terminal
- Expand tenant parking areas (cargo, general aviation, Airport / airline support) to address current space deficits or increase utilization of existing tenant parking areas
- Reconfigure or expand cargo building area to address current space deficits, particularly for other domestic and international cargo activity
- Expand cargo apron areas to address space deficits, particularly for transit or technical stop operations
- Expand general aviation building area to address current space deficits, particularly for based aircraft

9.2 PAL 1 (2015)

- Address Transportation Security Administration (TSA) space deficits (passenger security screening checkpoint, baggage screening and inspection, and TSA administration areas) in the North Terminal
- Assess regional gate parking positions and determine how, operationally and within the existing terminal apron area, to accommodate regional operations during peak times
- Expand tenant parking areas (cargo, general aviation, Airport / airline support) to address current space deficits or increase utilization of existing tenant parking areas

- Reconfigure or expand cargo building area to address current space deficits, particularly for other domestic and international cargo activity
- Expand cargo apron areas to address space deficits, particularly for transit or technical stop operations
- Expand general aviation building area to address current space deficits, particularly for based aircraft and for the terminal building(s)
- Expand Airport / airline support area to address space deficits

9.3 PAL 2 (2020)

- Expand tenant parking areas (cargo, general aviation, Airport / airline support) to address current space deficits or increase utilization of existing tenant parking areas
- Expand cargo building area to address current space deficits or increase utilization of existing building area
- Expand baggage make-up area in South Terminal to accommodate other domestic operations
- Expand cargo apron areas to address space deficits, particularly for transit or technical stop operations
- Expand general aviation building area to address current space deficits, particularly for based aircraft and for the terminal building(s)
- Start to plan for upgrades in general aviation apron space to address future deficits

9.4 PAL 3 (2025)

- Upgrade runway / airfield areas to accommodate Taxiway Design Group (TDG)-7 and A380F by PAL 4
- Address airfield delay, preferably through operational means
- Address economy public parking lot deficits by reconfiguring existing parking areas
- Address future rental car ready / return lot deficits by PAL 4
- Expand tenant parking areas (cargo, general aviation, Airport / airline support) to address current space deficits or increase utilization of existing tenant parking areas
- Expand cargo building areas to address space deficits or increase utilization of existing building area
- Expand cargo apron areas to address space deficits, particularly for transit or technical stop operations
- Expand general aviation building areas to address space deficits, particularly for based aircraft and for the terminal building(s)

9.5 PAL 4 (2030)

- Address the Airport loop road capacity to accommodate forecasted demand in future years
- Address untenable airfield delay, preferably through operational means, but consider new plans for a new runway
- Address Customs and Border Protection space deficits in the North Terminal
- Address economy public parking lot deficits by reconfiguring existing parking areas
- Assess future public parking needs
- Expand tenant parking areas (cargo, general aviation, Airport / airline support) to address current space deficits or increase utilization of existing tenant parking areas
- Expand cargo building area to address current space deficits or increase utilization of existing building area
- Expand cargo apron areas to address space deficits, particularly for transit or technical stop operations
- Expand general aviation building area to address current space deficits, particularly for based aircraft and for the terminal building(s)
- Expand general aviation apron area to address slight space deficit

9.6 OTHER

- Consider impacts to Airport facilities should the Asplund Wastewater Treatment Facility, owned and operated by Anchorage Water and Wastewater Utility, expand its facility
- Consider additional snow storage areas with future developments
- Consider additional materials storage areas with future developments
- Consider improved secured access for cargo carriers traveling between the North Airpark to locations east of Postmark Drive (U.S. Post Office, cargo facilities east of Postmark Drive)
- Should the airfield / airport development expand, minimum Aircraft Rescue and Fire Fighting (ARFF) response times will need to be maintained; consider a second ARFF station

Finally, the following are recommended as potential follow-on projects after the Airport Master Plan Update process and as demand increases:

- Landside Master Plan
- Utilities Master Plan

The next step in the Master Plan Update is the development of concepts and alternatives to address the aforementioned facility requirements. This analysis will conclude with a comprehensive recommended development plan.

Page intentionally left blank

Table 4.70 Facility Requirements Summary

Functional Area	Functional Component	Existing	Baseline[1]	Planning Activity Level Requirement				Planning Activity Level Surplus (Deficit)				
				1	2	3	4	Baseline[1]	1	2	3	4
Forecast Aviation Activity Levels	**Passenger Count**											
	Total Million Annual Passengers	5.03	-	5.12	5.43	5.78	6.22					
	Annual Enplaned Passengers	2,457,977	-	2,549,950	2,703,850	2,877,900	3,091,150					
	Peak Hour Originating Passengers[1]	812	-	804	818	857	912					
	Peak Hour Terminating Passengers[1]	1,083	-	1,108	1,179	1,237	1,315					
	Operations											
	Passenger Operations	97,026	-	99,198	101,540	106,376	111,212					
	All-Cargo Operations	74,871	-	82,680	95,812	107,262	118,714					
	Air Taxi and Other Operations	3,125	-	2,700	2,793	2,509	2,036					
	General Aviation Operations	37,761	-	38,152	39,863	43,324	47,713					
	Military Operations	2,408	-	2,267	2,267	2,267	2,267					
	Annual Aircraft Operations[2]	219,350	-	225,000	242,280	261,740	281,940					
	Cargo											
	Cargo Tonnage (millions of tons)	5.13	-	5.37	6.64	7.75	8.87					
	General Aviation											
	General Aviation Based Aircraft	97	-	100	105	114	126					
Airfield	**Runway 15-33**											
	Length (feet)	10,960	10,960	10,960	10,960	10,960	10,960	0	0	0	0	0
	Width (feet)	150	150	200	200	200	200	0	(50)	(50)	(50)	(50)
	Runway Lighting Type	HIRL	HIRL	HIRL	HIRL	HIRL	HIRL					
	Approach Type	(15) Precision (33) Visual	(15) Precision (33) Visual	(15) Precision (33) Visual	(15) Precision (33) Visual	(15) Precision (33) Visual	(15) Precision (33) Visual					
	NAVAIDS	(15) ILS CAT I, ODALS	(15) ILS CAT I, ODALS	(15) ILS CAT I, ODALS	(15) ILS CAT I, ODALS	(15) ILS CAT I, ODALS	(15) ILS CAT I, ODALS					
	Runway 7L-25R											
	Length (feet)	10,600	10,600	10,600	10,600	10,600	10,600	0	0	0	0	0
	Width (feet)	150	150	150	150	150	150	0	0	0	0	0
	Runway Lighting Type	HIRL	HIRL	HIRL	HIRL	HIRL	HIRL					
	Approach Type	(7L) Precision (25R) Visual	(7L) Precision (25R) Visual	(7L) Precision (25R) Visual	(7L) Precision (25R) Visual	(7L) Precision (25R) Visual	(7L) Precision (25R) Visual					
	NAVAIDS	(7L) MLS, MALSR, ILS	(7L) MLS, MALSR, ILS	(7L) MLS, MALSR, ILS	(7L) MLS, MALSR, ILS	(7L) MLS, MALSR, ILS	(7L) MLS, MALSR, ILS					

Table 4.70 Facility Requirements Summary (contd.)

Functional Area	Functional Component	Existing	Baseline[1]	Planning Activity Level Requirement 1	2	3	4	Baseline[1]	Planning Activity Level Surplus (Deficit) 1	2	3	4
Airfield (cont.)	**Runway 7R-25L**											
	Length (feet)	12,400	12,400	12,400	12,400	12,400	12,400	0	0	0	0	0
	Width (feet)	200	200	200	200	200	200	0	0	0	0	0
	Runway Lighting Type	HIRL	HIRL	HIRL	HIRL	HIRL	HIRL					
	Approach Type	(7R) Precision (25L) Visual	(7R) Precision (25L) Visual	(7R) Precision (25L) Visual	(7R) Precision (25L) Visual	(7R) Precision (25L) Visual	(7R) Precision (25L) Visual					
	NAVAIDS	(7R) ILS CAT III, ALSF-II	(7R) ILS CAT III, ALSF-II	(7R) ILS CAT III, ALSF-II	(7R) ILS CAT III, ALSF-II	(7R) ILS CAT III, ALSF-II	(7R) ILS CAT III, ALSF-II					
Passenger Terminal	**Domestic Operations (square feet)**											
	Ticketing	15,648	11,640	11,640	13,210	13,565	13,985	4,008	4,008	2,438	2,083	1,663
	Baggage Make-up Area	47,172	43,790	43,790	52,340	55,865	59,630	3,382	3,382	(5,168)	(8,693)	(12,458)
	Baggage Claim Area	17,585	7,630	7,630	7,630	7,710	7,810	9,955	9,955	9,955	9,875	9,775
	Inbound Baggage Service	17,160	11,800	11,800	11,800	11,900	12,100	5,360	5,360	5,360	5,260	5,060
	Departure Lounge	49,837	41,600	41,600	45,200	46,200	46,900	8,237	8,237	4,637	3,637	2,937
	Passenger Security Screening Checkpoint	10,425	14,560	14,560	14,560	14,560	14,560	(4,135)	(4,135)	(4,135)	(4,135)	(4,135)
	Baggage Screening / Inspection and Administration	24,610	18,270	18,270	18,270	18,270	18,720	6,340	6,340	6,340	6,340	5,890
	Total Domestic Operations Area (square feet)	182,437	149,290	149,290	163,010	168,070	173,705	33,147	33,147	19,427	14,367	8,732
	International Operations (square feet)											
	Airline Areas (Ticketing, Baggage Make-up, Baggage Claim, and Inbound Baggage, Departure Lounge)	115,119	40,380	40,380	41,180	41,980	46,550	74,739	74,739	73,939	73,139	68,569
	Transportation Security Administration (SSCP, Baggage Screening / Inspection, TSA Administration)	7,046	24,090	24,090	24,090	24,090	29,600	(17,044)	(17,044)	(17,044)	(17,044)	(22,554)
	Customs and Border Protection	39,772	27,600	27,600	27,600	27,600	40,000	12,172	12,172	12,172	12,172	(228)
	Concessions	17,442	1,100	1,100	1,200	1,300	1,600	16,342	16,342	16,242	16,142	15,842
	Circulation and Restrooms	76,164	7,700	7,700	8,100	8,600	9,600	68,464	68,464	68,064	67,564	66,564
	Airport Administration	36,055	16,500	16,500	16,700	16,800	20,400	19,555	19,555	19,355	19,255	15,655
	Building Systems	20,145	11,000	11,000	11,100	11,200	13,600	9,145	9,145	9,045	8,945	6,545
	Total International Operations Area (square feet)	311,743	128,370	128,370	129,970	131,570	161,350	183,373	183,373	181,773	180,173	150,393

Table 4.70 Facility Requirements Summary (contd.)

Functional Area	Functional Component	Existing	Baseline[1]	Planning Activity Level Requirement 1	2	3	4	Baseline[1]	Planning Activity Level Surplus (Deficit) 1	2	3	4
Passenger Terminal (contd.)	**Gates / Positions**											
	Mainline Carriers (future requirements include international operations) - 5 Turns / Gate / Day	20	17	18	19	20	21	3	2	1	0	(1)
	Regional Carriers - 6.5 Turns / Gate / Day	17	15	17	20	21	22	2	0	(3)	(4)	(5)
Landside	**Terminal Loop Roadway Lanes (no. of lanes)**											
	Entrance - South Aircraft Drive to Return Ramp	2	2	2	2	2	2	0	0	0	0	0
	Exit - Terminal Departures Ramp to Return Ramp	2	2	2	2	2	2	0	0	0	0	0
	Exit - Return Ramp to South Airport Drive	2	2	2	2	2	2	0	0	0	0	0
	Terminal Loop Roadway Level of Service											
	Entrance - South Aircraft Drive to Return Ramp	-	A	A	A	B	B					
	Exit - Terminal Departures Ramp to Return Ramp	-	A	A	A	A	A					
	Exit - Return Ramp to South Airport Drive	-	A	A	A	A	B					
	North Terminal Curb Length (linear feet)											
	Inner Curb	400	80	80	105	105	105	320	320	295	295	295
	Outer Commercial Curb	330	120	120	120	120	120	210	210	210	210	210
	Total North Terminal Curbfront (linear feet)	730	200	200	225	225	225	530	530	505	505.0	505.0
	South Terminal Curb Length (linear feet)											
	Upper Departures Level Curb Length	950	530	530	530	580	630	420	420	420	370	320
	Lower Arrivals Level Curb Length	825	300	325	325	350	375	525	500	500	475	450
	Commercial Vehicle Level Curb	970	585	585	585	615	615	385	385	385	355	355
	Total South Terminal Curbfront (linear feet)	2,745	1,415	1,440	1,440	1,545	1,620	1,330.0	1,305.0	1,305.0	1,200.0	1,125.0

Table 4.70 Facility Requirements Summary (contd.)

Functional Area	Functional Component	Existing	Baseline[1]	Planning Activity Level Requirement				Baseline[1]	Planning Activity Level Surplus (Deficit)			
				1	2	3	4		1	2	3	4
Landside (contd.)	**Public Parking Stalls (no. of stalls)**											
	South Terminal Short-Term Garage	1,172	860	875	935	1,000	1,085	312	297	237	172	87
	South Terminal Long-Term Parking Lot	1,082	785	800	855	915	990	297	282	227	167	92
	North Terminal Short-Term Parking Lot	205	110	115	120	130	140	95	90	85	75	65
	South Terminal Oversized Vehicle Lot	85	21	22	24	26	28	64	63	61	59	57
	Cell Phone Lot	15	4	4	4	5	5	11	11	11	10	10
	Park, Ride & Fly Parking Lot (Economy Parking)	300	150	185	225	279	350	150	115	75	21	(50)
	Total Public Parking Stalls	2,859	1,925	2,000	2,160	2,350	2,595	934	859	699	509	264
	Public Parking Area (acres)	350										
	South Terminal Short Term Garage	10.8	6.9	7.0	7.5	8.0	8.7	4	4	3	3	2
	South Terminal Long-Term Parking Lot	8.7	5.2	5.3	5.7	6.1	6.6	3	3	3	3	2
	North Terminal Short-Term Parking Lot	2.2	0.9	0.9	1.0	1.0	1.1	1	1	1	1	1
	South Terminal Oversized Vehicle Lot	0.7	0.2	0.2	0.2	0.2	0.2	1	1	0	0	0
	Cell Phone Lot	0.5	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0
	Park, Ride & Fly Parking Lot (Economy Parking)	3.5	1.2	1.5	1.8	2.2	2.8	2	2	2	1	1
	Total Public Parking Area (acres)	26.4	14.4	14.9	16.2	17.6	19.5	12.0	11.5	10.2	8.8	6.9
	Employee Parking Stalls (stalls)											
	North Terminal Employee Parking Lot	250	150	155	165	180	195	100	95	85	70	55
	South Terminal Employee Parking Lot	894	535	565	605	645	700	359	329	289	249	194
	Parking Revenue Gate Employee Parking Lot	13	7	7	7	8	9	7	6	6	5	4
	North Terminal Auxiliary, DOT&PF Administrative, FAA Tower Parking Lot	172	172	172	172	172	172	0	0	0	0	0
	Total Employee Parking Stalls	1,329	865	900	950	1,005	1,075	464	429	379	324	254
	Total Employee Parking (acres)	11.8	6.9	7.3	7.6	8.1	8.6	4.9	4.6	4.2	3.7	3.2

Table 4.70 Facility Requirements Summary (contd.)

Functional Area	Functional Component	Existing	Baseline[1]	Planning Activity Level Requirement 1	2	3	4	Baseline[1]	Planning Activity Level Surplus (Deficit) 1	2	3	4
Landside (cont.)	**Rental Car (includes Enterprise)**											
	Ready / Return Parking Lot (stalls)	660	530	560	595	635	680	130	100	65	25	(20)
	Ready / Return Lot (square feet)	300,640	237,600	252,620	267,890	285,165	306,330	63,040	48,020	32,750	15,475	(5,690)
	Quick-Turnaround Facility (square feet)	105,665	83,509	88,790	94,155	100,225	107,665	22,156	16,875	11,510	5,440	(2,000)
	On-Airport / Off-Airport Vehicle Storage (square feet)	433,115	237,600	252,620	267,890	285,165	306,330	195,515	180,495	165,225	147,950	126,785
	Vehicle Storage Equivalent Stalls (stalls)	1,969	1,080	1,150	1,220	1,295	1,390	889	819	749	674	579
	Total Rental Car Area (square feet)	708,700	558,709	594,030	629,935	670,555	720,325	149,991	114,670	78,765	38,145	(11,625)
	Total Rental Car Area (acres)	16.3	13	14	14	15	17	3.4	2.6	1.8	0.9	(0.3)
Cargo	**Building (square feet)**											
	Intra Alaska Cargo	522,951	209,855	209,855	215,765	220,255	223,795	313,096	313,096	307,186	302,696	299,156
	Other Domestic Cargo	30,126	31,490	31,490	40,610	51,450	62,785	(1,364)	(1,364)	(10,484)	(21,324)	(32,659)
	International	732,405	833,320	833,320	1,095,120	1,413,790	1,757,955	(100,915)	(100,915)	(362,715)	(681,385)	(1,025,550)
	Total Cargo Building Area (square feet)	1,285,482	1,074,665	1,074,665	1,351,490	1,685,495	2,044,540	210,817	210,817	(66,008)	(400,013)	(759,058)
	Apron (square yards)											
	Transit	243,415	258,800	266,233	279,100	320,525	368,100	(15,385)	(22,819)	(35,685)	(77,110)	(124,685)
	FedEx	163,238	75,200	91,611	127,300	136,414	146,200	88,038	71,627	35,938	26,824	17,038
	UPS	127,190	93,000	102,645	121,000	133,082	146,400	34,190	24,545	6,190	(5,892)	(19,210)
	Other	277,139	68,900	79,878	145,200	138,707	188,900	208,239	197,261	131,939	138,432	88,239
	Total Cargo Apron Area (square yards)	810,981	545,490	594,404	739,860	801,600	934,560	265,491	216,577	71,121	9,381	(123,579)
	Landside (square yards)											
	Total Cargo Landside Area	120,008	162,110	162,110	201,780	218,618	254,880	(42,102)	(42,102)	(81,772)	(98,610)	(134,872)
	Total Cargo Area (acres)	167.0	181.0	181.0	225.6	249.5	292.7	(14.0)	(14.0)	(58.6)	(82.5)	(125.7)
General Aviation	**Building Area (square feet)**											
	Based Aircraft Building Area	278,171	162,015	188,505	210,095	239,455	275,105	116,156	89,666	68,076	38,716	3,066
	Transient Aircraft Building Area	-	119,050	119,425	124,880	136,105	150,465	-	-	-	-	-
	Terminal Building Area	33,400	33,400	34,565	36,270	39,260	43,315	0	(1,165)	(2,870)	(5,860)	(9,915)
	Total General Aviation Building Area (square feet)	311,571	314,465	342,500	371,250	414,820	468,880	(2,894)	(30,929)	(59,679)	(103,249)	(157,309)

Table 4.70 Facility Requirements Summary (contd.)

Functional Area	Functional Component	Existing	Planning Activity Level Requirement					Planning Activity Level Surplus (Deficit)				
			Baseline[1]	1	2	3	4	Baseline[1]	1	2	3	4
General Aviation (contd.)	**Apron Area (square yards)**											
	Based Aircraft Apron Area	-	8,445	8,525	8,420	8,845	9,505	-	-	-	-	-
	Transient Aircraft Apron Area	-	65,480	64,620	65,605	68,860	73,665	-	-	-	-	-
	Circulation Area	-	3,795	4,095	4,425	4,940	5,580	-	-	-	-	-
	Total General Aviation Apron Area (square yards)	85,069	77,715	77,245	78,455	82,650	88,750	7,354	7,824	6,614	2,419	(3,681)
	Landside Area (square yards)											
	Total General Aviation Landside Area (square yards)	26,791	32,150	32,220	33,665	36,590	40,295	(5,359)	(5,429)	(6,874)	(9,799)	(13,504)
	Total General Aviation Area (acres)	30.3	29.9	30.5	31.7	34.2	37.4	0	(0.2)	(1.4)	(3.9)	(7.2)
Airport / Airline Support	**ARFF Index**	1E	1E	1E	1E	1E	1E	-	-	-	-	-
	Fueling (acres)	19.5	19.5	29.3	29.3	29.3	29.3	0	(10)	(10)	(10)	(10)
	Total Airport / Airline Support Area (acres)	195	195	200	215	233	251	0	(5.0)	(20.4)	(37.7)	(55.6)

Notes: ARFF = Airport Rescue and Fire Fighting, DOT&PF = Alaska Department of Transportation and Public Facilities, FAA = Federal Aviation Administration, TSA = Transportation Security Administration, UPS = United Parcel Service, VFR = Visual Flight Rules.
1 - Peak hour represents the peak 60-minutes during the peak month (July).
2 - Total operations shown are rounded.

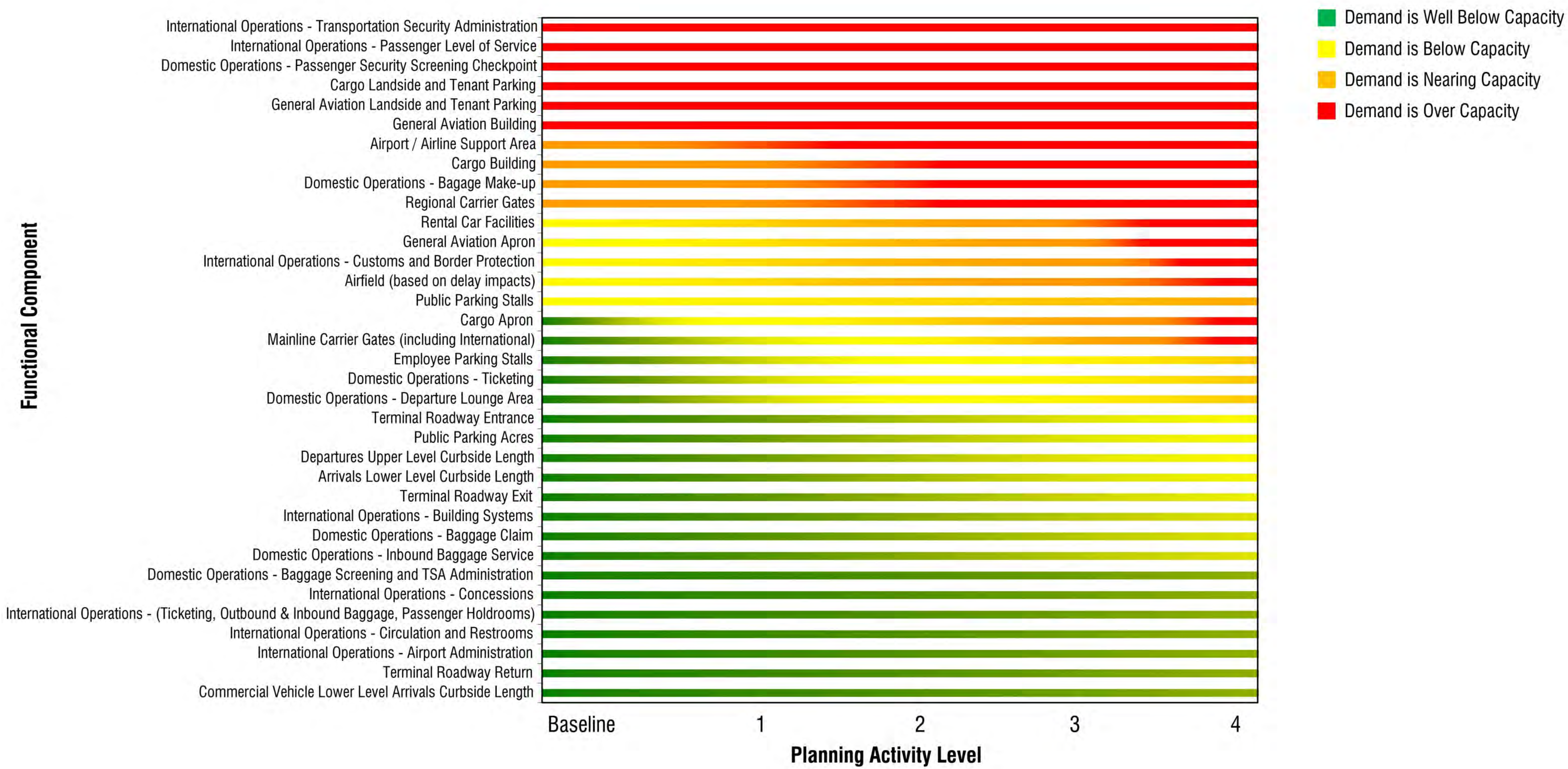
Table 4.71
PAL 4 Area Requirements

	Existing Area	Additional Area Required by PAL 4
Airfield	1,550 acres	Dependent primarily upon how delay would be addressed
Passenger Terminal and Landside	220 acres	0 acres
Cargo	167 acres	125 acres
Building		759,060 square feet
Landside		134,870 square yards
Apron		123,580 square yards
Positions		Airport Managed – 4 ADG-VI Non-Airport Managed – 4 ADG-VI
General Aviation	70 acres	7.2 acres
Building		157,300 square feet
Landside		13,500 square yards
Apron		3,700 square yards
Airport / Airline Support	195 acres	55 acres
Fueling		10 acres
FAA	10 acres	
Other	140 acres	0 acres
Undeveloped / Vacant	1,760 acres	0 acres
Total	4,210 acres	172 acres

Source: Airport staff and RS&H, 2014.
Notes: ADG = Airplane Design Group, FAA = Federal Aviation Administration, PAL = Planning Activity Level. Existing areas listed represent the total land area designated for a functional component. Some of the land areas may not actually be currently used for a particular functional use.

Page intentionally left blank

Figure 4.12 Facility Requirements Summary



Source: RS&H, 2014.

Page intentionally left blank.