Port of Lopez

LOPEZ ISLAND AIRPORT MASTER PLAN UPDATE

Lopez Island, WA

Draft

June 2017

PREPARED FOR

PORT OF LOPEZ
Lopez Island, Washington

PREPARED BY

ReidMiddleton

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CHAPTER 1. EXECUTIVE SUMMARY

The executive summary will be developed with the final master plan update.

CHAPTER 2. EXISTING CONDITIONS / INVENTORY

Introduction

The objective of the inventory chapter is to summarize significant airport facilities, airspace, land use, environmental and demographics data. Primary sources of information included Port commissioners, on-site investigations, FAA's National Plan of Integrated Airport Systems (NPIAS), the Washington State Department of Transportation's (WSDOT) Long-Term Air Transportation Study (LATS), San Juan County Planning Department, and commercial airport operators.

Lopez Island Airport (S31) is located on the top of a west facing bluff along the San Juan Channel, southwest of the village of Lopez on Lopez Island. The airport (approximately 50 acres total) is owned and operated by the Port of Lopez and is classified as a general aviation non-primary airport by the Federal Aviation Administration (FAA) and as a general aviation airport by the Washington State Department of Transportation, Aviation Division.

Existing Airport Plans and Documents

The location of Lopez Island is depicted in the regional map in Exhibit 2-1. The location of the airport and surrounding airports is depicted in Exhibit 2-2. The location of the airport in relation to the surrounding vicinity is provided in Exhibit 2-3.

Exhibit 2-1 Regional Map

Exhibit 2-2 Location Map

Exhibit 2-3 Vicinity Map

Existing Airport Facilities

The layout and location of airport facilities are identified in the Airport Layout Plan (Exhibit 2-4). Additional information is listed below.

There is a two-room single story Port-owned airport administration/terminal building located adjacent to the apron near the main airport gate. A part of this building is open to serve air taxi passengers, pilots and other airport users.

At the present time, there are no full service Fixed Base Operators (FBOs) or fuel facilities.

Property that had been privately owned was purchased by the Port to provide storage/parking for up to 16 aircraft in three buildings B-D and adjacent grassed areas. Hangar Building A, with spots for 5 aircraft is privately owned on an airport land lease. Aircraft access the airport via a central taxilane at about mid-apron of the airport. There are an additional 10 hangar buildings, capable of holding 15 aircraft. These hangars are privately owned with long-term land leases with the Port.

There are 16 aircraft tie-down spots, with eight not occupied for transient aircraft parking.

At the present time, there are no landing fees for individual operations but the charter carriers serving Lopez Island are charged $300 per year for their operations.

Exhibit 2-4 Terminal and GA Ramp Map

Inventory of Existing Runway 16-34 RPZ Conditions

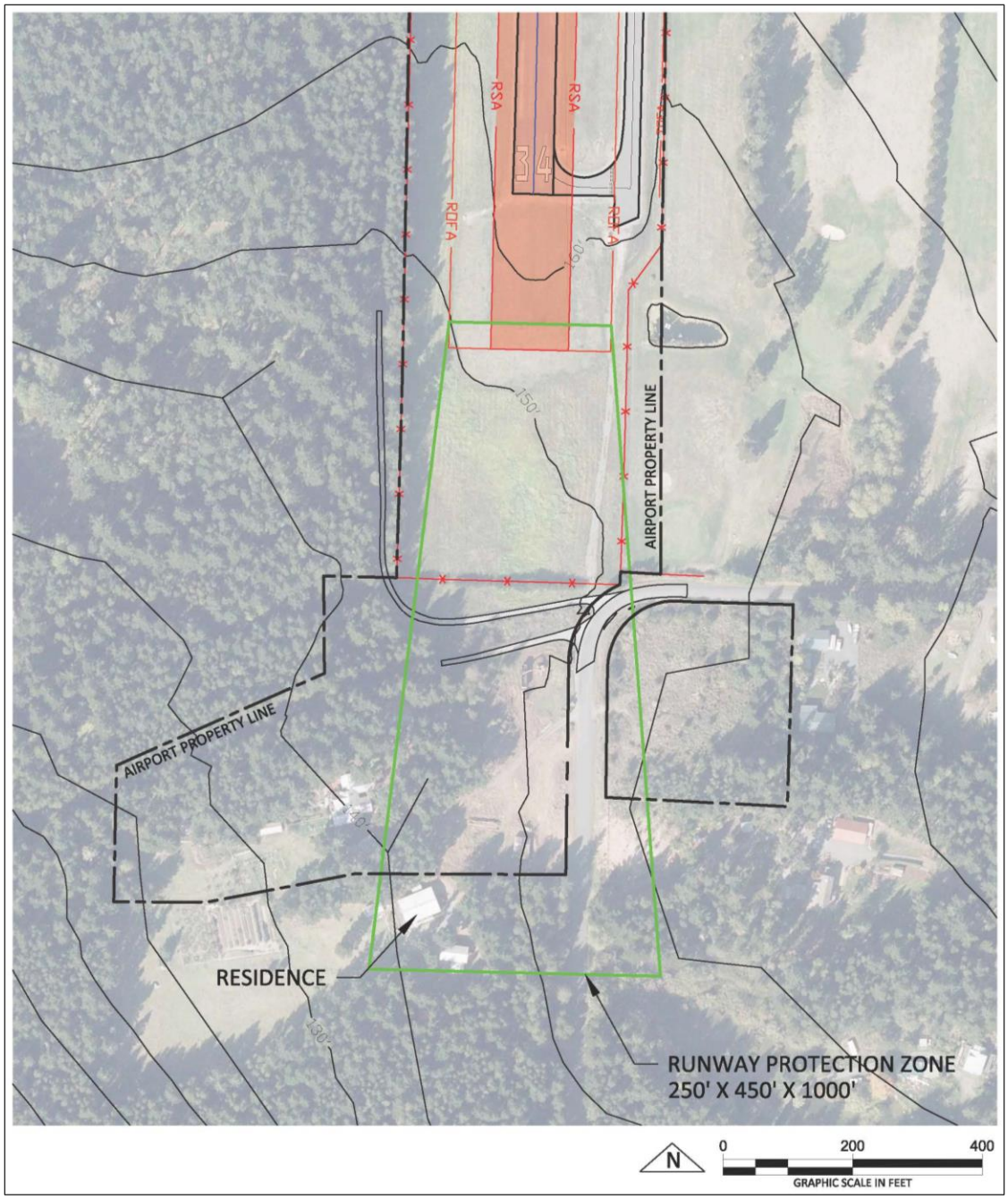
Runway Protection Zones (RPZ) protect people and property on the ground beyond runway ends. RPZs are trapezoidal in shape and centered about the extended runway centerline. They extend from a point 200 feet from runway ends, and their dimensions are based on the Aircraft Approach Category (AAC) and the most demanding visibility minimums associated with the approach runway end. In consideration of the visual approaches, and the size of the aircraft operating at the airport, Table 2-1 provides the existing RPZ dimensions for the runway ends at Lopez Island Airport.

Table 2-1 Runway Protection Zone Dimensions, In Feet

Runway	Width at Runway End	Length	Width at Outer End	Airport Controls Entire Land Area
16	250	1,000	450	Yes
34	250	1,000	450	No

Through recent land acquisitions, the airport owns the majority of the property within the existing Runway RPZs. However, a small portion of the Runway 34 RPZ extends beyond airport property south of the airport, west and east of Shark Reef Road into privately-owned property containing one residence. Exhibit 2-5 provides a detailed illustration of the location of the Runway 34 RPZ, airport property, and the residence.

Exhibit 2-5 Runway 34 Runway Protection Zone



Inventory of Existing Land Use

Existing land uses in the vicinity of Lopez Airport consists primarily of scattered rural residences on large lots. A golf course is located immediately east of the airport. North of airport property, north of Channel Road, industrial/mining land use occurs. Exhibit 2-6 illustrates the generalized land uses in the vicinity of the airport.

Exhibit 2-6 Generalized Existing Land Use

Comprehensive Plan Land Use Designations

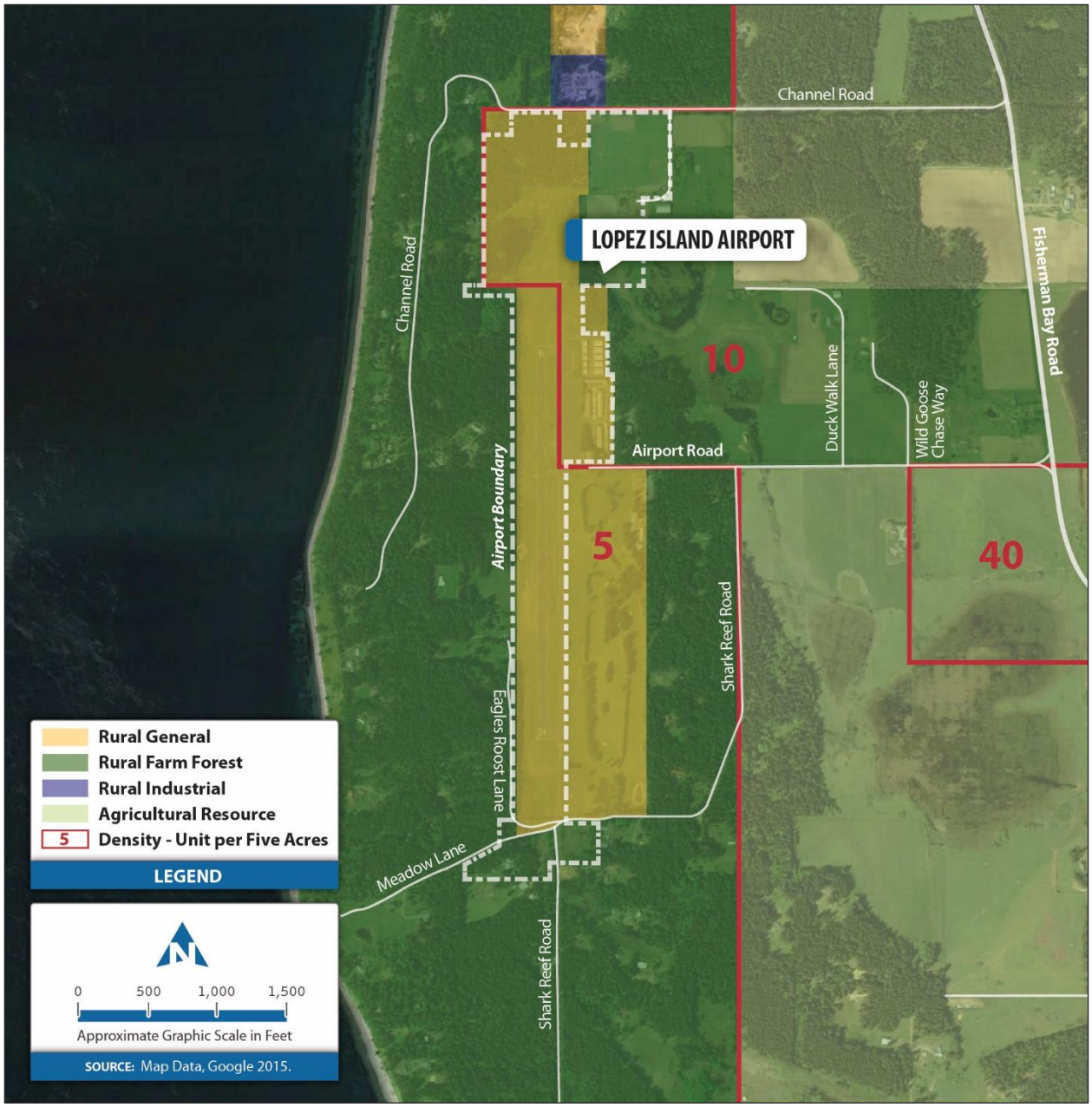
According to the 1998 San Juan County Comprehensive Plan, Lopez Airport is designated as Rural General Use. This designation is intended to provide flexibility for a variety of small-scale, low-impact uses to locate on rural lands that maintain and enhance the rural character of San Juan County. Allowable uses are intended to be compatible with the existing rural character and should not result in more than a minimal and manageable increase in demand on existing rural governmental services and facilities, utilities, community water systems, sewage disposal systems, and County roads.

Land use to the east, south, and west of the airport is predominantly Rural Farm Forest. This designation provides for rural living opportunities that are compatible with small-scale farming and forestry activities. Allowable land uses are predominantly farming and forestry mixed with residential development, generally on parcels five or more acres in size. This designation also allows for cottage enterprise uses and agriculture- and forestry-related commercial and industrial uses, such as processing and limited retailing facilities for farm and forest products.

Land to the north of the airport, just north of Channel Road, is a parcel of property designated Rural Industrial. This designation provides for rural oriented industrial uses that are not generally compatible with activity center land uses, which complement rural character and development, and that can be served by rural governmental services. Allowable uses should be limited to those which are most appropriately located in the rural environment because of incompatibility with intensive, mixed use development patterns characteristic of activity centers. Such uses include, but are not limited to, storage yards, lumber mills, wood craft manufacturing, gas storage facilities, and cement batch plants. Further to the north of this property is another Rural General Use designated area.

Exhibit 2-7 presents the San Juan County Comprehensive Plan land use designations for lands surrounding the airport. It should be noted that the Comprehensive Plan is in the process of being updated, scheduled for completion by the year 2018.

Exhibit 2-7 Generalized Comprehensive Plan Land Use Designations



Inventory of Current Traffic Patterns

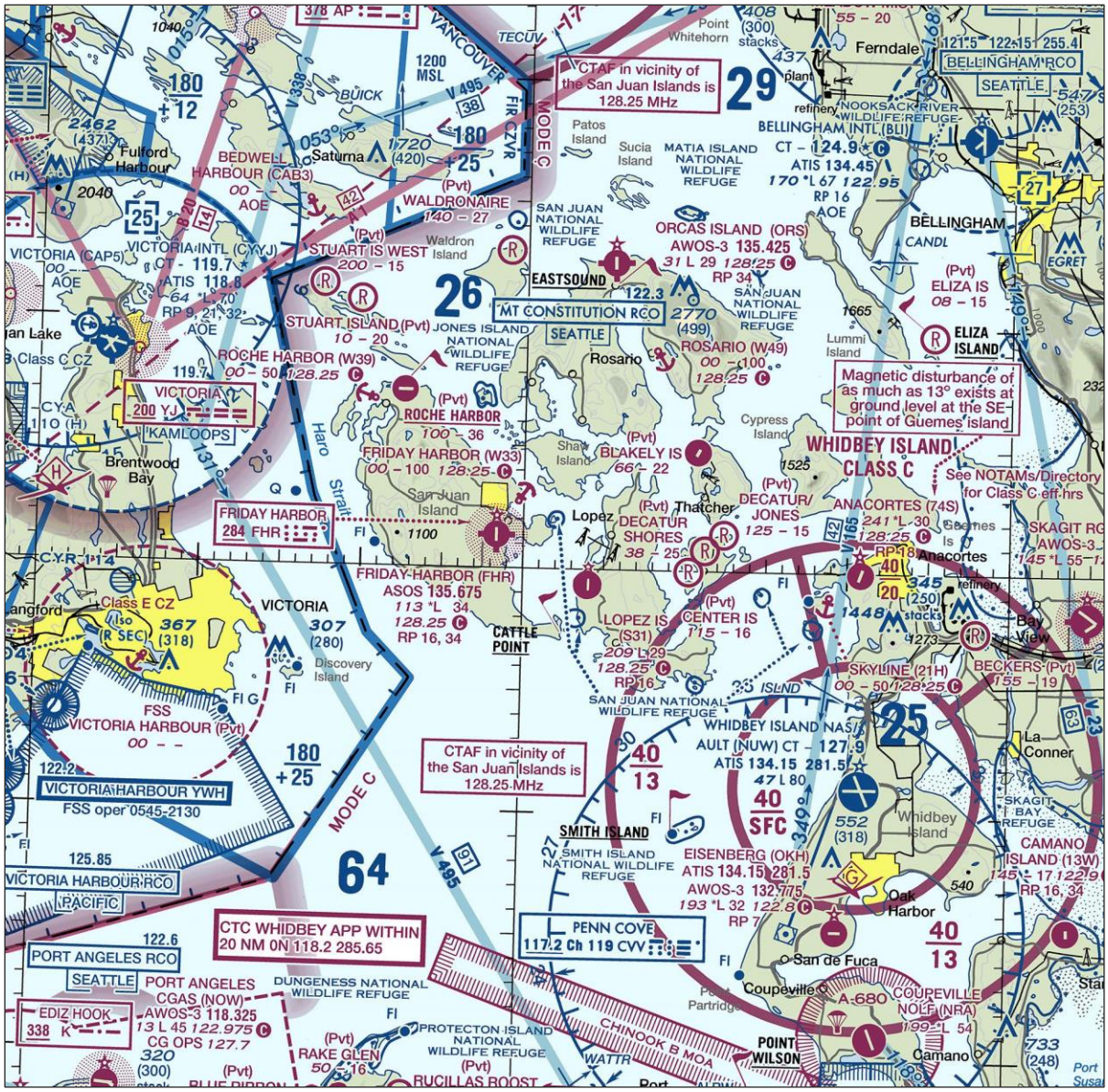
The airport traffic pattern is a standard left-hand pattern to runway 34, and a right hand pattern to runway 16. In this way, regardless of wind direction and runway being utilized the airport traffic stays primarily west of the airport over the San Juan Channel to lessen associated noise impacts on local area residents. Voluntary Noise Abatement procedures are now posted on the airport to remind pilots about noise impacts and foster a fly-friendly attitude. Aircraft separation in the terminal area is maintained visually by pilots. According to information provided on the WSDOT Aviation website (www.wsdot.wa.gov/aviation), the flight pattern altitude for the airport is 1,209 feet Above Mean Sea Level (AMSL) [i.e., 1,000 feet Above Ground Level (AGL)]. There are no mandatory procedures established for the airport.

Inventory of Airspace/NAVAIDS

Lopez Island Airport functions within the local, regional, and national airspace system. The airport is equipped with an Aeronautical Advisory Station (UNICOM) and Common Traffic Advisory Frequency (CTAF) on frequency 128.25. Local controlled airspace surrounding the airport is designated Class E with floor established at 700 feet Above Ground Level (AGL). To the Southeast of Lopez Island lies the Whidbey Island Naval Air Station Class C airspace. The outer perimeter of the Class C is ten miles from the air base. The outer ring begins 5 miles from the base, and goes out to ten mile perimeter with a base at 1,300’ MSL up to 4,000’ MSL. The Class C inner ring goes from the surface up to 4,000’ MSL. To the west of the San Juan Islands lies the international border between the United States and Canada. The Chinook B Military Operations Area (MOA) and the Alert Area A-680 are located south of the airport. Navigational Aids (NAVAIDS) for use by pilots in the vicinity of the airport consist of the Friday Harbor NDB (284 FHR), the Penn Cove VOR-DME (117.2 CVV), and the Victoria VOR-DME (113.7 YYJ).

The available NAVAIDS, local airspace, and surrounding airports are illustrated in Exhibit 2-8, which shows a portion of the Seattle Sectional Aeronautical Chart (a type of map used by pilots flying with visual flight rules).

Exhibit 2-8 Airspace/NAVAIDS Summary



Applicable Federal/State Plans

FAA National Plan of Integrated Airport Systems

The FAA's National Plan of Integrated Airport Systems (NPIAS) classifies Lopez Island Airport (S31) as a Non-Primary General Aviation Airport. This airport type is the largest single group of airports in the U.S. system. The category also includes privately owned, public use airports that enplane 2500 or more passengers annually and receive scheduled airline service. The NPIAS is used by FAA to identify 3,300 airports nationwide deemed significant to the national air transportation system. Airports listed in the NPIAS are eligible to receive Federal grants under the Airport Improvement Program (AIP) to help fund certain airport improvements

WSDOT LATS/State System Plan – Airport Classification

The Washington State Department of Transportation's (WSDOT) Long-Term Air Transportation Study (LATS) represents WSDOT's perspective on the State's aviation system and the Lopez Island Airport's role in it. In the LATS, S31 is identified as a Local Service General Aviation Airport. As with the NPIAS, airports that are included under this classification serve small to medium-sized communities and are busy enough to warrant aviation support services such as fuel sales.

Brief Airport Development History

Travel by boat was slow and subject to weather delays, and when private aviation began to boom after World War II, all of the major San Juan Islands, including Lopez, became accessible by air. In those early days, floatplanes would simply land on the water and taxi to shore, but wheeled planes had to set down on beaches and farmers' fields, occasionally with unfortunate results. There was a need for well-maintained airfields, and port districts were a logical choice to provide them.

The Lopez Island airport had its start as a cooperative public effort. In 1957, Mr. and Mrs. Bernard J. McConaghy donated a 100- by 2,575-foot strip of land on the island's west side to the Hoey-Kjargaard Post 185 of the American Legion. Using volunteer labor and donated equipment, the Legion post established the island's first purpose-built airstrip on the McConaghy property, and in subsequent years purchased three smaller pieces of land on the airstrip's north end to lengthen the runway. The upkeep of the airport was a financial burden to Post 185, however, and in 1965, it appealed to the residents of the island for additional aid. This was to give impetus to the idea of creating a port district to take over and operate the airport that the Legion and the people had built.

November 5, 1968, voters on Lopez Island approve the creation of a port district, the primary purpose of which is to establish a public airport to serve island residents and visitors. The district covers the entire island and is divided into three commissioner districts. The following year the local American Legion post donates an existing grass landing strip to the Port. Supplemented with other gifts and purchases, this becomes the Lopez Island Airport. Later, the runway will be paved, a parallel taxiway and apron installed, public and private hangars built, and lighting and other safety equipment provided.

The first official act of the new port commission was to seek a loan of $1,825 from the San Juan County Auditor for expenses the Port needed to incur immediately, to be repaid from 1970 tax receipts. "Resolution No. 1," passed on May 27, 1969, authorized this transaction, and noted that the "assessed value of the Lopez Port District," which encompassed all of the nearly 30-square-mile island, was at that time a mere $2,155,833 (Port of Lopez Resolution No. 1). Also in 1969, a small strip of land adjacent to the airport that was owned by San Juan County was quit-claimed to the port district.

In 2003, the Port of Lopez shared the Washington Public Ports Association's "Port of the Year" honors with the much larger Port of Tacoma. In making its award, the association noted the role the public had taken in airport development:

"For the Port of Lopez, marshalling volunteer community support has been a cornerstone of its efforts in maintaining the airport. Volunteers planted 215 drought-tolerant, low-growing evergreen trees; an adjacent property owner donated an easement for a storm water runoff system which enabled the port to proceed with safety and security improvements while helping the drainage for adjacent property owners; and a new rotating beacon was installed, with local help, which is less intrusive into neighbor's properties" (Press Release from WPPA).

The Lopez Island Airport has become an integral part of island life, and it is classified as an Essential Public Facility under the state's Growth Management Act. Three airlines -- Kenmore Air, San Juan Airlines, and Island Air – have provided passenger and freight service, and the airport is also used for crucial medevac flights. In addition, volunteer pilots ferry island residents back and forth for non-emergency medical treatments.

Current Aviation Activity

As of February 2016, there were 22 based aircraft at the Lopez Airport, including 20 on Port-owned land and the remaining 2 on adjacent private land. The 2015 FAA Form 5010 lists a total of 31,500 total operations, including 8,000 air taxi operations and 23,500 general aviation operations. Port Commissioners state that the total of 31,500 operations is probably overstated and the Master Record 5010 needs to be adjusted.

San Juan Airlines, the airport's major air taxi operator, confirmed a current total of approximately 1600 annual operations (435 scheduled commercial service operations plus 365 chartered operations) at Lopez using Cessna 172 and 207 aircraft. Aeronautical Services had previously operated a DHC-3 Turbo-Otter, which is a Group II category aircraft, but has stopped using this type to serve Lopez Island. On rare occasions, privately owned Group II aircraft operations were indicated by Port representatives but these do not constitute a number of annual operations to be considered close to critical aircraft requirements.

Current Critical Aircraft

In order to accurately project the facility requirements for an airport (such as runway length and width, runway and taxiway separation, and approach surface and runway protection zone dimensions), identification of the critical aircraft must be made. The critical aircraft is a single

aircraft or a family of aircraft, which controls one or more design items based on wingspan, approach speed, and/or maximum certificated takeoff weight. The same aircraft may not be critical to all design items. The critical aircraft should use the facility on a regular basis, considered to be at least 500 annual operations. The airport is classified and inspected for compliance with FAA design standards based upon the current critical aircraft. Plans for the future are based upon the forecast future critical aircraft.

Currently, the airport serves small aircraft (less than 12,500 pounds maximum gross weight), primarily in approach category B with approach speeds less than 121 knots, and airplane design group I with wingspans less than 49 feet. ARC B-I (Small) aircraft currently using the airport includes a Cessna 206 operated by San Juan Airlines for scheduled and chartered passenger service. San Juan Airlines also uses a Cessna 172 for a varying portion of its flights, according to demand and aircraft availability. San Juan Airlines operates in and out of Lopez with regularly scheduled service, resulting in an average 1600 annual air taxi operations (estimates for 800 flights in and out per year).

Due to its wingspan, a privately owned and operated DHC-3 Otter is the most demanding aircraft that occasionally uses Lopez Island Airport but the number of operations do not approach the 500 per year to be considered the critical aircraft. Current runway length is adequate for the Otter, and the owners are accustomed to operating at Lopez as currently configured. The airport designation will remain as the existing ARC B-I (Small), despite occasional operations by the Otter.

Existing Airside/Airfield Facilities

Table 2-2 Runway dimensions and specifications

Runway 16/34	
Dimensions:	2904 x 60 ft. / 885 x 18 m
Surface:	asphalt/grooved, in good condition
Weight bearing capacity:	Single wheel: 12.5
Runway edge lights:	medium intensity Taxiway is marked with reflectors.

	RUNWAY 16	RUNWAY 34
Latitude:	48-29.273617N	48-28.795883N
Longitude:	122-56.262100W	122-56.259667W
Elevation:	209.0 ft.	163.0 ft.
Gradient:	1.6%	1.6%
Traffic pattern:	right	left
Markings:	basic, in good condition	basic, in good condition
Visual slope indicator:	2-light PAPI on left (4.00 degrees glide path)	2-light PAPI on left (4.00 degrees glide path)
Runway end identifier lights:	yes	yes
Obstructions:	62 ft. trees, 1200 ft. from runway, 16:1 slope to clear	60 ft. trees, 900 ft. from runway, 11:1 slope to clear

Airfield Lighting and Navigational Aids

Runway 16-34 is equipped with Medium Intensity Runway Lights (MIRLs) that are pilot controlled. Each runway has a two-box Precision Approach Path Indicator (PAPI) on the left side set to 4º approach slope to aid pilots in avoiding obstacles in the approach environment. Each runway end is also equipped with flashing strobe Runway End Identifier Lights (REILs) to facilitate identifying the runway threshold for night operations.

Signage

The airport incorporates standard runway and taxiway signage and meets all FAA signage standards.

Review Existing Part 77 Surfaces

Under Part 77 of the Federal Aviation Regulations (FAR), standards are established for determining obstructions to navigable airspace. The regulation also provides for aeronautical studies of obstructions to determine their effect on the safe and efficient use of airspace. Ideally, airports are designed so the surrounding airspace is free and clear of obstructions that could be hazardous to aircraft on approach or departure paths. Standards set forth in FAR Part 77 are

intended to protect airspace in the vicinity of airports by defining a set of imaginary surfaces. Penetrations of these surfaces represent an obstruction to air navigation. The type of approach available to a runway governs the geometry of the imaginary surfaces. Five imaginary surfaces make up the protected airspace around an airport.

Primary Surface

The primary surface is an imaginary surface that is longitudinally centered on the runway and extends 200 feet beyond the end of each runway. The elevation of any point of that surface is equal to the elevation of the nearest point on the runway centerline. For S31, Runway 16-34 is a visual flight rules B-I runway with visibility minimums of at least three miles. As a result, the primary surface for this runway is 250 feet wide centered on the runway centerline.

Approach Surface

The approach surface for B-I is an inclined slope extending outward and upward from each end of the runway thresholds, centered on the extended runway centerline. Runway 16-34 is a B-I visual runway with an approach surface starting at the runway threshold with a width of 120 feet then expanding uniformly for a distance of 500 feet reaching a width of 300 feet. The approach surface then extends another 2,500 feet at 500 feet wide and continuing upwards at 20:1 slope.

Horizontal Surfaces

The horizontal surface is a horizontal plane 150 feet above the established airport elevation. Lopez Island Airport has an established elevation of 209 feet MSL (above Mean Sea Level) so the horizontal surface is 359 feet MSL. The perimeter of the surface is determined by arcs extending from the centerline of the runway and its intersection with the primary surface. The radii of these arcs correspond with the approach surface lengths for each of the runway ends. The runways at Lopez Island Airport are designated as utility or visual and use a radius of 5,000 feet.

Transitional Surfaces

The transitional surface is an inclined plane with a slope of 7:1, extending upward and outward at right angles to the runway centerline from the primary surface and the sides of the approach surfaces. These surfaces terminate where they intersect with the horizontal surface or another surface with more critical restrictions.

Conical Surface

The conical surface is an inclined plane at a slope of 20:1, extending upward and outward from the periphery of the horizontal surface for a distance of 4,000 feet. The top of the conical surface for Lopez has an elevation of 409 feet MSL.

These five surfaces together make up the FAR Part 77, Imaginary Surfaces requirements for a civil airport. This regulation defines the criteria for identifying obstructions that could be hazardous to aircraft on approach or departure paths.

Surface Penetrations / Obstacles

As shown on Exhibits 2-9 and 2-10, the FAR Part 77 Approach Surfaces for S31 are penetrated by numerous objects. In 2000, a detailed survey was undertaken to identify each object that penetrated these surfaces in order to initiate an obstruction clearing program. This survey identified numerous penetrations to the primary, approach, and transitional surfaces for Runways 16-34. This survey did not indicate any penetrations of objects in the horizontal or conical surfaces. The majority of these penetrations were identified to be trees, with some located on airport property. The remainder of the obstructions are located off airport. In 2012 the Port initiated the obstruction removal process with a tree clearing project in the off- airport portions of the approach and transitional surfaces for both approaches. The Port continues the clearing effort with initial concentration on the trees that are located on airport property, followed by the removal of off-airport obstructions in the approach slopes. The AGIS survey associated with this Master Plan Update will include an updated obstacle map to be presented in the updated ALP drawing set.

Exhibit 2-9 Runway 16 Part 77 Approach Surface

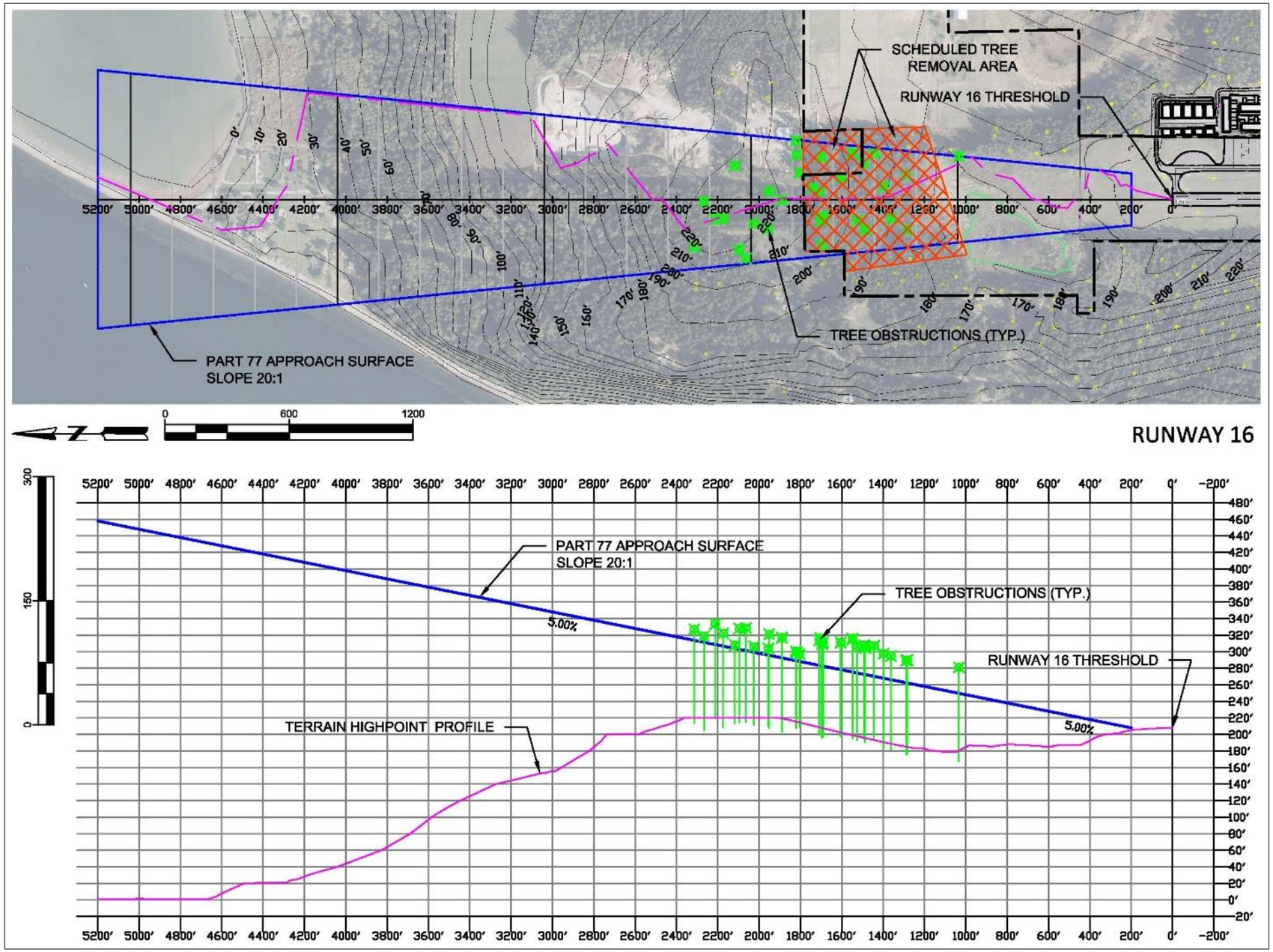
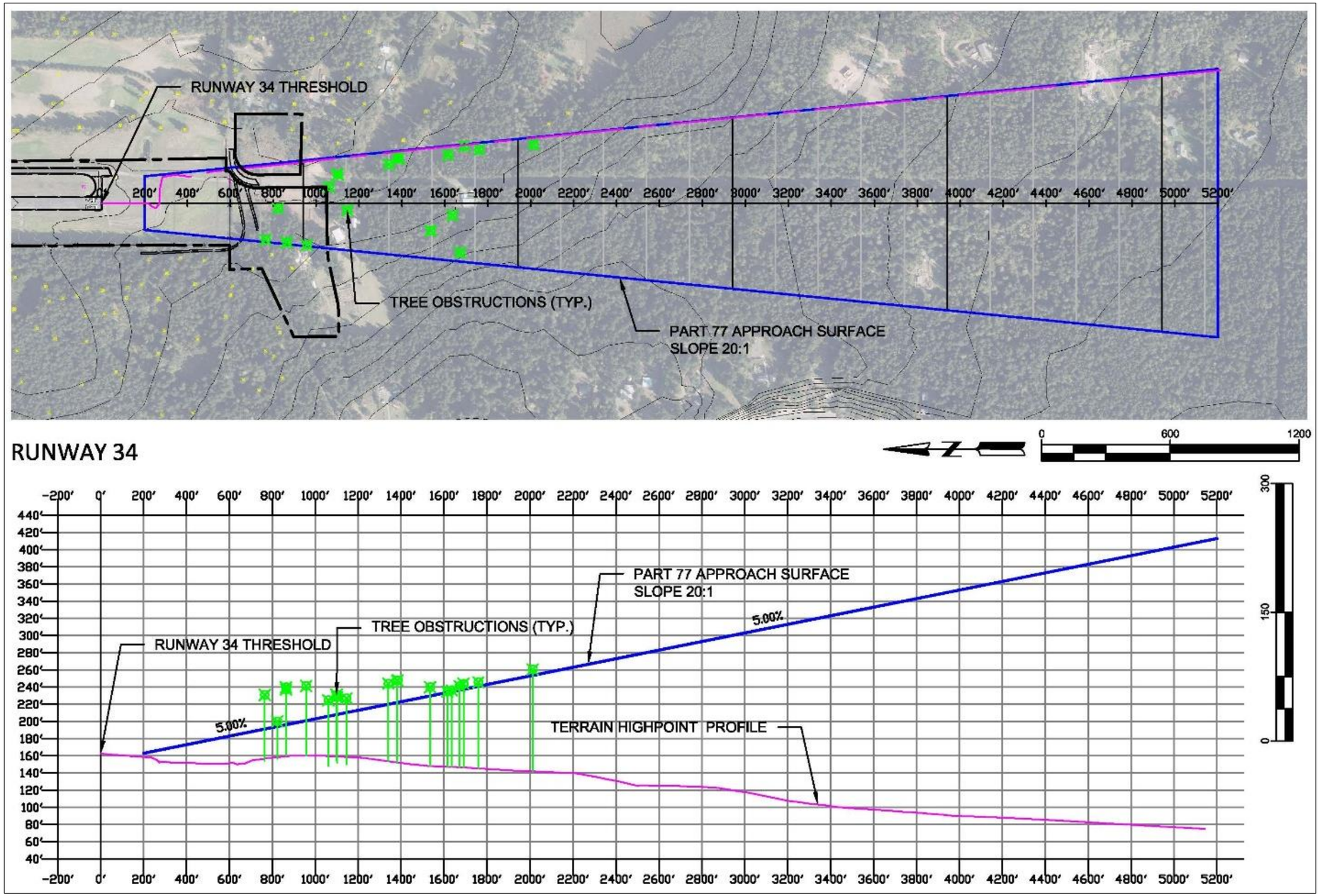


Exhibit 2-10 Runway 34 Part 77 Approach Surface



Environmental Conditions Inventory

Introduction

An Airport Master Plan needs to consider potential environmental impacts of the developments being proposed. The Federal Aviation Administration (FAA) encourages the review of existing environmental conditions at the airport as a foundational understanding of sensitive areas and a basis for estimating potential impacts associated with alternatives proposed later in the master planning process. The purpose and intent is to identify the potential means of avoiding, minimizing, and/or mitigating impacts to sensitive resources at an appropriate level of detail for facility planning. The Environmental Conditions Inventory explores the environmental factors considered in the preparation of the Master Plan. Further environmental review will be conducted for the preferred alternatives chapter and will identify the level of environmental documentation necessary to move forward with any development construction and operations at Lopez Island Airport.

Air Quality

The U.S. Environmental Protection Agency (EPA) has established National Ambient Air Quality Standards (NAAQS) for six criteria air pollutants: carbon monoxide (CO), ozone (O_3), particulate matter ($PM_{2.5}$) sulfur dioxide (SO_2), nitrogen dioxide (NO_x), and lead (Pb). According to the EPA, Lopez Island and all of San Juan County are currently designated as being "in attainment" for all criteria pollutants under the NAAQS. An attainment area is one in which air pollution levels do not exceed the established NAAQS.

Noise

Noise is generally defined as unwanted sound that can disturb routine activities (e.g., sleep, conversation, student learning) and can cause annoyance. As such, the determination of acceptable levels is subjective. The standard unit of measurement of the loudness of sound is the decibel (dB). The FAA has determined that the cumulative noise energy exposure of individuals to noise resulting from aviation activity must be established in terms of yearly day-night average sound level (DNL). DNL is a 24-hour, time-weighted energy average noise level based on the "A" weighted decibel dBA ("A" weighted refers to the sound scale pertaining to the human ear). It is the overall noise energy level experienced during an entire day. Time-weighted refers to the fact that noise occurring between the hours of 10:00 p.m. and 7:00 a.m. is penalized by ten dBA in an attempt to account for the higher sensitivity to noise during nighttime hours and the expected decrease in background noise levels.

Existing levels of operations at Lopez Island Airport currently do not warrant a full noise modeling effort for this Master Plan.

Compatible Land Use

The compatibility of existing and planned land uses in the vicinity of an airport is usually determined in relation to the level of aircraft generated noise. However, it can also include other ramifications related to zoning, relocations, disruptions of communities, and induced socioeconomic impacts Federal compatible land use guidelines for a variety of land uses are

provided in Table 1 in Appendix A of 14 CFR part 150, *Land Use Compatibility with Yearly Day-Night Average Sound Levels*, and are presented in the Table 2-3.

Table 2-3 Land Use Compatibility Matrix

LAND USE	YEARLY DAY-NIGHT NOISE LEVEL (DNL) IN DECIBELS					
	BELOW 65	65-70	70-75	75-80	80-85	OVER 85
RESIDENTIAL						
Residential, other than mobile homes and transient lodgings	Y	N(1)	N(1)	N	N	N
Mobile home parks	Y	N	N	N	N	N
Transient lodgings	Y	N(1)	N(1)	N(1)	N	N
PUBLIC USE						
Schools	Y	N(1)	N(1)	N	N	N
Hospitals and nursing homes	Y	25	30	N	N	N
Churches, auditoriums and concert halls	Y	25	30	N	N	N
Governmental services	Y	Y	25	30	N	N
Transportation	Y	Y	Y(2)	Y(3)	Y(4)	Y(4)
Parking	Y	Y	Y(2)	Y(3)	Y(4)	N
COMMERCIAL USE						
Offices, business and professional	Y	Y	25	30	N	N
Wholesale and retail-building materials, hardware and farm equipment	Y	Y	Y(2)	Y(3)	Y(4)	N
Retail trade-general	Y	Y	25	30	N	N
Utilities	Y	Y	Y(2)	Y(3)	Y(4)	N
Communication	Y	Y	25	30	N	N
MANUFACTURING AND PRODUCTION						
Manufacturing, general	Y	Y	Y(2)	Y(3)	Y(4)	N
Photographic and optical	Y	Y	25	30	N	N
Agriculture (except livestock) and forestry	Y	Y(6)	Y(7)	Y(8)	Y(8)	Y(8)
Livestock farming and breeding	Y	Y(6)	Y(7)	N	N	N
Mining and fishing resource production and extraction	Y	Y	Y	Y	Y	Y
RECREATIONAL						
Outdoor sports arenas and spectator sports	Y	Y(5)	Y(5)	N	N	N
Outdoor music shells, amphitheaters	Y	N	N	N	N	N
Nature exhibits and zoos	Y	Y	N	N	N	N
Amusements, parks, resorts and camps	Y	Y	Y	N	N	N
Golf courses, riding stables and water recreation	Y	Y	25	30	N	N

Numbers in parentheses refer to NOTES.

The designations contained in this table do not constitute a Federal determination that any use of land covered by the program is acceptable or unacceptable under Federal, State or local law. The responsibility for determining the acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with the local authorities. FAA determinations under Part 150 are not intended to substitute federally determined land uses for those determined to be appropriate by local authorities in response to locally determined needs and values in achieving noise compatible land uses.

TABLE KEY

SLUCM	Standard Land Use Coding Manual.
Y(Yes)	Land Use and related structures compatible without restrictions.
N(No)	Land Use and related structures are not compatible and should be prohibited.
NLR	Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.
25, 30 or 35	Land Use and related structures generally compatible; measures to achieve NLR of 25, 30 or 35 dB must be incorporated into design and construction of structure.

NOTES

(1) Where the community determines that residential or school uses must be allowed, measures to achieve outdoor to indoor Noise Level Reduction (NLR) of at least 25 dB to 30 dB should be incorporated into building codes and be considered in individual approvals. Normal residential construction can be expected to provide a NLR of 20 dB, thus, the reduction requirements are often stated as 5, 10 or 15 dB over standard construction and normally assume mechanical ventilation and closed windows year round. However, the use of NLR criteria will not eliminate outdoor noise problems.

(2) Measures to achieve NLR of 25 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.

(3) Measures to achieve NLR of 30 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.

(4) Measures to achieve NLR of 35 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.

(5) Land use compatible provided that special sound reinforcement systems are installed.

(6) Residential buildings require an NLR of 25.

(7) Residential buildings require an NLR of 30.

(8) Residential buildings not permitted.

The table identifies land use types as being compatible, incompatible, or compatible if conducted within a sound attenuated structure. The table, developed by the FAA, can act as a guide to local municipalities for land use planning and control, and as a tool to compare relative land use impacts resulting from various planning alternatives.

Historical, Architectural, Archaeological, Tribal, and Cultural Resources

According to the National Register of Historic Places, there is one listed property located on Lopez Island, which is Port Stanley School. It is located approximately four miles northeast of the airport. According to the Washington Department of Archaeology and Historic Preservation (DAHP) Washington Information System for Architectural and Archaeological Records Data (WISAARD), there are two Historic Register Properties Heritage Barns located southeast of the airport on Richardson Road. Steinbrueck's Place Barn is located approximately two miles southeast of the airport; Wilson-Kring Farm's Barn is located approximately 1-3/4 mile southeast of the airport. Additionally, according to data contained in the WISAARD, airport property is designated as either high risk or very high risk of containing archaeological resources and highly advises that a cultural resources survey be conducted prior to any future projects that involve earthwork or ground disturbance.

Section 4(f) Property

There does not appear to be any publicly-owned land from a public park, recreation area, or wildlife and waterfowl refuge of national, state, or local significance within the immediate vicinity of the airport. Nor does there appear to be any publicly or privately owned land from an historic site of national, state, or local significance that could be affected by, or have an effect on, the airport and its daily operation. The nearest park area is Shark Reef Park, a San Juan County owned park approximately 1.5 miles south of the airport.

Threatened and Endangered Species

According to the U.S. Fish and Wildlife Service (USFWS), there is one endangered species, ten threatened species, one species under review, one candidate species, and one species listed as recovery known to occur within San Juan County. The Washington Department of Fish and Wildlife (WDFW) Priority Habitats and Species (PHS) List identifies multiple priority areas for five species occurring on or near airport property. Table 2-4 provides a listing of the species and their status for San Juan County.

According to the USFWS Critical Habitat Mapper, the entire water bodies surrounding Lopez Island are designated as critical habitat for the Killer whale (Orcinus orca).

Table 2-4 San Juan County Threatened, Endangered, Candidate, and Priority Species

Group	Name	Status
Amphibians	Oregon Spotted frog (*Rana pretiosa*)[1]	Federal Threatened
Birds	Brown pelican (*Pelecanus occidentalis*)[1]	Federal Recovery
	Short-tailed albatross (*Phoebastria albastrus*) [1]	Federal Threatened
	Yellow-billed Cuckoo (*Coccyzus americanus*)[1]	Federal Threatened
	Marbled murrelet (*Brachyramphus marmoratus*)[1]	Federal Threatened
	Northern spotted owl (*Strix occidentialis caurina*) [1]	Federal Threatened
	Streaked Horned lark (*Eremophila alpestris strigata*) [1]	Federal Threatened
	Bald eagle (*Haeliaeetus leucocephalus*)[2]	State Sensitive
	Golden eagle (*Aquila chrysaetos*)[2]	State Candidate
Fishes	Bull Trout (*Salvelinus confluentus*)[1]	Federal Threatened
	Dolly Varden (*Salvelinus malma*)[1]	Federal Threatened
Flowering Plants	Golden Paintbrush (*Castilleja levisecta*)[1]	Federal Threatened
Insects	Island large marble Butterfly (*Ehchloe ausonides insulanus*)[1]	Federal Candidate
	Sand-verbena moth (*Copablepharon fuscum*)[1]	Federal Under Review for Potential Listing as Threatened or Endangered
Mammals	Townshend's big-eared bat (*Corynorhinus townsendii*)[2]	State Candidate
Mollusks	Pinto abalone (*Haliotis kamtschatkana*)	State Candidate
Reptiles	Leatherback sea turtle (*Dermochelys coriacea*)[1]	Federal Endangered
	Green sea turtle (*Chelonia mydas*)[1]	Federal Threatened

Sources: [1]U.S. Fish and Wildlife Service 2016.
[2]Washington Department of Fish and Wildlife 2015.

Further research into the USFWS's Information for Planning and Conversation (IPAC) website, reveals that the species listed in Table 2-4 are known to occur within San Juan County, but are not likely to be present in the area of the airport. IPAC also shows that no critical habitat is found within the airport property for the above-mentioned species that are listed as federally threatened or endangered. Migratory birds are known to occur in the area of the airport, but these species are not currently listed as threatened or endangered. According to the IPAC website, it is unlikely that any of the species would be impacted by activities at the airport, however; it would be recommended that future projects be further evaluated for the presence or absence of these listed species.

Water Quality

According to the Environmental Protection Agency (EPA) website NEPAssist (http://nepassisttool.epa.gov/nepassist/entry.aspx), there are no impaired streams, impaired waterbodies, or wild or scenic rivers near the airport. The Washington Department of Natural Resources designates a stream located east of the airport as Type "F" (or Fish) according to the Forest Practices Water Type Classification. This classification is applied to streams and waterbodies that are known to be used by fish, meet the physical criteria to be potentially used by fish, and may or may not have flowing water all year. The stream located west of the airport is classified by the Washington Department of Natural Resources as Type "N" (or Non-Fish). This classification is applied to streams having year round flow, may have spatially intermittent dry reaches downstream of perennial flow, and do not meet the physical criteria of a Type "F" stream, or have been proven not to contain fish.

Wetlands

NEPAssit indicates there are four National Wetlands Inventory (NWI) identified wetland areas on airport property. A freshwater emergent wetland appears to have been filled for the construction of the north Port owned hangar and the south part of the private hangars. Two wetland areas are within the Runway 16 RPZ in the northwest part of airport property, consisting of a large freshwater emergent wetland and a smaller freshwater forested/shrub wetland. A corner of the northeast portion of airport property encompasses another freshwater emergent wetland. Additional freshwater emergent wetlands and freshwater ponds are identified east of airport property. Figure 2-11 provides the location of wetlands and streams within the vicinity of Lopez Island Airport.

Exhibit 2-11 Wetlands and Streams

Farmland

According to the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey, soils on airport property are comprised of four types, which are presented in Table 2-5.

Table 2-5 Soil Types on Airport Property

Soil Type	Acres Within Airport	Percent of Airport Property	Prime Farmland
Shalcar muck, 0-2% slopes	2.5	5.2%	Prime if drained
Coveland-Michellbay complex, 2-15% slopes	0.1	0.2%	All areas prime
Miechellbay-sholander-Bazal complex, 0-8% slopes	34.9	69.6%	Prime if irrigated and drained
Whidbey-Hoypus complex, 2-15% slopes	12.6	25.0%	Prime if irrigated

Floodplains

The Federal Emergency Management Administration (FEMA) Flood Insurance Rate Map (FIRM) indicates there are no floodplains or floodways on or in the vicinity of the airport.

Critical Areas

The State of Washington Growth Management Act (GMA) identifies five types of critical areas: geologically hazardous areas, frequently flooded areas, critical aquifer recharge areas, wetlands, and fish and wildlife habitat conservation areas. Local jurisdictions are required by the GMA, at a minimum, to designate and protect critical areas through policies, rules, and regulations.

Geologically Hazardous Areas. The Liquefaction Susceptibility Map of San Juan County, produced by the Washington Division of Geology and Earth Resources, designates the soils within the airport property as primarily a low susceptibility for liquefaction. There is a small area of very low susceptibility in the west part of the airport and a small area of low to moderate susceptibility to the north.

Frequently Flooded Areas. As stated above, the FEMA Flood Insurance Rate Map indicates there are no floodplains or floodways on or in the vicinity of the airport.

Critical Aquifer Recharge Areas. According to San Juan County Community Development and Planning Department maps, all of the land within San Juan County is designated a Critical Aquifer Recharge Area because of its sensitivity and vulnerability to groundwater contamination.

Wetlands. As stated above, NEPAssist identified four wetland areas on airport property.

Fish and Wildlife Habitat Conservation Areas. As stated previously, the USFWS and the WDFW have identified Federal and State species that could potentially occur on or near the airport. However, lacking a formal Critical Habitat designation, a determination of the presence or absence of these species must be made prior to undertaking development projects at the airport.

CHAPTER 3. AVIATION DEMAND FORECASTS

Introduction

The objective of this chapter is to develop forecasts of aviation activity for Lopez Island Airport. Forecasting efforts are a key element in the airport planning process and are essential for analyzing existing airport facilities and identifying future needs and requirements for these facilities. By its very nature, forecasting is not an exact science, but does identify general parameters for development and, when soundly established, provides a defined rationale for various development activities as demands increase. The forecasts presented in this chapter are prepared for the short-, intermediate-, and long-range time frames using 2015 as a base year.

Aviation activity forecasting commences by utilizing the present time as an initial point, supplemented with historic data obtained from various sources, and compared to trends and forecasts. Forecasts used for comparison purposes in this Master Plan Update include the 1999 Airport Layout Plan Report, the WSDOT Aviation Division Long-Term Air Transportation Study (LATS) 2009, the FAA's Terminal Area Forecast (TAF) 2015, and the FAA Aerospace Forecasts 2015-2035.

The forecasts prepared for the 1999 Lopez Airport Layout Plan Report are presented in Table 3-1. The average annual growth rates are also presented. It should be noted that an aircraft operation is defined as a takeoff or a landing; so if an aircraft performs a touch-and-go, it is counted as two operations.

Table 3-1 Summary of 1999 Lopez Island Airport Layout Plan Report Aviation Forecasts

Activity	1999	2003	2008	2018	Growth Rate
Aircraft Operations					
Commercial Service Operations	8,000	9,100	10,300	13,300	2.7%
General Aviation Operations	24,200	25,800	27,500	31,300	1.4%
Total Operations	32,200	34,900	37,800	44,600	1.7%
Itinerant Operations	26,200	28,400	30,900	36,800	1.8%
Local Operations	6,000	6,500	6,900	7,800	1.4%
Critical Aircraft (DHC-3 Otter)	1,100	1,250	1,410	1,830	2.7%
Based Aircraft	**44**	**47**	**50**	**57**	**1.4%**
Single Engine Piston	44	45	47	53	1.0%
Multi Engine Piston	0	2	3	4	
Multi Engine Turboprop	0	0	0	0	

Source: Lopez Airport Layout Plan Report, November 1999.

Historical and Existing Airport Activity

With no on-site Airport Traffic Control Tower (ATCT), there are limited historical records that provide accurate aviation activity information for Lopez Island Airport. A tabulation of the best available historical aviation activity occurring at the airport since 2005 is presented in Table 3-2. The data from 2005 through 2014 is obtained from the FAA's Terminal Area Forecasts (TAF). The historic enplanements data is obtained from the U.S. Department of Transportation (DOT)

Bureau of Transportation Statistics (BTS) T-100 Market data. The 2015 aircraft operations data is provided by Port of Lopez personnel.

Table 3-2 Historical Aviation Activity, 2005-2015

Year	Enplanements[1]	Air Taxi Operations[2]	GA Operations[2]	Military Operations	Total Operations[2]	Based Aircraft[2]
2005	10	7,500	28,174	0	35,674	34
2006	---	7,500	28,419	0	35,919	34
2007	707	7,500	28,665	0	36,165	34
2008	1,015	8,000	23,500	0	31,500	42
2009	1,098	8,000	23,500	0	31,500	42
2010	891	8,000	23,500	0	31,500	34
2011	750	8,000	23,500	0	31,500	34
2012	445	8,000	23,500	0	31,500	22
2013	60	8,000	23,500	0	31,500	23
2014	658	8,000	23,500	0	31,500	23
2015	396	3,760[3]	9,850[3]	24[3]	13,634[3]	24[3]

Sources: [1]FAA Air Carrier Activity Information System (ACAIS), December 2015.
[2]FAA Terminal Area Forecast (TAF), January 2016. Includes air cargo aircraft operations. Fiscal year.
[3]Estimates provided Port of Lopez personnel, February 2016. Calendar Year.

Air taxi aircraft operations are generally classified as any company or individual performing air passenger and/or air cargo transportation service on a nonscheduled basis over unspecified routes. General aviation aircraft operations are those operations that are not commercial service, air taxi, or military aircraft operations.

It should be noted that the TAF data at non-towered airports is dependent on information contained on the airport's FAA Form 5010, which is typically updated annually from generalized estimates provided by airport sponsors. It is not unusual for 5010 data, and consequently TAF data, to contain inaccurate and repeated data from year to year, as reflected in Table 3-2. Therefore, for this Master Plan Update, it was confirmed by Port of Lopez personnel observations that the aircraft operational data presented for 2015 is an accurate reflection of existing airport activity, and through Port records that the 24 based aircraft is accurate.

Historic enplanements at Lopez Island Airport have primarily been provided by unscheduled, on demand air taxi operations. It is anticipated that the same level of service will continue in the future and no scheduled passenger airline service will be provided at the airport. Therefore, no forecasts of passenger enplanements will be provided in this Master Plan Update.

Existing Aircraft Operations by Aircraft Type

The current level of aviation activity by aircraft type is summarized in Table 3-3.

Table 3-3 Existing Operations by Aircraft Type, 2015

Aircraft Type	Operations[1]	Percentage
Air Taxi[2]	**3,760**	**27.6%**
Single Engine	3,760	100.0%
General Aviation	**9,850**	**72.2%**
Single Engine	9,520	96.6%
Multi-Engine Piston	100	1.0%
Multi-Engine Turboprop	100	1.0%
Business Jet	---	0.0%
Helicopter	130	1.3%
Military	**24**	**0.2%**
Helicopter	24	100%
Total	**13,634**	

Sources: [1]Port of Lopez personnel estimate based on observations and knowledge of activity occurring at the airport, February 2016.
[2]Includes air cargo aircraft operations.

Air Taxi

The existing commercial service at Lopez Island Airport is currently provided by San Juan Airlines with service to Anacortes and Bellingham. However, on a per-flight basis, if no passengers are ticketed to or from Lopez Island Airport, flights to the airport are not made (i.e., conducting air taxi services). The operational counts provided in Table 3-3 also include air cargo aircraft operations conducting one flight per day, five days of the week.

General Aviation

The majority of general aviation aircraft are conducted primarily by single engine aircraft, followed by 130 medevac helicopter operations conducted by the Lopez Fire Department. There are approximately 100 operations each of multi-engine piston and turboprop aircraft operations, as provided by Port of Lopez personnel.

Military

Port of Lopez personnel estimate that Coast Guard helicopters conducted once-monthly practice missions at the Airport in 2015.

Factors Affecting Aviation Activity

There are many variables and factors that can affect aviation activity at a particular airport. General aviation airports can be influenced by national, regional, and local (i.e., airport market area) trends in population, income, and employment. Other factors include the overall measure of economic activity [as measured in Gross Domestic Product (GDP], the regulatory climate, tourist destinations, nationwide aviation industry trends, available airport facilities, and even the meteorological conditions under which the airport exists.

Lopez Island Airport is unique in that its island location acts as a "constraint" to growth. The island is, for all intents and purposes, a self-contained system with a limit on future growth (i.e., population growth is limited because of the finite land available for development). Population

projections available from the state are available at the county-level basis only. San Juan County will be used for purposes of this Master Plan, but it is understood that Lopez Island represents the true "market area" for the Airport. Very little seasonal or tourist travel to island occurs by air. The most popular tourist activities involve hiking, camping, and bicycling, but the vast majority of them travel to the island by ferry, not by air. It is not anticipated that this will change in the future.

Socioeconomic Conditions

Population

Source: U.S. Census Bureau, 2014 American Community Survey (ACS); Washington State Office of Financial Management (OFM).

- San Juan County. 16,015 (ACS), 17,443 by 2040 (OFM), average annual growth rate of 0.3%.
- Washington State. 7,061,530 (ACS), 8,790,981 by 2040 (OFM), average annual growth rate of 0.8%.
- United States. 321369,000 (ACS), 380,219,000 by 2040 (ACS), average annual growth rate of 0.7%.

As indicated, it is not expected that the San Juan County population will exceed the average annual growth rates of Washington State or the United States.

Income

Source: U.S. Census Bureau, 2010-2014 American Community Survey (ACS).

- San Juan County. Per capita income of $38,556.
- Washington State. Per capita income of $31,233.
- United States. Per capita income of $28,555.

As presented, San Juan County exceeds both the state and national levels of per capita income.

Employment

Source: U.S. Census Bureau, 2010-2014 American Community Survey (ACS); Washington State Employment Security Department, 2014 Labor Market and Economic Report (LMER).

- San Juan County. 2014 Employed persons 7,677, Unemployment rate of 6.2% (ACS).
- Northwest Workforce Development Area (WDA, consisting of Island, San Juan, Skagit, and Whatcom Counties). Projected employment growth rate from 2012 to 2017 of 2.15%, and projected employment growth rate from 2017 to 2022 of 1.38% (LMER).
- Washington State. 2014 Employed persons 3,194,382, Unemployment rate of 8.8% (ACS): projected employment growth rate from 2017 to 2022 of 1.94%, and projected employment growth rate from 2017 to 2022 of 1.27% (LMER).
- United States. 2014 Employed persons 143,435,233, Unemployment rate of 9.2%.

San Juan County has a lower unemployment rate than both the state and nation. Major employers in the county by category include: Educational Services, Health Care and Social

Assistance (16.7%); Arts, Entertainment, Recreation, and Accommodation and Food Services (15.6%); Professional, Scientific, Management, and Administrative (12.8%); and Construction (12.6%) (ACS). The Northwest WDA, of which San Juan County belongs, is expected to have a higher increase in employment growth from 2012 through 2022 than the State of Washington.

Gross Domestic Product

Source: U.S. Bureau of Economic Analysis, Regional Data (BEA).

- Washington State. $271,676,000 in 2004, $422,877,000 by 2014 (BEA), average annual growth rate of 4.5%.
- United States. $12,206,995,000 in 2005, $17,232,619,000 by 2014 (BEA), average annual growth rate of 3.5%.

Between 2005 and 2014, the State of Washington Gross Domestic Product increased at a greater rate compared to the United States.

Other Transportation Modes

Lopez Island is served by the Washington State Ferry system transporting passengers between the island and Anacortes, Washington. Between 2005 and 2015, the ferries transported approximately 1,666,800 passengers, which is an annual average of 151,530. In 2015, 156,700 approximate passengers traveled between Lopez Island and Anacortes. The island is much more reliant on ferry transportation than air transportation.

Regulatory Climate

For forecasting purposes in this Master Plan Update, it is assumed that the regulatory climate of the aviation industry will not change dramatically during the forecast time period. Specifically, it is assumed that Federal aircraft noise and emission requirements will remain within the bounds prescribed by current rules and regulations, no new Federal or local user fees will be imposed on general aviation aircraft, that access to airports and airspace will not be limited or constrained, and general aviation airports will not be subject to security restrictions that are currently imposed at commercial service airports.

Air Taxi Operations Forecast

As stated previously, the existing air taxi aircraft operations consist of on-demand charter services and once-daily flights by single engine air cargo aircraft. It is assumed that this level of activity will remain fairly constant throughout the planning period of this document, since it is not expected that the cargo demand will exceed the loading potential of the existing single engine aircraft currently providing the service. Additionally, air charter service is expected to remain fairly stable, increasing with the demands of the increasing population base of the island and the county. Therefore, air taxi aircraft operations are expected to increase at an average annual growth rate of 0.3%, equal to the San Juan County population growth provided by the OFM.

Table 3-4 provides the forecasts for air taxi operations throughout the planning period for the Airport, as well as the Trend Projection based on the 10-year historic data, the operations

contained in the WSDOT Aviation LATS, the forecasts presented in the 1999 Lopez Airport Layout Plan Report, and the forecast contained in the TAF.

Table 3-4 Air Taxi Aircraft Forecasts, 2015-2035

Year	Trend	LATS	ALP	TAF	Forecast
2015	3,760	5,400	---	8,000	3,760
2016	6,649		---	8,000	3,770
2017	6,511		13,300	8,000	3,779
2018	6,373		---	8,000	3,789
2019	6,235		---	8,000	3,799
2020	6,096	5,600	---	8,000	3,809
2025	5,405	5,800	---	8,000	3,859
2030	4,715	6,000	---	8,000	3,909
2035	4,024	---	---	8,000	3,960
Growth Rate	-2.6%	0.7%	2.7%	0.0%	0.3%

Source: Reid Middleton, Inc. and Mead & Hunt.

General Aviation Forecast Activity

In developing the general aviation forecasts, it is necessary to review and understand the general aviation industry trends and forecasts at the national level, as they have a trickle-down effect on the local level and provide insight into potential future aviation activity at Lopez Island Airport. Sources: General Aviation Manufacturers (GAMA), FAA Aerospace Forecast Fiscal Years 2015-2035 (FAA Aerospace).

- **U.S. Economy.** Projected to range between 2.1 to 3.1% on an annual basis for the next two years, 2.6% for the following three-year period, and 2.4% annually through 2035 (FAA Aerospace).
- **Aircraft Shipments.** More turbine-powered aircraft have been manufactured in the United States since 2009 than piston-powered aircraft (GAMA).
- **Aircraft Age.** The average age of single engine and multi-piston-powered aircraft is over 30 years and almost 39 years, respectively. Conversely, the average age of multi-engine turboprop and business jets is just over 25 years and just under 15 years, respectively (GAMA).
- **General Aviation Active Fleet.** The whole general aviation active aircraft fleet is projected to increase from 198,860 aircraft in 2014 to 214,260 in 2035, an average annual growth rate of 0.4% (FAA Aerospace).
- **General Aviation Aircraft Fleet Changes.** As piston-powered aircraft retire in future years (reaching the end of their useful lives), turbine-powered aircraft will increase as a proportion of the total general aviation aircraft fleet. Active turboprop fixed wing aircraft are expected to increase at an annual growth rate of 1.5% through 2035; business jets are projected to increase at an average annual rate of 2.8% (FAA Aerospace).
- **Light Sport Aircraft.** Light sport aircraft (i.e., aircraft with weight, capacity, and performance restrictions) are expected to increase at an annual average growth rate of 4.3% through 2035 (FAA Aerospace).

- **General Aviation Aircraft Hours Flown.** Projected overall increase of an average annual growth rate of 1.4% through 2035. Hours flown by piston-powered fixed wing aircraft (both single-engine and multi-engine) projected to decrease 0.5% per year. By turbine-powered fixed wing aircraft expected to increase at an annual rate of 0.9%. By rotorcraft expected to increase 2.0% annually, and for light sport aircraft expected to increase 5.1% through the year 2035 (FAA Aerospace Forecast).

Based Aircraft Forecast

The number and type of aircraft expected to base at an airport is dependent upon several factors, such as communications, available facilities, airport services, airport proximity and access, aircraft basing capacity available at nearby airports, and other similar considerations. General aviation aircraft operators are particularly sensitive to both the quality and location of their basing facilities, with proximity of home and work often being identified as the primary considerations in the selection of an aircraft basing location. Historic (2005-2014) based aircraft data as contained in the TAF has varied during the time period contained in Table 3-2, with as few as 22 to a high of 42. The existing 22 aircraft currently based at the airport is provided by Port of Lopez personnel.

Table 3-5 presents the various based aircraft forecast scenarios prepared for this Master Plan Update, as well as the trend projection based on historic data (2005-2015), the forecasts developed in the 1999 Lopez Airport Layout Plan Report, and the forecast generated in the TAF for the airport. As shown, the trend growth rate decreases at an annual average rate of 19.0%, the forecasts prepared for the 1999 Lopez Airport Layout Plan Report indicate an average annual growth rate of 1.4%; and the TAF projects a growth rate of 2.5%. It should be noted that the WSDOT-Aviation Division LATS forecasts did not project general aviation activity by individual airport, so no comparison is provided.

Scenario One: Scenario One applies the nationwide growth rate for active general aviation aircraft (0.4% annually) projected in the FAA Aerospace Forecast Fiscal Years 2015-2035. By applying this annual rate to the existing based aircraft at Lopez Island Airport, an increase to 26 aircraft is realized by 2035.

Scenario Two: Scenario Two utilizes the employment growth rates for the Northwest WDA provided by the Washington State Employment Security Department 2014 Labor Market and Economic Report. This publication projected from 2012 through 2017, the employment growth rate would be 2.15%, decreasing to 1.38% from 2017 through 2022. A trend projection is used to extend the forecast to 2035, resulting in an overall increase to 32 based aircraft and an average annual growth rate of 1.4%.

Scenario Three: Scenario Three applies a slightly lower growth rate than used for the TAF to project based aircraft at Lopez Island Airport, which is thought to be slightly high since the population growth of San Juan County is below the state and national rates. This results in an increase to 36 aircraft reflecting an average annual growth rate of 2.0%.

It is recommended that Scenario Two be selected as the preferred based aircraft forecast. By utilizing the forecasts from the 2014 Labor Market and Economic Report used for the Northwest WDA, this scenario couples the based aircraft projections to an independent variable for which there has historically been an acceptable ten-year correlation coefficient (i.e., 0.66).

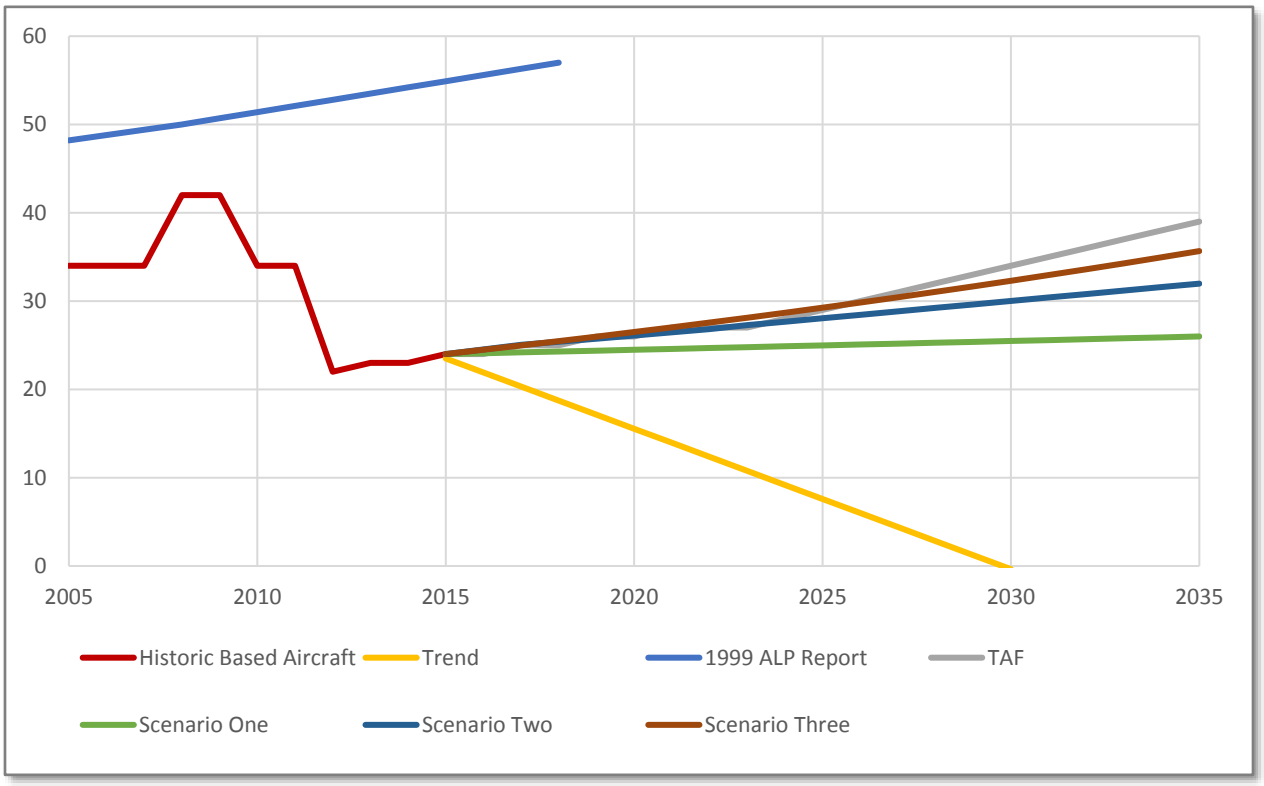
Table 3-5 Based Aircraft Forecasts, 2015-2035

Year	Trend	ALP	TAF	Scenario One	Scenario Two	Scenario Three
2015	24		24	24	**24**	24
2016	22		24	24	**24**	24
2017	20		25	24	**25**	25
2018	19	57	25	24	**25**	25
2019	17		26	24	**25**	26
2020	16		26	24	**26**	26
2025	8		29	25	**28**	29
2030	0		34	25	**30**	32
2035	---		39	26	**32**	36
Growth Rate	-19.0%	1.4%	2.5%	0.4%	1.4%	2.0%

Source: Reid Middleton, Inc. and Mead & Hunt.

Exhibit 3-1 graphically presents the historic based aircraft, the trend projection based on the historic data, the 1999 Lopez Airport Layout Plan Report forecast, the TAF, and the three forecast scenarios prepared for this Master Plan Update.

Exhibit 3-1 Based Aircraft Forecasts



Based Aircraft Forecast by Aircraft Type

The based aircraft fleet mix for incremental periods is shown in Table 3-6. The existing based aircraft fleet mix at Lopez Island Airport consists exclusively of single engine piston powered aircraft. It can be expected that at least one multi-engine turbine-powered aircraft will be based at the Airport in the future. This is related to the overall nationwide changes reflected in the aircraft manufacturing, delivery, and use trends discussed earlier. It can also be expected that light sport aircraft will increase as a percentage of future single engine aircraft fleet in the future.

Table 3-6 Based Aircraft Forecast By Type, 2015-2035

Aircraft Type	2015[1]	2020	2025	2030	2035
Single Engine	24	26	28	29	31
Multi-Engine Turboprop	---	---	---	1	1
Total Aircraft	**24**	**26**	**28**	**30**	**32**

Source: Reid Middleton, Inc. and Mead & Hunt.

[1]Actual, as provided by Port of Lopez personnel, February 2016.

General Aviation Aircraft Operations Forecast

Generally, a relationship exists between based aircraft and general aviation aircraft activity, stated in terms of operations per based aircraft (OPBA). Sometimes, a trend can be established from historical information when reliable information for both based aircraft and operations is available. The national trend has been changing with more aircraft being used for business purposes and less for pleasure flying. This impacts the OPBA in that business aircraft are usually flown more often than recreational or pleasure aircraft. The OPBA for Lopez Island Airport in 2015 is 410, with a historical average OPBA of 776.

Table 3-7 shows the three general aviation operations forecast scenarios prepared for this Master Plan Update, as well as the trend projection based on historical data (2005-2015), the forecasts developed in the 1999 Lopez Airport Layout Plan Report, and the forecast contained in the TAF. As presented, the trend projection indicates a declining average annual growth rate of 20.7%. The 1999 Lopez Airport Layout Plan Report forecast expected an average annual growth rate of 1.4%. The TAF projects an annual growth rate of 0.8% throughout the forecast time period.

Scenario One: Scenario One utilizes the future population forecasts (2015-2040) for San Juan County provided by OFM to forecast general aviation operations. Population has been thought to be a strong indicator of general aviation operations. However, standard regression analysis methodologies relying strictly on population as an independent variable are starting to show this is not the case. When coupled with the unreliable historic aircraft activity data available for non-towered airports like Lopez Island Airport, the correlation values are reduced even more. Therefore, using population as an independent variable for forecasting is considered to be untrustworthy. However, this forecast is included for comparison purposes to reflect the potential local growth conditions. It results in an average annual growth rate of 0.3% and an overall increase to 10,458 general aviation aircraft operations.

Scenario Two: Scenario Two uses the TAF average annual growth rate developed for general aviation aircraft operations specifically for Lopez Island Airport, but applies it to the more

accurate estimated 2015 operations. This scenario reflects an average annual growth rate of 0.8% and an overall increase to 11,552 general aviation aircraft operations.

Scenario Three: Scenario Three uses the 2015 OPBA (410) and applies it to the selected based aircraft forecast developed in the preceding section. This scenario results in an increase to 11,552 general aviation aircraft operations and an average annual growth rate of 1.4%. This growth rate mirrors the nationwide forecasted number of hours flown by general aviation aircraft in the *FAA Aerospace Forecasts Fiscal Years 2015-2040*.

It is recommended that Scenario Two be selected as the preferred general aviation aircraft operations forecast. This scenario correlates the FAA's TAF future expectations of general aviation aircraft activity at Lopez Island Airport to a more accurate estimate of actual activity.

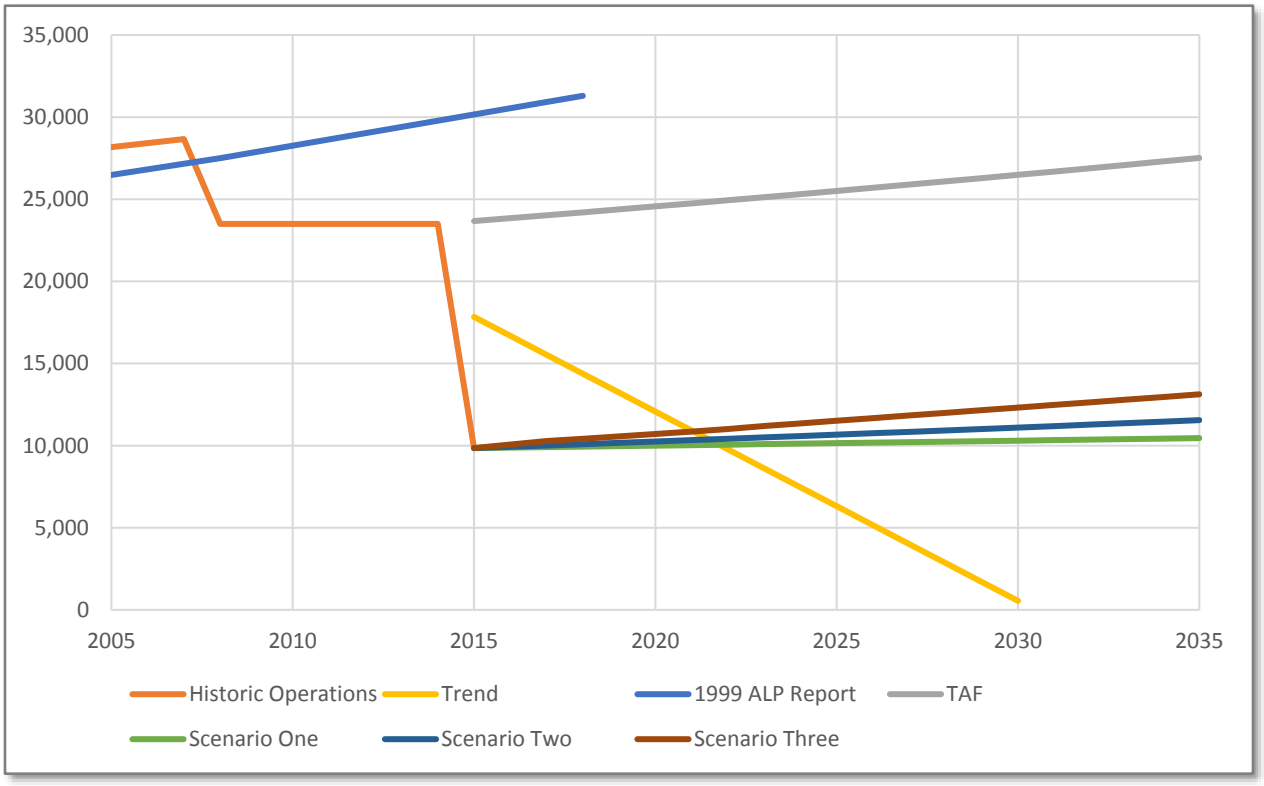
Table 3-7 General Aviation Aircraft Operations Forecasts, 2015-2035

Year	Trend	ALP	TAF	Scenario One	Scenario Two	Scenario Three
2015	---	30,160	23,674	9,850	**9,850**	9,850
2016		30,540	23,849	9,880	**9,929**	10,062
2017		30,920	24,026	9,909	**10,008**	10,278
2018		31,300	24,205	9,939	**10,088**	10,420
2019			24,385	9,969	**10,169**	10,564
2020			24,567	9,999	**10,250**	10,710
2025			25,504	10,150	**10,667**	11,514
2030			26,486	10,303	**11,101**	12,319
2035			27,514	10,458	**11,552**	13,123
Growth Rate	-20.7%	1.4%	0.8%	0.3%	**0.8%**	1.4%

Source: Reid Middleton, Inc. and Mead & Hunt.

Exhibit 3-2 graphically presents the three general aviation aircraft operations forecast scenarios prepared for this Master Plan Update, as well as the trend projection, the 1999 Lopez Airport Layout Plan Report, and the TAF.

Exhibit 3-2 General Aviation Aircraft Forecasts



Military Activity Forecast

Generally, there are three components in determining military aircraft activity at an airport. First is the Department of Defense (DOD) funding, which can vary from year-to-year but has been declining in recent years. Second is a fueling contract the airport or an FBO may have with the DOD. Third is the location, or proximity, of the airport with adjacent aviation-related military bases or training areas.

Presently, no airport entity has a government fueling contract and Lopez Island Airport is not a primary destination training facility for military aircraft, as revealed by historic activity. Military aircraft operations have not historically been recorded at the Airport, but Port personnel did report approximately 24 training operations by Coast Guard helicopters (one flight per month). It is likely that military operations will continue to fluctuate in response to changing DOD funding, missions, and training levels, but there are no factors indicating a significant increase or decrease in flight operations is expected at Lopez Island Airport throughout the 20-year forecasting period.

Operations Forecast By Aircraft Type

Table 3-8 depicts the approximate level of use by aircraft types that are projected to use Lopez Island Airport. As expected nationally, the use of turbine-powered general aviation aircraft is forecasted to increase more rapidly than is the use of smaller general aviation aircraft.

Table 3-8 Summary of Operations Forecast By Aircraft Type, 2015-2035

Aircraft Type	2015[1]	2020	2025	2030	2035
Air Taxi	**3,760**	**3,809**	**3,859**	**3,909**	**3,960**
Single Engine	3,760	3,809	3,859	3,909	3,960
General Aviation	**9,850**	**10,250**	**10,667**	**11,101**	**11,552**
Single Engine	9,520	9,900	10,300	10,691	11,112
Multi-Engine Piston	100	105	97	90	80
Multi-Engine Turboprop	100	115	140	190	230
Helicopter	130	130	130	130	130
Military	**24**	24	24	24	24
Helicopter	24	24	24	24	24
Total Operations	**13,634**	**14,083**	**14,550**	**15,033**	**15,536**

Source: Reid Middleton, Inc. and Mead & Hunt.

[1]Actual, as estimated by Port of Lopez personnel, February 2016.

Local and Itinerant Aircraft Operations

Aircraft operations forecasts have also been categorized accordingly into local and itinerant operations. The Air Traffic Control Handbook defines a local operation as any operation performed by an aircraft operating in the local traffic pattern or within sight of a tower, an aircraft known to be departing or arriving from a flight in the local practice area, or an aircraft executing practice instrument approaches at an airport. Existing local operations at Lopez Island Airport are estimated to account for approximately 8% of all aircraft operations. The local operations percentage is expected to remain fairly constant throughout the planning period, although experiencing a slight increase to 10% by 2035. Based on this consideration, the existing and forecast local and itinerant operations are provided in Table 3-9.

Table 3-9 Summary of Local and Itinerant Operations Forecast, 2015-2035

Year	Local	Itinerant	Total
2015	1,084	12,550	13,634[1]
2020	1,127	12,956	14,083
2025	1,237	13,313	14,550
2030	1,353	13,680	15,033
2035	1,554	13,982	15,536

Source: Reid Middleton, Inc. and Mead & Hunt.

[1]Actual, as estimated by Port of Lopez personnel, February 2016.

Critical Design Aircraft

As presented in the previous chapter, in order to accurately determine the airport facility requirements, the types of aircraft presently using and those projected to use Lopez Island Airport are important elements. Runways must be designed in accordance with the Runway Design Code (RDC) standards that are described in AC 150/5300-13A, Change 1, *Airport Design*. The RDC is a coding system used to relate and compare design criteria to the operational and physical characteristics of the aircraft intended to operate on the runway.

The RDC has two components that relates to the airport's "Design Aircraft" or "Critical Aircraft". The first aircraft component, depicted by a letter (i.e., A, B, C, D, or E), is the aircraft

approach category and is related to the aircraft approach speed based upon operational characteristics. The second aircraft component, depicted by a roman numeral (i.e., I, II, III, IV, V, or VI), is the airplane design group and is related to the aircraft wingspan and tail height. FAA guidance defines a "substantial use threshold" on federally funded projects for the "Critical Aircraft" to have at least 500 annual itinerant operations by a specific aircraft model or composite of several different aircraft to determine the representative RDC.

Data from based aircraft, FAA records as recorded in the Traffic Flow Management System Counts (TFMSC), and input provided by Port of Lopez personnel were used to determine the RDC aircraft utilization. Currently, all of the based aircraft are general aviation single engine aircraft within the RDC A-I or B-I categories. Input provided by the Port of Lopez personnel indicate that the vast majority (i.e., over 97%) of aircraft activity is conducted by single engine aircraft, also within the A-I or B-I RDC categories.

TFMSC data is compiled from IFR filed flight plans to or from a particular airport, and/or when flights are detected by the National Airspace System usually via RADAR (see Appendix One). It excludes most VFR and some non-enroute IFR traffic. Therefore, it is an incomplete data source, but can provide a rough gauge of the percentage of aircraft types operating at an airport, especially the larger and more sophisticated aircraft that almost always file IFR flight plans regardless of weather conditions. Table 3-10 provides the Lopez Island Airport TFMSC data separated by RDC. According to this data, by percentage, the vast majority of 2015 aircraft operations were by RDC A-I (47.4%) and B-II (41.0%).

Table 3-10 TFMSC Operations By RDC, 2015

RDC	Representative Aircraft	2015	Percentage
A-I	Cessna 172/182, Cessna Super Skymaster, Beech Bonanza 33/36, Cirrus SR 22, Piper Aztec	37	47.5%
A-II	Cessna Caravan	5	6.4%
B-I	Piper Cheyenne 2, Piper Malibu Meridian, Cessna 206	4	5.1%
B-II	Beech Super King Air 200/350, Pilatus PC-12	32	41.0%
Total		**78**	**100.0%**

Source: FAA Traffic Flow Management System Counts (TFMSC), February 2016.

Because the TFMSC data is an imperfect and incomplete data source, assumptions must be made regarding the amount of larger and faster aircraft (i.e., primarily multi-engine piston and turboprop aircraft) that are unaccounted for in the data. Port of Lopez personnel have estimated that 100 annual aircraft operations were conducted by multi-engine piston aircraft, which have a RDC of either A-I or B-I. Port personnel also estimate that there were 100 multi-engine turboprop aircraft operations in 2015, of which the majority are in the B-II category. From a close examination of the TFMSC data, it can be determined that approximately one-third of the multi-engine turboprop aircraft, and approximately 7% of the multi-engine piston aircraft are accounted for in the data. The vast majority of single engine aircraft are not being accounted for in the TFMSC data. Therefore, combining the TFMSC data with estimates provided by the Port of Lopez personnel, Table 3-11 presents the estimate of existing and forecast aircraft operations by RDC throughout the planning period.

Table 3-11 Summary of Operations Forecast By RDC, 2015-2035

RDC	2015[1]	2020	2025	2030	2035
A-I	12,759	13,174	13,581	14,000	14,442
A-II	15	20	30	40	50
B-I	600	620	650	670	690
B-II	106	115	135	170	200
Total[2]	**13,480**	**13,929**	**14,396**	**14,880**	**15,382**

Source: Reid Middleton, Inc. and Mead & Hunt.

[1]Actual, as estimated by Port of Lopez personnel, February 2016.

[2]Does not include helicopter operations, which have no RDC designation.

San Juan Airlines currently provides scheduled and chartered passenger service using a Cessna 206 aircraft, which has a RDC of B-I. San Juan Airlines also uses a Cessna 172 for a varying portion of its flights, according to demand and aircraft availability. This aircraft has a RDC of A-I. San Juan Airlines may consider using larger multi-engine aircraft in the future, depending on the growth of its business. However, these aircraft will still be in the RDC B-I category.

Due to its wingspan, the Beech Super King Air 200/350 is the most demanding aircraft that occasionally uses Lopez Island Airport (estimated 75 annual operations), but the number of operations does not approach the 500 annual non-touch and go operations to be considered the "Critical Aircraft". From Table 3-11, it can be surmised that RDC B-I (small) is appropriate for use as the existing and future RDC and the Cessna 206 can be considered the "Critical Aircraft" (estimated 400 annual operations). Small refers to the certificated maximum takeoff weight for aircraft, which is less than 12,500 pounds.

Summary

A summary of the aviation forecasts prepared for this Master Plan Update is presented in Table 3-12.

Table 3-12 Summary of Aviation Activity, 2015-2035

	2015[1]	2020	2025	2030	2035
Aircraft Operations					
Air Taxi	**3,760**	**3,809**	**3,859**	**3,909**	**3,960**
Single Engine	3,760	3,809	3,859	3,909	3,960
General Aviation	**9,850**	**10,250**	**10,667**	**11,101**	**11,552**
Single Engine	9,520	9,900	10,300	10,691	11,112
Multi-Engine Piston	100	105	97	90	80
Multi-Engine Turboprop	100	115	140	190	230
Helicopter	130	130	130	130	130
Military	**24**	**24**	**24**	**24**	**24**
Helicopter	24	24	24	24	24
Total Operations	**13,634**	**14,083**	**14,550**	**15,033**	**15,536**
Local Operations	1,084	1,127	1,237	1,353	1,554
Itinerant Operations	12,550	12,956	13,313	13,680	13,982
Critical Aircraft (Cessna 206)	**400**	**420**	**440**	**450**	**460**
Based Aircraft	**24**	**26**	**28**	**30**	**32**
Single Engine	24	26	28	29	31
Multi-Engine Turboprop	---	---	---	1	1

Source: Reid Middleton, Inc. and Mead & Hunt.

[1]Actual, as estimated by Port of Lopez personnel, February 2016.

Forecast Approval

According to language contained in *Review and Approval of Aviation Forecasts*, regional airports division offices or airports district offices are responsible for aviation forecast approvals at local airports. Local forecasts that are consistent with the FAA's TAF (i.e., the local forecast differs by less than 10% in the first five years, and differs by less than 15% in the ten-year forecast period) do not need to be coordinated with FAA headquarters (APP-400, APO-110). As noted on Tables 3-13 and 3-14, the Master Plan Update forecasts for total operations are not within the specified TAF thresholds for acceptance. The primary reasons for these discrepancies are outlined below.

As stated previously, the Port of Lopez has no data to substantiate how many, if any, of the historic recorded enplanements contained in the Bureau of Transportation Statistics T-100 Market data occurred at Lopez Island Airport, because a portion of the enplanements were provided by Kenmore Air floatplanes at Fisherman Bay. Therefore, no passenger enplanement forecasts have been provided in this Master Plan Update. This results in a -100% variance from the data presented in the TAF.

The commercial operations forecast contained in the Lopez Island Airport TAF projects flat growth as it relied on the inaccurate historical air taxi aircraft operational numbers, which are thought to be overinflated. The total operations contained in the TAF also relied on the inaccurate historic commercial operations and general aviation operations. The estimated air taxi and general aviation aircraft operations provided by Port of Lopez personnel are deemed to be much more accurate and in line with actual airport activity. Therefore, the starting point for the

commercial and total operations presented in this Master Plan Update are well below what is contained in the TAF. The Master Plan Update forecasts do not increase at a sufficient rate to get within the 10% or 15% of the TAF forecasts.

Table 3-13 Summary of Master Plan Update & TAF Comparison

	Year	Airport Forecast	TAF	AF/TAF (% Difference)
Passenger Enplanements				
Base Year	2015	0	457	-100.0%
Base Year + 5 Years	2020	0	457	-100.0%
Base Year + 10 Years	2025	0	457	-100.0%
Base Year + 15 Years	2030	0	457	-100.0%
Commercial Operations				
Base Year	2015	3,760	8,000	-53.0%
Base Year + 5 Years	2020	3,809	8,000	-52.4%
Base Year + 10 Years	2025	3,859	8,000	-51.8%
Base Year + 15 Years	2030	3,909	8,000	-51.1%
Total Operations				
Base Year	2015	13,634	31,674	-57.0%
Base Year + 5 Years	2020	14,083	32,567	-56.8%
Base Year + 10 Years	2025	14,550	33,504	-56.6%
Base Year + 15 Years	2030	15,033	34,486	-56.4%

Source: Reid Middleton, Inc. and Mead & Hunt.
Note: TAF data is based on the U.S. Government fiscal year basis (October through September).

Table 3-14 TAF Summary of Airport Planning Forecasts

	Base Year (2015)	Base Yr. + 1 Yr. (2016)	Base Yr. + 5 Yrs. (2020)	Base Yr. +10 Yrs (2025)	Base Yr. + 15 Yrs. (2030)	Base Yr. to + 1 (2016)	Base Yr. to + 5 (2020)	Base Yr. to + 10 (2025)	Base Yr. to + 15 (2030)
Enplanements									
Air Carrier	0	0	0	0	0				
Commuter	0	0	0	0	0				
TOTAL	0	0	0	0	0				
Operations									
Itinerant									
Air Carrier									
Commuter/Air Taxi	3,760	3,770	3,809	3,859	3,909	0.3%	0.3%	0.3%	0.3%
Total Commercial Operations	3,760	3,770	3,809	3,859	3,909	0.3%	0.3%	0.3%	0.3%
General Aviation	8,767	8,838	9,124	9,430	9,748	0.8%	0.8%	0.9%	0.9%
Military	24	24	24	24	24	0.0%	0.8%	0.7%	0.7%
Local									
General Aviation	1,084	1,092	1,127	1,237	1,353	0.8%	0.8%	1.3%	1.5%
Military	0	0	0	0	0				
TOTAL	13,634	13,724	14,083	14,550	15,033	0.7%	0.7%	0.7%	0.7%
Instrument Operations	---	---	---	---	---	---	---	---	---
Peak Hour Operations	5	5	5	5	5	0.0%	0.0%	0.0%	0.0%
Cargo/Mail (Tons)	---	---	---	---	---				
Based Aircraft									
Single Engine	24	24	26	28	29	1.7%	1.7%	1.6%	1.3%
Multi-Engine Piston	0	0	0	0	0				
Multi-Engine Turboprop	0	0	0	0	1	---	---	---	---
Business Jet	0	0	0	0	0				
Other	0	0	0	0	0				
TOTAL	24	24	26	28	30	1.7%	1.7%	1.6%	1.5%

Source: Reid Middleton, Inc. and Mead & Hunt.

The actual FAA templates for these two tables have been completed and are presented for reference in Appendix Two of this document.

CHAPTER 4. FACILITY REQUIREMENTS

Introduction

The objective of the facility requirements chapter is to determine whether existing airport infrastructure is sufficient to accommodate current usage and future growth using FAA standards and guidelines. As an analysis of the Airport's capabilities, facility requirements are the result of the inventory and forecasts chapters as well as area planning, research, and analysis. They explain the relevancy of existing airport facilities and determine what facilities may be necessary in the future. Facility needs are based upon forecasted use and evaluation procedures include the analysis of runway length, dimensions of aprons and hangars, and vehicle access.

Although this analysis uses the forecasts presented in the preceding chapter for establishing future development at Lopez Island Airport, it is not intended to dismiss the possibility that either accelerated growth or consistently higher or lower levels of activity may occur. Additionally, as described in the previous chapter, an airport's geometric design is based on the specified Runway Design Code (RDC) standards as specified in FAA AC 150/5300-13A. Although the RDC is based on the "Critical Aircraft" or "Design Aircraft" and is used for planning and design, it does not limit the aircraft that may be able to operate safely at an airport. In addition to the aircraft approach speed and wingspan components comprising the RDC introduced in the previous chapter, a third component is also present and it is related to the lowest instrument approach visibility minimums. The instrument approach visibility minimums are expressed as Runway Visual Range (RVR) values in feet. Table 4-1 provides the instrument approach visibility minimums and corresponding RVR value. Lopez Island Airport has visual approaches only, so the full RDC for it is expressed as B-I-VIS (Small Aircraft). The B is based on the aircraft approach speed, or 1.3 times the aircraft stall speed, in this case "B" is between 91 to 120 knots. The "I" designation is the critical aircraft wings span, which is <49'. The Lopez Island Critical Aircraft Design Group as determined in the Forecast chapter is B-I (Small Aircraft), with the small referring to aircraft having certificated maximum takeoff weight less than 12,500 pounds. The "VIS" stands for Visual because there are no instrument approaches and no Runway Visual Range equipment at the airport.

Table 4-1. RVR Values

Instrument Flight Visibility Category (statute mile)	RVR (feet)[1]
Visual	VIS
Not lower than 1 mile	5000
Lower than 1 mile but not lower than 3/4 mile	4000
Lower than 3/4 mile but not lower than 1/2 mile Lower than 1/2 mile but no t	2400
Lower than 1/2 mile not lower than 1/4 mile	1600
Lower than 1/4 mile	1200

[1]RVR values are not exact equivalents.

Facilities at Lopez Island Airport can be divided into two general categories: airside and landside. Airside facilities are those that are related directly with the movement of aircraft (i.e., runway, taxiways, approach areas, lighting systems, and navigational aids). Landside facilities encompass terminal buildings, hangars, aircraft aprons, surface access, automotive parking, etc. The components of landside and airside are determined based upon standards set by the FAA.

Airside Facility Requirements

The airside facility requirements analysis focuses on determining the necessary elements and the spatial relationship of the elements. The evaluation includes the delineation of airfield dimensional criteria, establishment of design parameters for the runway and taxiway systems, runway length and an identification of airfield instrumentation and lighting needs.

Wind Analysis

Climatological conditions specific to the location of an airport not only influence the layout of the airfield, but also affect the use of the runway system. Variations in the weather resulting in limited cloud ceilings and reduced visibility typically restrict the time an airport is available for use by aircraft, while changes in wind direction and velocity typically dictate runway usage. When landing and taking off, aircraft are able to operate on a runway properly and safely as long as the wind velocity perpendicular to the direction of travel (i.e., a crosswind) is not excessive. Wind conditions affect all aircraft to some extent, but the smaller the aircraft, generally the more it is affected by crosswinds. The wind coverage analysis translates the crosswind velocity and direction into a "crosswind component".

The appropriate crosswind component is dependent upon the RDC for the type of aircraft that utilize an airport on a regular basis. As previously identified, the RDC for Lopez Island Airport is B-I-VIS (Small Aircraft). According to the FAA AC 150/5300-13A, a crosswind component 10.5 knots is considered maximum for runways with a RDC designation of A-I and B-I. Therefore, for Runway 16/34, a crosswind component of 10.5 knots will be utilized to analyze the adequacy of the runway orientation with the prevailing wind conditions.

To determine wind velocity and direction at Lopez Island Airport, accurate and timely wind data was obtained for the period between January 1, 2006 and December 31, 2015 for Friday Harbor Airport, as wind data for Lopez Island Airport is not available. The data was compiled by the National Oceanic and Atmospheric Administration, National Climatic Data Center. Using this data, an all-weather wind rose was constructed and is presented in Exhibit 4-1.

Exhibit 4-1. All Weather Wind Rose

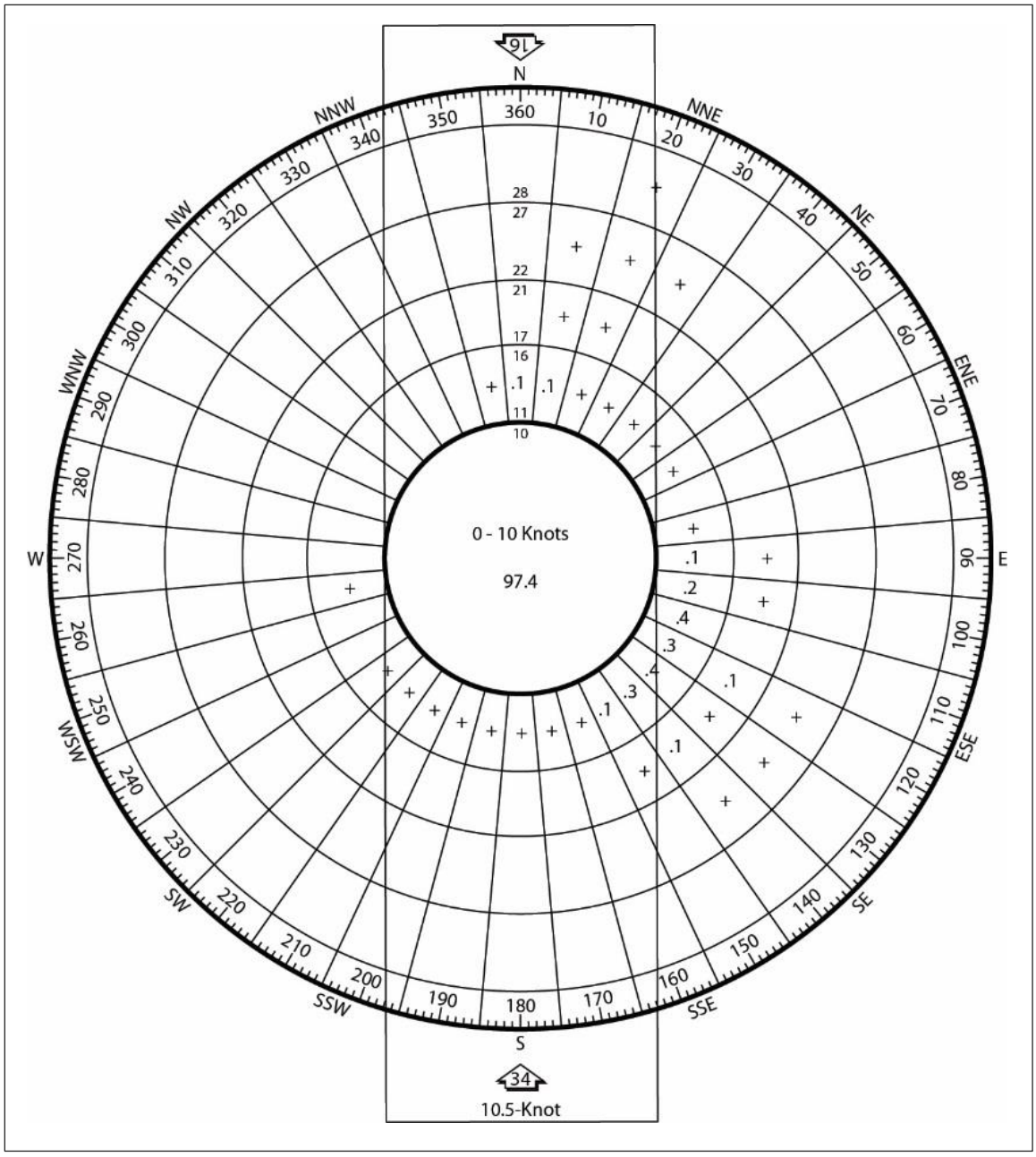


Table 4-2 quantifies the wind coverage provided by the individual runway ends and Runway 16/34 during all weather conditions at the Airport. The desirable wind coverage for a runway is 95 percent, which means that the runway should be oriented so that the maximum crosswind component is not exceeded more than 5 percent of the time. Runway 16/34 provides 95.69% percent wind coverage for 10.5-knot crosswind component, which indicates that the existing runway configuration provides adequate wind coverage for the 10.5-knot crosswind component. A five-knot tailwind component is used in the individual runway end analysis because aircraft can operate with a slight tailwind, so a realistic wind analysis assumes some level of use for each runway end with a tailwind.

Table 4-2. All Weather Wind Coverage Analysis

Runway Designation	10.5-Knot Crosswind Component
Runway 16[1]	90.29%
Runway 34[1]	84.14%
Runway 16/34	95.69%

Source: Wind analysis tabulation provided by Reid Middleton, Inc. and Mead & Hunt utilizing the FAA Airport Design Tools, Wind Analysis. Wind data obtained from the National Oceanic and Atmospheric Administration, National Climate Data Center. Station 727985 Friday Harbor Airport. Period of Record: 2006-2015.

Note: A 5-knot tailwind component was used for the individual runway end analysis.

Airport Design Standards

The airport design standards applicable to Lopez Island Airport are presented in Table 4-3. Airport design standards are based on the appropriate RDC and are contained in Advisory Circular (AC) 150/5300-13A, Change 1. The design standards have developed to assure that facilities can be operated in a safe and efficient manner and represent a minimum standard to be achieved. As presented, Lopez Island Airport meets or exceeds all the FAA airport design standards associated with RDC B-I-VIS (Small Aircraft), with two exceptions associated with the Runway Safety Area (RSA) at each runway end. The RSA is a defined surface centered on the runway centerline, prepared and suitable for reducing the risk of damage to aircraft in the event of an undershoot, overshoot, or excursion from the runway. It must be cleared and graded and have no potentially hazardous ruts, humps, depressions, or other surface variations; drained by grading or storm sewers to prevent water accumulation; capable under dry conditions of supporting rescue vehicles; and free of objects except those that must be located in the RSA by function (i.e., runway edge lights). If objects higher than three inches must be located within the RSA, then to the extent practical, they must be constructed on frangible mounted structures of the lowest practical height with the frangible point no higher than three inches above grade. The standard maximum RSA gradient within 200 feet of a runway end is 3.0%, with a maximum allowable gradient of 5.0% beyond that.

The existing grade at the northwest corner of the Runway 16 RSA is nearly 8.5%; the existing grade at the southeast corner of the Runway 34 RSA is nearly 9.0%. Exhibit 4-3 graphically presents the grade deficiencies associated with the RSA. It should be noted that the Port of Lopez has programmed a Fiscal Year 2018 project to extend the Runway 16 RSA to the full 240-foot length required.

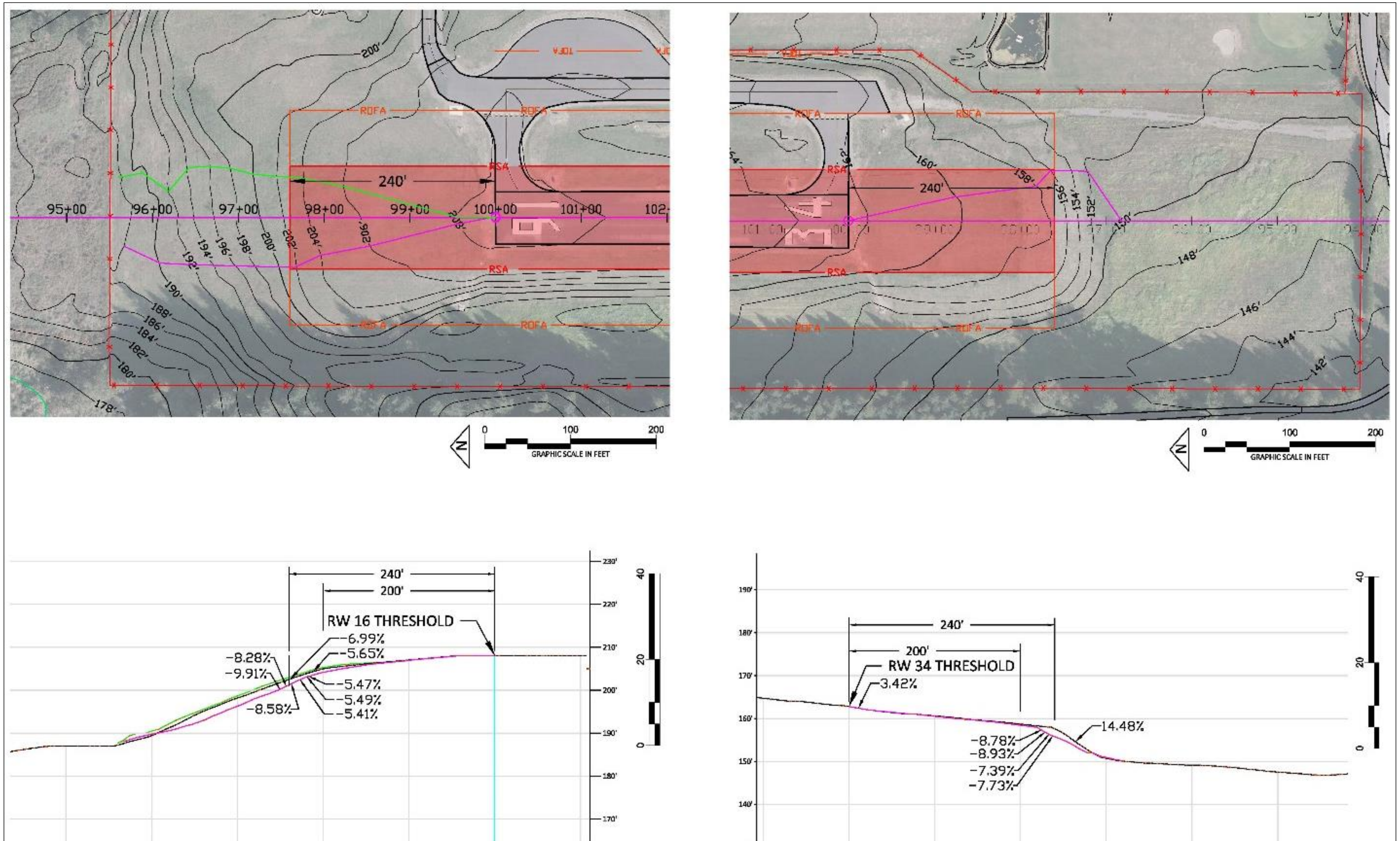
Table 4-3. Runway 16/34 Airport Design Standards

Item	Existing Dimension	B-I-VIS[1]
Runway Width	60’	60’
Runway Safety Area		
Width	120’	120’
Length Beyond Runway End:		
Runway 16	**200’**	240’
Runway 34	**200’**	240’
Length Prior to Landing Threshold		
Runway 16	240’	240’
Runway 34	240’	240’
Runway Object Free Area		
Width	250’	250’
Length Beyond Runway End		
Runway 16	240’	240’
Runway 34	240’	240’
Runway Obstacle Free Zone		
Width	250’	250’
Length		
Runway 16	200’	200’
Runway 34	200’	200’
Runway Centerline To:		
Parallel Taxiway	150’	150’
Aircraft Parking	190’	125’
Holding Position Line	125’	125’

Source: FAA AC 150/5300-13A, Change 1, *Airport Design*.

Notes: [1]Airport Design Standards for small aircraft (i.e., aircraft with maximum takeoff weights less than 12,500 pounds).

Exhibit 4-2. Runway 16/34 RSA Non-Standard Conditions



Runway Length Analysis

Generally, for runway design purposes, the determination of appropriate runway length recommendations at general aviation airports is premised upon a combination of factors, which include:

- Airport Elevation
- Mean maximum daily temperature of the hottest month
- Runway gradient
- Family grouping of critical aircraft for runway length purpose

The runway length operational requirements for aircraft are greatly affected by elevation, temperature, and runway gradient. The calculation for runway length requirement at Lopez Island Airport is based on an elevation of 205.2 feet Above Mean Sea Level (AMSL), 68° Fahrenheit Mean Normal Maximum Temperature (MNMT) of the hottest month, and a maximum difference in runway elevation at the centerline of 46 feet.

Runway length determination involves the family grouping of critical aircraft consisting of those aircraft types deemed the most demanding aircraft within the general aviation fleet that are operating, or are projected to operate at the airport. For Lopez Island Airport, this fleet is dominated by small aircraft with maximum takeoff weight of less than 12,500 pounds and having fewer than ten passenger seats, as provided in Table 4-4.

Table 4-4. Critical Design Aircraft for Runway Length

Aircraft	RDC	Maximum Takeoff Weight (MTOW) - pounds	Number of Seats	Estimated 2015 Operations	Runway Length (in feet)
Beech Super King Air 200	B-II	12,500	6	40	2,845[1]
Cessna 206	B-I	3,600	6	400	1,860
Piper Malibu Meridian	B-I	5,092	6	180	2,335
Piper Cheyenne 2	B-I	9,000	6	20	1,980
Pilatus PC-12	B-II	10,500	9	26	2,230
Beech Bonanza 33	A-I	3,650	6	600	1,769
Piper Cherokee	A-I	2,150	4	500	1,759

Source: Aircraft Ground Service Guide, National Air Transportation Association (NATA), 2002.

Note: [1]Landing distance.

According to FAA AC 150/5325-4B, Runway Length Requirements for Airport Design, there are two runway length recommendations for aircraft with less than ten passenger seats based a percentage of the small aircraft fleet, as presented in Table 4-5. Exhibit 4-3 presents the runway length curves provided in AC 150/5325-4B used for calculating the runway length required of aircraft with fewer than ten passenger seats operating at Lopez Island Airport with a mean daily maximum temperature of 68° Fahrenheit and an elevation of 205.2 feet (green arrows). The small aircraft fleet with less than ten passenger seats is further divided into two family groupings

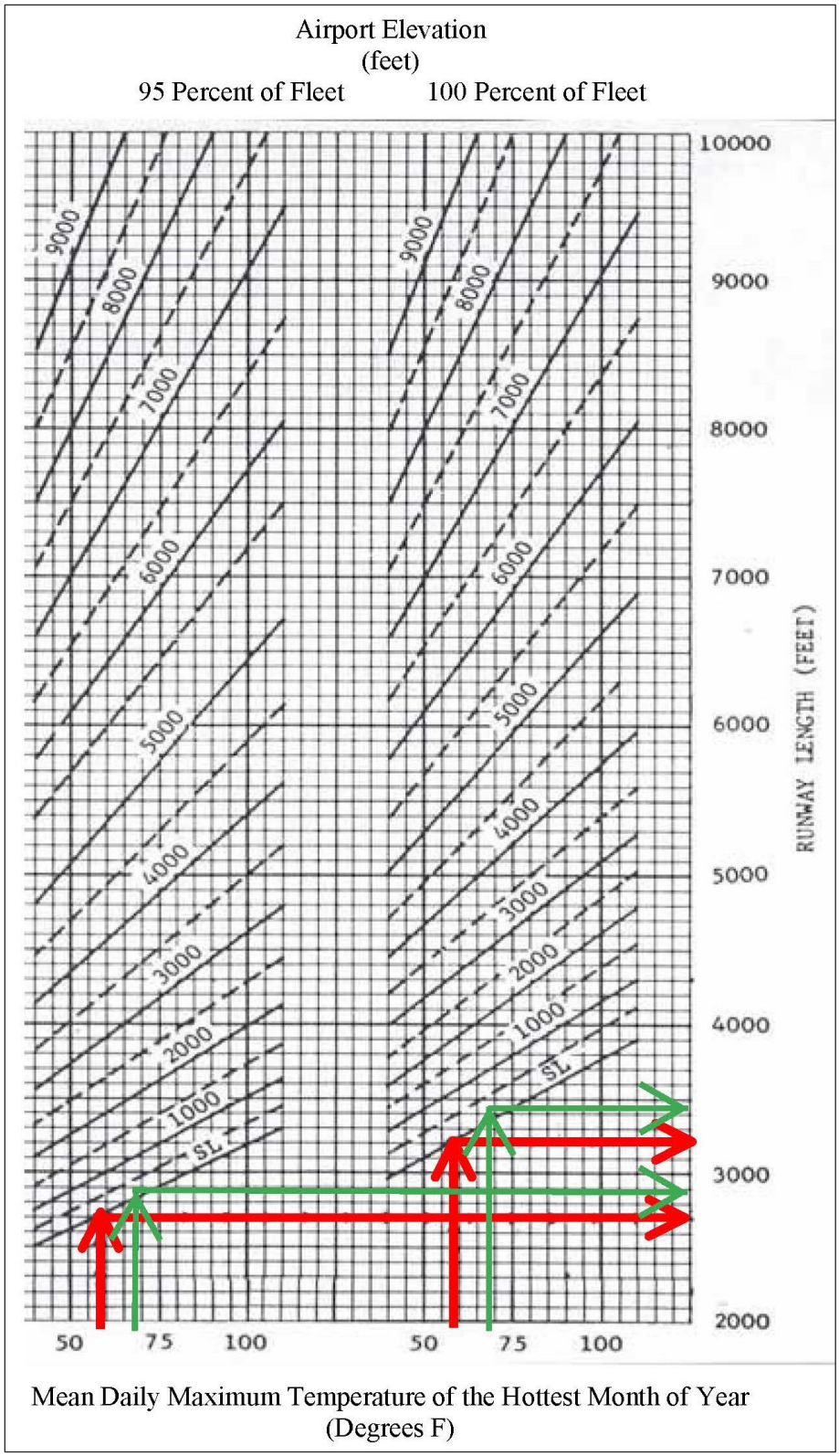
according to "percentage of the fleet". According to AC 150/5325-4B, the primary difference between the two categories is the 95% category is intended to serve medium size population communities with a diversity of usage and a greater potential for increased aviation activities. It also includes those airports that are primarily intended to serve low-activity locations, small population communities, and remote recreational areas. The 100% category is primarily intended to serve communities located on the fringe of a metropolitan area or a relatively large population remote from a metropolitan area.

Table 4-5. Runway 16/34 Length Recommendations, In Feet

	Runway Length
Existing Runway 16/34 Length	2,904
Small Airplanes with Fewer than 10 Passenger Seats	
95% of Fleet	2,900
100% of Fleet	3,450

Source: Reid Middleton, Inc. and Mead & Hunt analysis utilizing FAA AC 150/5325-4B, Runway Length Requirements for Airport Design.

Exhibit 4-3. Runway Length Curve



Because Lopez Island Airport is a low activity airport serving a small population community, the 95% family grouping of small aircraft with less than 10 passenger seats is the appropriate category. The existing runway length of 2,904 accommodates the recommended runway length of approximately 2,900 feet for this aircraft family grouping.

Runway Protection Zones

The function of Runway Protection Zones (RPZ) is to enhance the protection of people and property on the ground beyond the runway ends. This is achieved through airport control of the RPZ areas, and control is preferably exercised through fee simple ownership by the airport within the RPZs. It is desirable to clear all above ground objects from within RPZs; where this is impractical, airport owners, at a minimum, should maintain the RPZ clear of all facilities supporting incompatible activities.

Table 4-6 presents the existing RPZ dimensions and the dimensional requirements for an airport designed to accommodate small aircraft only and having only visual approaches. As can be seen, the existing RPZs meet the dimensional standards associated with these criteria. However, the Runway 34 RPZ extends beyond airport property south of the airport, west and east of Shark Reef Road, into private property containing one residence, as illustrated in Exhibit 4-4. It is recommended that the Port of Lopez continue to program for property acquisition of the remainder of lands within the Runway 34 RPZ beyond airport property.

Table 4-6 Runway Protection Zone Dimensions, In Feet

Runway Protection Zone	Inner Width	Length	Outer Width	Airport Controls Entire Land Area
Existing RPZ Dimensions				
Runway 16	250	1,000	450	Yes
Runway 34	250	1,000	450	No
Standard Approach RPZ Dimensions Applicable to Lopez Island Airport				
Visual and not lower than one statute mile, Small Aircraft Only	250	1,000	450	

Source: FAA AC 150/5300-13A, Change 1, *Airport Design*.

Exhibit 4-4 Runway Protection Zones

Runway End Siting

Criteria contained in AC 150/5300-13A provide guidance for the proper siting of runway ends and thresholds. The criteria are in the form of evaluation surfaces that are typically trapezoidal shaped and extend away from the runway along the centerline at a specific slope, expressed in horizontal feet by vertical feet (e.g., a 20:1 slope rises one unit vertically for every 20 units horizontally). Like RPZs, the specific size, slope, and starting point of the surfaces depend on the visibility minimums and aircraft type associated with the runway end.

Obstructions are one of the most significant issues facing the Port because of the many trees located within the approach areas to both runway ends. In the past year, the Port has been in the process of removing trees on airport-owned property.

Threshold Siting Analysis

Thresholds are located to provide proper clearance over obstacles for landing aircraft on approach to a runway end. When an object beyond an airport owner's ability to remove, relocate, or lower obstructs the airspace required for aircraft to land at the beginning of the runway for takeoff, the landing threshold may require a location other than the end of pavement (i.e., a displaced threshold). The existing criteria for Lopez Island Airport and the requirements for an airport designed to accommodate small aircraft only with approach speeds greater than 50 knots and having only visual approaches are presented in Table 4-7.

Table 4-7. Threshold Siting Surfaces, In Feet

Threshold Siting Surface	Distance From Runway End	Inner Width	Length	Outer Width	Slope	Existing Obstructions
Existing Dimensions						
Runway 16	0	250	5,000	700	20:1	Yes
Runway 34	0	250	5,000	700	20:1	Yes
Standard Threshold Siting Surface Dimensions Applicable to Lopez Island Airport						
Small aircraft only with approach speeds > 50 knots, visual approach	0	250	5,000	700	20:1	

Source: FAA AC 150/5300-13A, Change 1, *Airport Design*.

There are a number of trees that penetrate the threshold siting surfaces for both runway ends, as illustrated in Exhibits 4-5 and 4-6. The Port of Lopez owns most of the property where the trees are located within the approach areas, but several trees are located beyond Port-owned property. The Port is currently scheduled to remove all the trees within the north portion of airport property, as identified on Exhibit 4-4. It is recommended that the Port continue the process of trimming or removing the trees on airport property, and explore options to attain the rights to remove or trim the trees beyond airport property.

Exhibit 4-5 Runway 16 Threshold Siting Surface, Plan and Profile

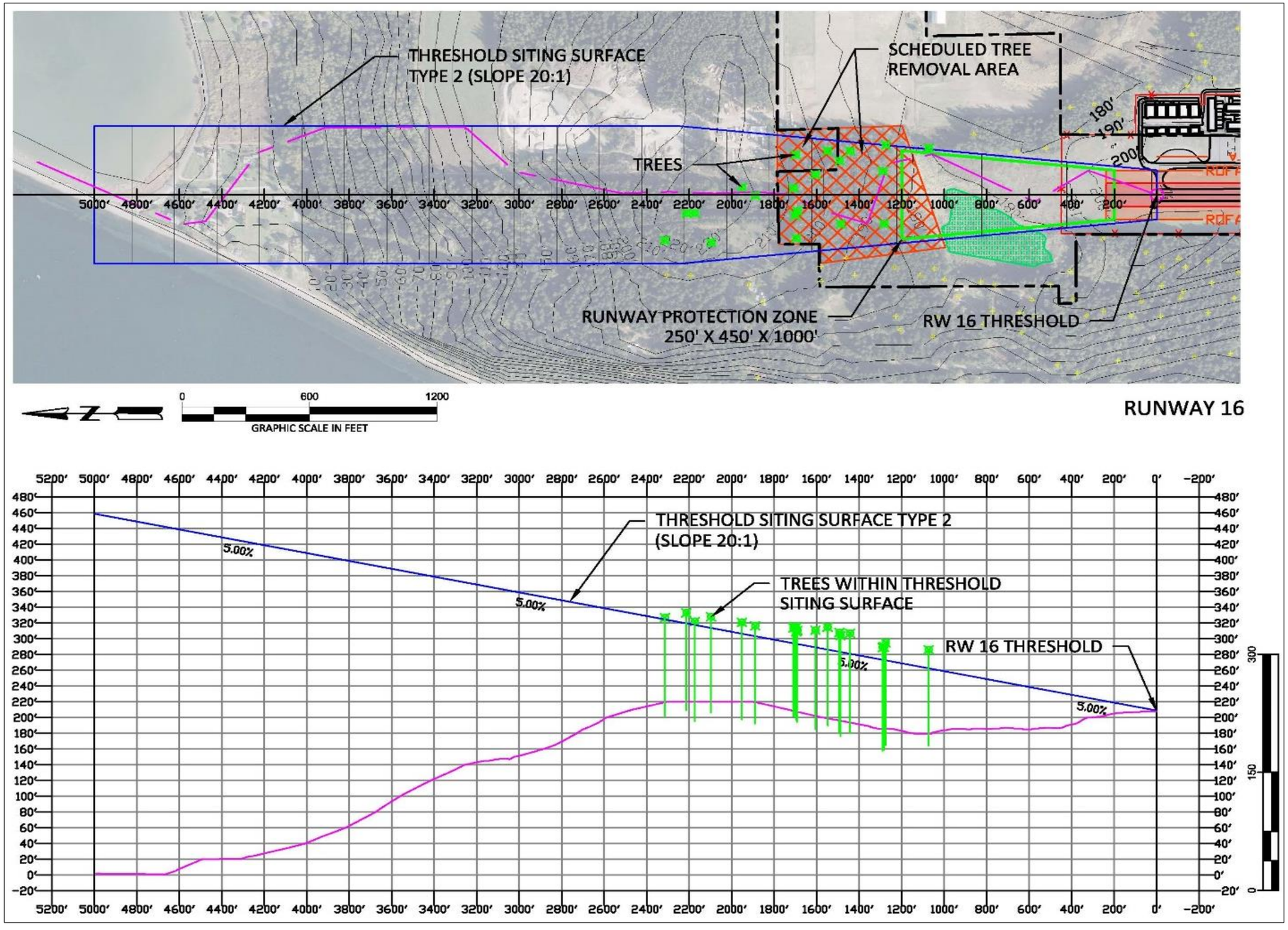
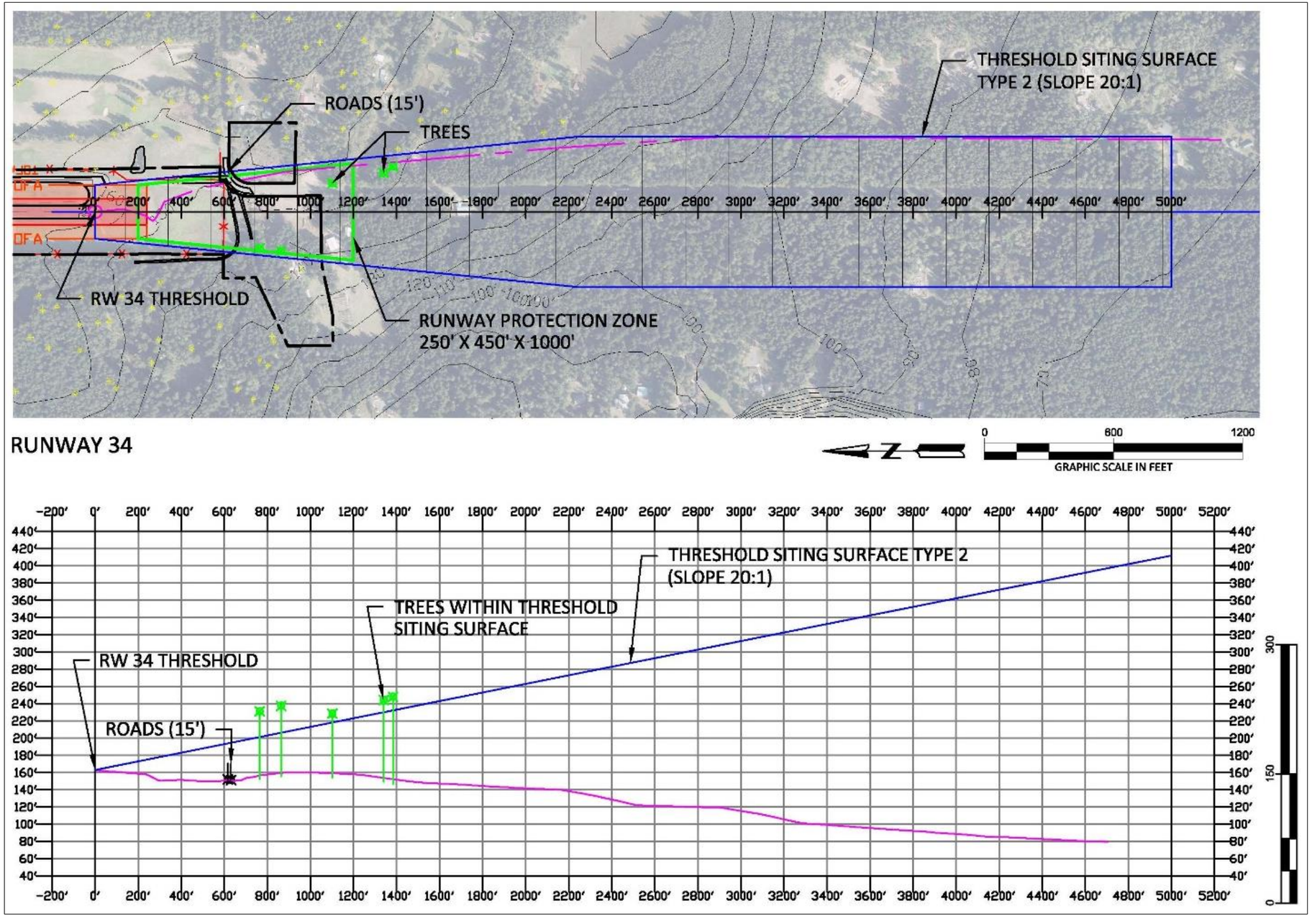


Exhibit 4-6 Runway 34 Threshold Siting Surface, Plan and Profile



Runway Marking, Lighting, and Signage

Runway 16/34 is provided with basic visual markings and is equipped with holding position lines at all taxiway intersections conforming to standards for visual approaches provided in AC 150/5300-13A, Change 1 and AC 150/5340-1L, *Standards for Airport Markings*. The airport's 5010 Form indicates they are in good condition. The runway is equipped with Medium Intensity Runway Lights (MIRLs), 2-light Precision Approach Path Indicator (PAPI), and Runway End Identifier Lights (REILs) at each runway end. According to AC 150/5300-13A, Lopez Island Airport is equipped with satisfactory marking, lighting, and signage to meet the current and forecast aircraft fleet requirements. However, the existing MIRL is dated and the Port plans to replace the system in the near future.

Taxiway System

Taxiways facilitate aircraft movement between the various functional landside areas on an airport and the runway system. Taxilanes are designed for low speed and precise taxiing of aircraft that are usually, but not always, located outside the movement area, providing access from taxiways (usually an apron taxiway) to aircraft parking positions or hangar areas. Taxiways and taxilanes are designed for "cockpit over centerline" taxiing with sufficient pavement width to allow for a certain amount of wander. Potential runway incursions should be kept to a minimum by proper taxiway design criteria contained in AC 150/5300-13A. Taxiway and taxilane clearance requirements are based on wingtip clearance, a function of aircraft wingspan, and are determined by the Airplane Design Group (ADG) of the design aircraft, which at Lopez is the "I" in the B-I critical aircraft design group. Taxiway and taxilane pavement design standards are related to the Taxiway Design Group (TDG), which is based on the overall Main Gear Width (MGW) and the Cockpit to Main Gear (CMG) distance of the design aircraft. The existing and forecast aircraft fleet indicate that ADG I and TDG 1A are appropriate for the design of the taxiway system at Lopez Island Airport.

The airport is equipped with a full parallel taxiway and five taxiway connectors providing access between the runway and parallel taxiway. Taxiway widths range from 25 to 30 feet. Table 4-8 provides the existing taxiway conditions and appropriate taxiway design standards.

Table 4-8. Taxiway Design Standards, In Feet

Design Standard	Existing Dimension	Design Standard Dimension
Design Standard Based on ADG		**ADG I**
Taxiway Safety Area	49	49
Taxiway Object Free Area	**87.3**	89
Taxilane Object Free Area	50, 79	79
Taxiway Centerline to:		
Parallel Taxiway/Taxilane Centerline	NA	70
Fixed or Movable Object	**42.8**	44.5
Taxilane Centerline to:		
Parallel Taxilane Centerline	NA	64
Fixed or Movable Object	40	39.5
Design Standard Based on TDG		**TDG 1A**
Parallel Taxiway Width	25	25
Mid-field Taxiway Widths	30	25

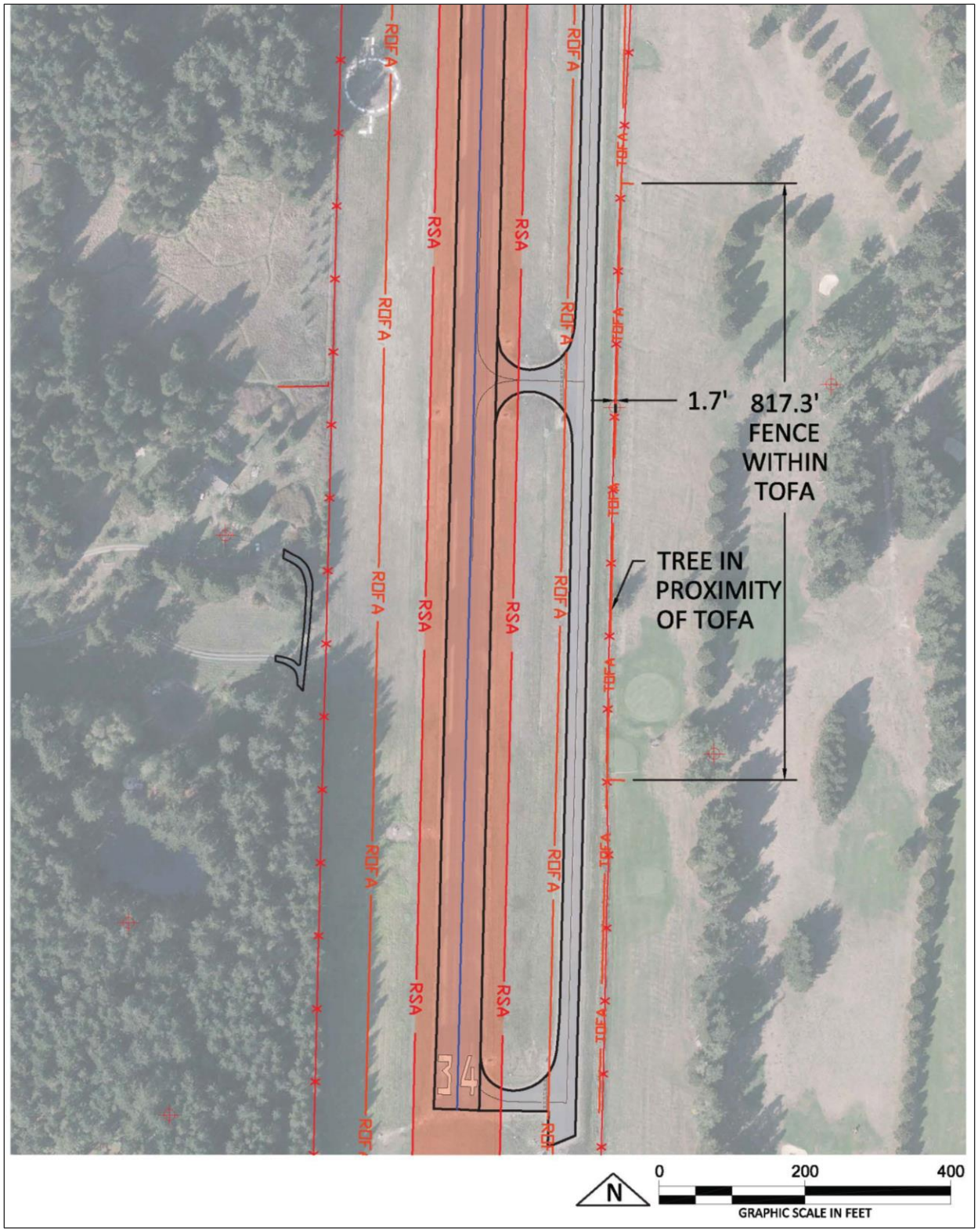
Source: FAA AC 150/5300-13A, Change 1, *Airport Design*.

Taxiway Standards Analysis

Applying the appropriate TDG and ADG design standards to the existing taxiway conditions indicates that Lopez Island Airport meets or exceeds most of the taxiway design standards. The lone exception is the Taxiway Object Free Area (TOFA) associated with the parallel taxiway. A tree and the fence separating airport property from the golf course are located approximately 1.7 feet within the standard 44.5 feet of the taxiway centerline. This non-standard condition exists for a stretch of approximately 817 feet along the parallel taxiway. The Port should explore options for removing the tree and relocating the fence beyond the TOFA. Exhibit 4-7 graphically presents the deficiencies associated with the parallel taxiway.

It should be noted that the three mid-field taxiway connectors have widths of 30 feet, exceeding the TDG 1A design standard of 25 feet. FAA policies and guidelines indicate that funding for pavement maintenance and rehabilitation projects are generally limited to that required by the appropriate design standard. If the Port of Lopez decides to retain the extra taxiway connector widths, it must do so utilizing Port monies exclusively for the extra width.

Exhibit 4-7. Parallel Taxiway Object Free Area Non-Standard Conditions



Taxilane Standards Analysis

Taxilane Standards Analysis

Applying the appropriate criteria to the existing taxilanes on the airport indicates that the taxilanes providing access to the private and Port-owned hangars, and between the hangars, have Object Free Area widths of approximately 50 feet, 29 feet less than the required TDG 1A design standard of 79 feet. The Port should amend their hangar leases to provide notice of the existing limited distance between the hangars and have lessees sign hold harmless agreements for any and all damages. When age and condition of the hangars warrant replacement, it is recommended that all FAA setback standards be incorporated into the design of future hangars.

The taxilane located at the north end of the parallel taxiway providing access to the private hangars exceeds the 2.0% FAA standard grade for Aircraft Approach Categories A and B. The overall grade is approximately 6.1%, with parts of the existing grade exceeding 7.0%. The Port has a hold harmless agreement with aircraft owners basing their aircraft in the private hangars for any and all damages resulting from the steepness of the taxilane.

The airport incorporates standard taxiway signage that meets all FAA signage standards.

Instrument Approach Requirements

Runway 16/34 currently supports visual approaches only. Any improvements to the current approaches would use satellite based platforms rather than ground based systems. The FAA is currently implementing "NextGen" capabilities nationwide that will allow a higher level of efficiency between airports and provide innovative instrument approach and departures.) Lopez Airport is in the process of applying for an AWOS to meet the requirements of Medflight. This system will allow rapid medical evacuations under most conditions. Adding a GPS/IFR approach will further improve the safety of Medflight approaches during IFR conditions and is on the airport FAA planning list.

Electronic Navigational Aids

The Port desires to install an Automated Weather Observing Station (AWOS) on the airport providing local weather reporting services to pilots. These stations require proper siting and ample land area to provide accurate data recording. Typically, stations are sited from 1,000 to 3,000 feet from the runway threshold and a minimum 500 feet from the runway centerline to a maximum of 1,000 feet. Wind sensors should be mounted at 30 to 33 feet above the average ground height within a radius of 500 feet. It is also desirable that all obstructions such as vegetation and buildings be at least 15 feet lower than the sensor within the 500-foot radius, and be no more than 10 feet above the sensor from 500 to 1,000 feet.

Landside Facility Requirements

Landside facilities are those airport facilities that support the airside facilities, but are not actually a part of the aircraft operating surfaces. They consist of such facilities as terminal buildings, hangars, aprons, access roads, and support facilities. At the Lopez Island Airport, landside facilities are the aircraft apron and hangars.

During the planning period, based aircraft are projected to increase from 24 to 32, with at least one multi-engine turboprop powered aircraft expected to be based at the airport. Lopez Island Airport is in the

unique situation to also have 8 aircraft using hangars which are not permanently based on Lopez. Lopez Island has a number of residents maintaining a second home on the Island. Pilots will often own or rent a hangar at Lopez Airport long term for weekend or vacation use. Currently, there are 16 tiedowns on the apron and 34 hangar spaces available for aircraft storage. Eight of the tiedowns are reserved for based aircraft (with two currently being used) and eight reserved for transient aircraft.

Table 4-9 summarizes the required space needs for aircraft storage throughout the planning period. As can be seen, there is more than adequate apron to meet the demand for based aircraft owners who may not desire to pay the cost for hangar spaces, but there may be a deficiency in tiedown spaces allocated for transient aircraft. However, the total number of tiedown spaces appears adequate to meet the demand if some of the reserved based aircraft spaces are reallocated for transient use.

Currently, Lopez Airport has a waiting list for aircraft owners who desire hangar space, The airport is in immediate need for hangar space and should plan for this increasing need during this planning period.

Table 4-9. Aircraft Storage Requirements, 2015-2035

Aircraft Storage Type	2015[1]	2020	2025	2030	2035
Based Aircraft Apron					
Number of Tiedowns	8	1	1	1	2
Square Yards	3,000	360	360	360	720
Transient Apron					
Number of Tiedowns	8	11	12	12	12
Square Yards	3,800	4,600	4,800	4,800	4,800
Total Apron					
Total Number of Tiedowns	16	12	13	13	14
Total Square Yards	7,200	5,840	6,240	6,240	6,240
T-hangar Spaces	34	38	42	46	50

Source: Reid Middleton, Inc. and Mead & Hunt analysis using FAA AC 150/5300-13A, Change 1, Airport Design, and actual airport conditions.

Note: [1]Actual.

The Port has had ongoing discussions about the need for a fuel storage and dispensing system at the airport. At this time, it is not thought to be a necessary item to provide. However, this is a market-based business decision and each potential opportunity should be evaluated on its merits and compatibility with Port goals for the airport.

Summary of Facility Requirements

The facility requirements presented in this chapter form the basis of the development plan for the airport. Facility requirements are based upon current operations and future forecasts. Although many of the existing airport facilities are adequate, others will require improvement to accommodate the existing and future aviation demand safely and efficiently. Table 4-10 presents a summary of the facility requirements.

Table 4-10 Summary of Facility Requirements, 2015-2035

Facility	2015[1]	2020	2025	2030	2035
Runway System					
Runway Length and Width	2,904' X 60'	Same	Same	Same	Same
RSA Length					
Runway 16	200'	240'	Same	Same	Same
Runway 24	200'	240'	Same	Same	Same
Runway Protection Zones					
Runway 16	250' x 1000' x 450'	Same	Same	Same	Same
Runway 34	250' x 1000' x 450'	Same	Same	Same	Same
Threshold Siting					
Runway 16	Obstructions	Remove	Same	Same	Same
Runway 34	Obstructions	Remove	Same	Same	Same
Taxiway System					
Taxiway Lights	Reflectors	Same	Same	Same	Same
Parallel Taxiway OFA			Remove Tree and Relocate Fence		
Midfield Taxiway Connector Widths	30'	Same	Same	25'	Same
Electronic Navigational Aids					
Weather Reporting System	None	AWOS	Same	Same	Same

Source: Reid Middleton, Inc. and Mead & Hunt.

CHAPTER 5. ALTERNATIVES ANALYSIS

Introduction

This chapter identifies and evaluates the alternatives for meeting the needs of airport users as well as presenting the strategic vision for airport development in terms of both its concept and reasoning, with a focus on the comprehensive nature of the elements involved. A description of the various factors, influences, concepts, and issues that will form the basis for the ultimate plan and program is provided. The conclusion of this chapter is the selection and presentation of the Conceptual Development Plan for the Airport.

Development Assumptions and Goals

The preparation of the future development plan begins with establishing several basic assumptions and goals, the purpose of which is to direct and guide the evaluation process and establish continuity. They allow for several short- and long-term categorical considerations relating to facility needs, including safety, capital improvements, land use compatibility, financial and economic conditions, noise, public interest and investment, and community recognition and awareness. While most are project oriented, some obviously represent more tangible activities than others. However, all are deemed important and appropriate for future airport development.

Development Assumptions

Assumption One:

The Airport will continue to be developed and operated in a manner that is consistent with local ordinances and codes, federal and state statutes, federal grant assurances, and FAA regulations.

Assumption Two:

The runway will be maintained to FAA defined Runway Design Code (RDC) B-I-VIS (Small Aircraft) dimensional standards.

Assumption Three:

Lopez Island Airport will continue in its primary role as a general aviation airport, as it is not expected to accommodate commercial air carrier activity beyond the existing unscheduled, on demand air taxi activity.

Assumption Four:

The existing visual approaches will continue to be planned for and protection afforded accordingly.

Assumption Five:

Lopez Island Airport will be designed, to the maximum extent possible, to enhance the compatibility of airport operations with the surrounding environs.

Development Goals

- Plan the Airport to accommodate the forecasts aircraft fleet safely and efficiently.
- Program the construction of facilities when demand is realized (construction is demand driven, not forecast driven).
- Enhance the self-sustaining capability of the Airport and ensure the financial feasibility of all future development.

- Plan and develop airport facilities to be environmentally compatible with the community, minimizing the potential environmental impacts to both airport property and adjacent properties.
- Provide effective direction for future airport development through the preparation of a rational plan and adherence to the adopted development program.
- Encourage the protection of existing public and private investment in land and facilities, and advocate the resolution of any potential land use conflicts, both on and off airport property.

Airside Development Concepts, Alternatives, and Recommendations

Because all other airport functions are related to and revolve around the basic runway and taxiway layout and configuration (i.e., the airside component of the Airport), airside development alternatives must first be examined. The primary objective of the airside alternatives analysis is to examine options that will result in the best and safest possible aircraft operating environment.

Runway System

There have been three primary runway system issues identified in the previous chapter: the deficient Runway Safety Area (RSA) at both runway ends, the Runway 34 RPZ that extends beyond airport-owned property, and the obstructions to the threshold siting surfaces at each runway end.

Runway Safety Area Alternative

In order to be compliant with the dimensional standards associated with RDC B-I-VIS, the RSAs at both runway ends will need to be extended to attain the proper gradient within the full 240-foot length. FAA Order 5300.1F, *Modification to Agency Airport Design, Construction, and Equipment Standards*, does not allow for a Modification of Standards (MOS) for nonstandard RSAs. Therefore, the only alternative available to the Port is to plan and program for projects that correct the nonstandard RSA conditions that exists at both runway ends. As stated previously, the Port has programmed a Fiscal Year 2020 project to extend the Runway 16 RSA to the full 240-foot length. A similar project will be programmed for the nonstandard Runway 34 RSA.

Recommendation: Extend Runways 16 and 34 RSAs to the full length of 240 feet.

Runway 34 RPZ Alternatives

The Runway 34 RPZ extends beyond airport property to the south into private property. One parcel of property contains a residence in the RPZ. A county road (i.e., Shark Reef Road), and two private lanes (i.e., Meadow Lane and Eagles Roost Lane) are also within the RPZ.

Runway 34 RPZ Alternative One.

Runway 34 RPZ Alternative One. This alternative provides for the fee simple acquisition of the private property and residence contained within the Runway 34 RPZ directly south of existing airport property and west of Shark Reef Road, and the purchase of an RPZ easement for the property within the RPZ east of Shark Reef Road. Alternative One also proposes the closure of the portions of Meadow Lane and Eagles Roost

Lane through the RPZ, and the construction of a new road providing access to Meadow Lane and Eagles Roost Lane with Shark Reef Road outside the RPZ boundary. The advantage of this alternative is that Airport ownership of the majority of RPZ property ensures incompatible land uses are removed and are not allowed to develop in the future. An RPZ easement purchase for the property east of Shark Reef Road is appropriate given the small amount of property within the RPZ (less than one acre), the need to provide the landowner continued driveway access to Shark Reef Road, and the low probability that the landowner will ever develop incompatible uses within this portion of the property. Easements can cost less than fee simple purchase of property, but depending upon the negotiations needed to get the land owner's agreement can be close to the cost of a fee simple purchase. It should be noted that easements do not equal complete control by the airport over the property as they require additional coordination and cooperation from the land owner. However, a properly negotiated RPZ easement would prohibit the development of incompatible land uses and limit the height of vegetation and structures. The disadvantage is the cost to purchase additional property, including the residence.

Runway 34 RPZ Alternative Two.

This alternative does not provide for the acquisition of the entire property located within the Runway 34 RPZ. The FAA Memorandum *Interim Guidance on Land Uses Within a Runway Protection Zone*, provides guidance for determining land use compatibility within RPZs. Residential land uses and roads are defined as incompatible within RPZs. However, the Memorandum only addresses the introduction of new or modified land uses to an RPZ and proposed changes to the RPZ size or location. Since no proposed airport improvements are planned that would introduce new incompatible land uses, or change the size or location of the RPZ, the land use compatibility requirements contained in the Memorandum are not pertinent and no action is required by the Port.

This alternative has the advantage of having no cost to implement. Maintaining the status quo will not create additional incompatible RPZ land uses. The disadvantage is the Port does not have direct control of uses within the portion of the Runway 34 RPZ extending beyond airport property.

Recommendation: A recommendation will be made after careful consideration and review by the Port of Lopez.

Threshold Siting Obstructions

Multiple trees penetrate the threshold siting surfaces at both runway ends.

Threshold Siting Alternative One.

This alternative would displace the runway thresholds at both runway ends to provide adequate clearance of the threshold siting surfaces above the trees located beyond existing airport property. This would entail the displacement of the Runway 16 threshold by approximately 350 feet, and the displacement of the Runway 34 threshold by approximately 250 feet.

The advantage provided by this alternative is the Port controls the steps required for implementation; it would not require negotiation with property owners for the purchase of additional property or an easement to remove trees. The disadvantages are the loss of runway

landing length associated with the displaced thresholds, the cost to relocate the thresholds (i.e., remarking the runway pavement and relocating runway lights), and the temporary nature of the remedy as the trees will continue to grow.

Threshold Siting Alternative Two.

This alternative involves the acquisition of easements granting the Port the rights to remove the trees penetrating the threshold siting surfaces located beyond existing and future airport property. The advantages associated with this alternative are the retention of the full runway landing length and the more permanent nature of the alternative as a properly negotiated easement should stipulate that future trees determined to penetrate the threshold siting surface will be removed at the Port's expense.

Recommendation: A recommendation will be made after careful consideration and review by the Port of Lopez.

Taxiway System

As identified in the previous chapter, the parallel taxiway TOFA width is deficient by approximately 1.7 feet for a length of roughly 817 feet in length caused by a tree and the fence separating airport property from the golf course.

Taxiway Configuration Alternative One.

This alternative proposes to remove or trim the tree on the golf course and relocate the portion of the fence creating the deficiency to the east outside the TOFA. Before implementing this alternative, the Port should have the airport property line and fence line surveyed for accuracy. If the fence is located on the airport property line, then acquisition of sufficient golf course property will be required to move the fence and remove or trim the tree. If the fence is not located on the property line and the Port owns sufficient property to relocate the fence, then an agreement with the golf course should be decided upon that allows for fence relocation to coincide with the property line and tree removal or trimming.

The advantage of this alternative is it provides a permanent remedy to the nonstandard Taxiway OFA and does not operationally restrict aircraft taxiing on the parallel taxiway. The disadvantage is the associated costs of fence relocation and additional property (if required).

Taxiway Configuration Alternative Two.

This alternative proposes that the Port of Lopez request from the FAA a MOS to allow the TOFA deficiency to remain. According to FAA Order 5300.1F, in order to approve an MOS, it must be justified by unusual local conditions and assurance that an acceptable level of safety will be provided. Unusual local conditions that exist include the existing golf course development immediately adjacent to airport property and the very tight fairway, green, and tee box located next to the area of deficiency. Relocating the fence to the east would further restrict the width of the fairway and encroach on the green and tee box.

Engineering Brief No. 78 provides guidance to evaluate proposed MOS on taxiway separation standards and clearance from taxiways to fixed or movable objects (i.e., TOFA). According to this brief, an MOS would have merit by applying ***taxilane*** clearance standards instead of ***taxiway*** clearance standards. As analyzed and presented in the previous chapter, a Taxiway OFA distance

for Airplane Design Group (ADG) I aircraft requires 44.5 feet between the taxiway centerline and any fixed or movable objects. However, applying taxilane OFA separation standards to the parallel taxiway would require only 39.5 feet between the taxiway centerline and fixed or movable objects. Thus, the existing dimension of 42.8 feet between the taxiway centerline and the fence and tree would exceed the standard. Approval of the MOS might also depend upon operational restrictions applied to the parallel taxiway, such as limiting taxiing speeds to 10 miles per hour or less to provide the acceptable level of safety.

It should be noted that the preparation and submittal of an MOS to the FAA is beyond the scope of this Master Plan Update.

The advantage of this alternative is it reduces the expense of rectifying the nonstandard Taxiway OFA dimensional standard. The disadvantage is it operationally restricts aircraft taxiing on the parallel taxiway to potentially slower-than-normal speeds.

Recommendation: At this time, the Port of Lopez desires to pursue Alternative Two, a MOS from the FAA that would apply taxilane clearance standards to the parallel taxiway, thus eliminating the deficient object clearing standards, and limit taxiing speeds to 10 miles per hour or less. As a pathway to compliance of the design standard, a future site survey of the property boundary would be needed to determine if property acquisition and fence relocation is required. If required, a property acquisition and fence relocation project would be identified and scheduled in the CIP.

Automated Weather Observing Station (AWOS)

As identified in the previous chapter, the Port desires to install an Automated Weather Observing Station (AWOS) on the airport.

AWOS Alternative One**.**

According to siting criteria contained in FAA Order 6560.20B, *Siting Criteria for Automated Weather Observing Systems (AWOS)*, the preferred siting of the cloud height, visibility, and wind sensors portion of an AWOS III is adjacent to the runway between 1,000 and 3,000 feet from the runway threshold, with a minimum distance from the runway centerline of 500 feet and a maximum distance of 1,000 feet. The minimum distance from the runway centerline assumes flat terrain. If the sensor is above the runway elevation, then the minimum distance is adjusted positively (i.e., the minimum distance is greater than 500 feet) seven feet laterally for every one foot of elevation difference. If the sensor is below the runway elevation, then the minimum distance is adjusted negatively (i.e., the minimum distance is less than 500 feet) by the same ratio.

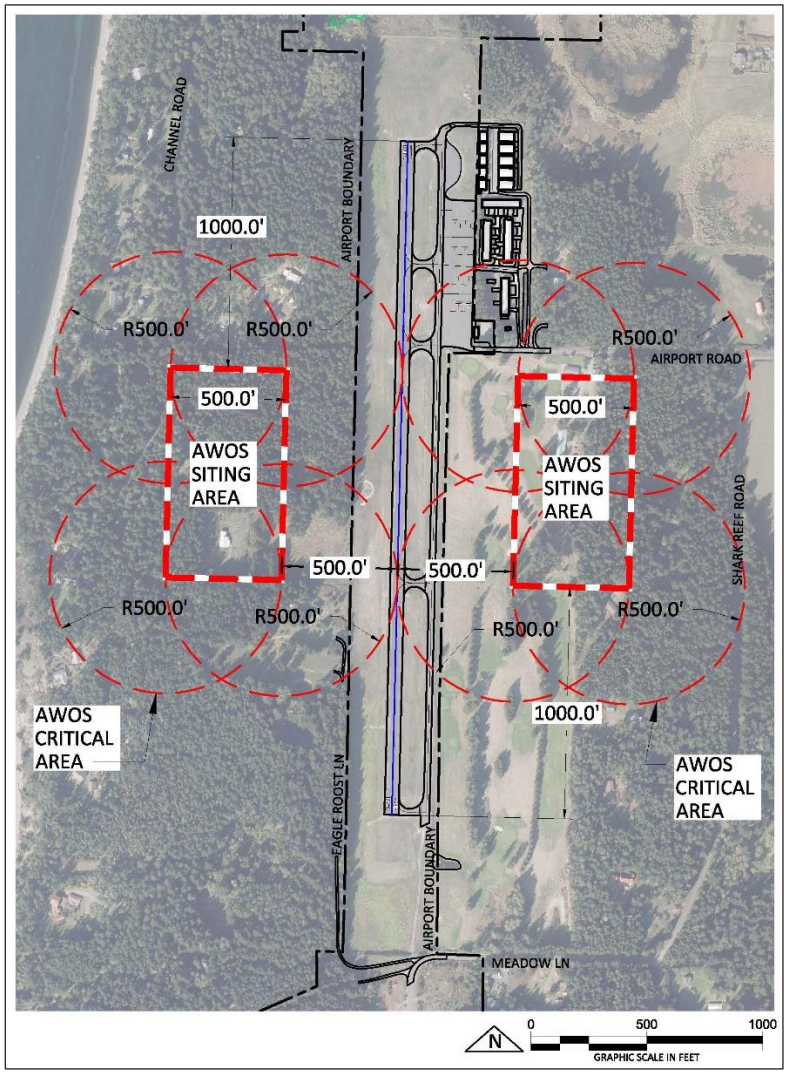
The wind sensor is typically mounted 30 to 33 feet above the average ground height within a 500-foot radius. It is desirable that all obstructions (i.e., vegetation, buildings, etc.) be at least 15 feet lower than the sensor within the 500-foot radius, and be no greater than 10 feet above the sensor from 500 to 1,000 feet.

Exhibit 5-1 illustrates the general siting locations for the AWOS using the criteria presented above. As presented, all available sites would be located off airport property, either in the residential area to the west or in the golf course and/or residential areas to the east. Applying the

500-foot critical area radius indicates that most sites would require substantial tree trimming or removal for proper wind sensor functionality.

AWOS Alternative Two. This alternative involves the purchase and installation of a non-Federal, non-certified AWOS system (e.g., Super AWOS) on the airport, which does not require the siting restrictions presented above. However, the weather reporting capabilities would be advisory only, meaning it is not considered an approved source of weather information. After discussions with manufacturers, a viable location for a non-Federal, non-certified AWOS system would be south of the existing lighted wind indicator/segmented circle, approximately 150 feet from the runway centerline.

Exhibit 5-1. AWOS Alternative Siting Locations



Recommendation: A decision about the weather reporting system and location will be made as more detailed information is gathered and analysis is conducted at the time of project design.

Landside Development Concepts, Alternatives and Recommendations

The overall objective of the Lopez Island Airport landside development plan are the provision of facilities that are conveniently located, accessible to the community, maximize the economic viability of the Airport, and accommodate the specific requirements of airport users and tenants.

Landside Development Concepts

Landside facilities are commonly categorized into three generalized development categories, described in the following text. Because of the limited developable land within or adjacent airport property.

Aviation Use

Development areas related to aircraft storage and handling that require direct airfield access, consisting of facilities such as aprons, hangars, and access taxiways. There are two primary concepts that influence the ability to designate areas for aviation use. First, an area must be located beyond protected airfield spaces such as runways, taxiways, and approach protection areas. Second, the areas must have physical attributes that make access to the airfield system economically feasible.

There are two aviation use designated development areas on the airport. The first is the existing hangar and terminal area, which can be re-developed as age and condition of the older hangars warrants. The second area consists of the vacant land directly north of the existing private hangars.

Aviation-Related or Aviation-Compatible Use

Development areas consisting of facilities that may benefit from close proximity to airport facilities, but do not require direct airfield access, such as commercial, office, and/or light industrial facilities that are compatible with airport operations and surrounding land uses, and which generate revenue to the Airport and should be marketed as potential revenue producing properties. Development concepts used for this designation include areas beyond protected airfield spaces that cannot be feasibly developed for aviation uses because of physical constraints such as topography, floodplains, drainage features, major roadways, or because airfield access would be cost prohibitive.

At Lopez Island Airport, the recently acquired property in the northeast corner of the airport can be designated as Aviation-Related or Aviation-Compatible. It is unlikely that this property will be needed for aviation facilities, as the distance from the airfield system makes it unfeasible to provide taxiway access. Excellent vehicle access from Channel Road can be provided.

Aviation Support

Development areas required for airports to operate properly, but not related directly to aircraft storage and handling and are not part of the airfield system. They consist of facilities such as fuel storage and dispensing systems, Airport Traffic Control Tower (ATCT), on and off airport fire protection facilities, and airport maintenance facilities. Development concepts used to designate areas for aviation support facilities include close proximity to the airfield that are economically feasible to develop without encroaching into the prime aviation use development areas.

It is unlikely that any Aviation Support facilities will be developed at the airport. As stated in the previous chapter, the Port has had discussions about the need for a fuel storage and dispensing system at the airport, but it is not thought to be a necessary facility at this time.

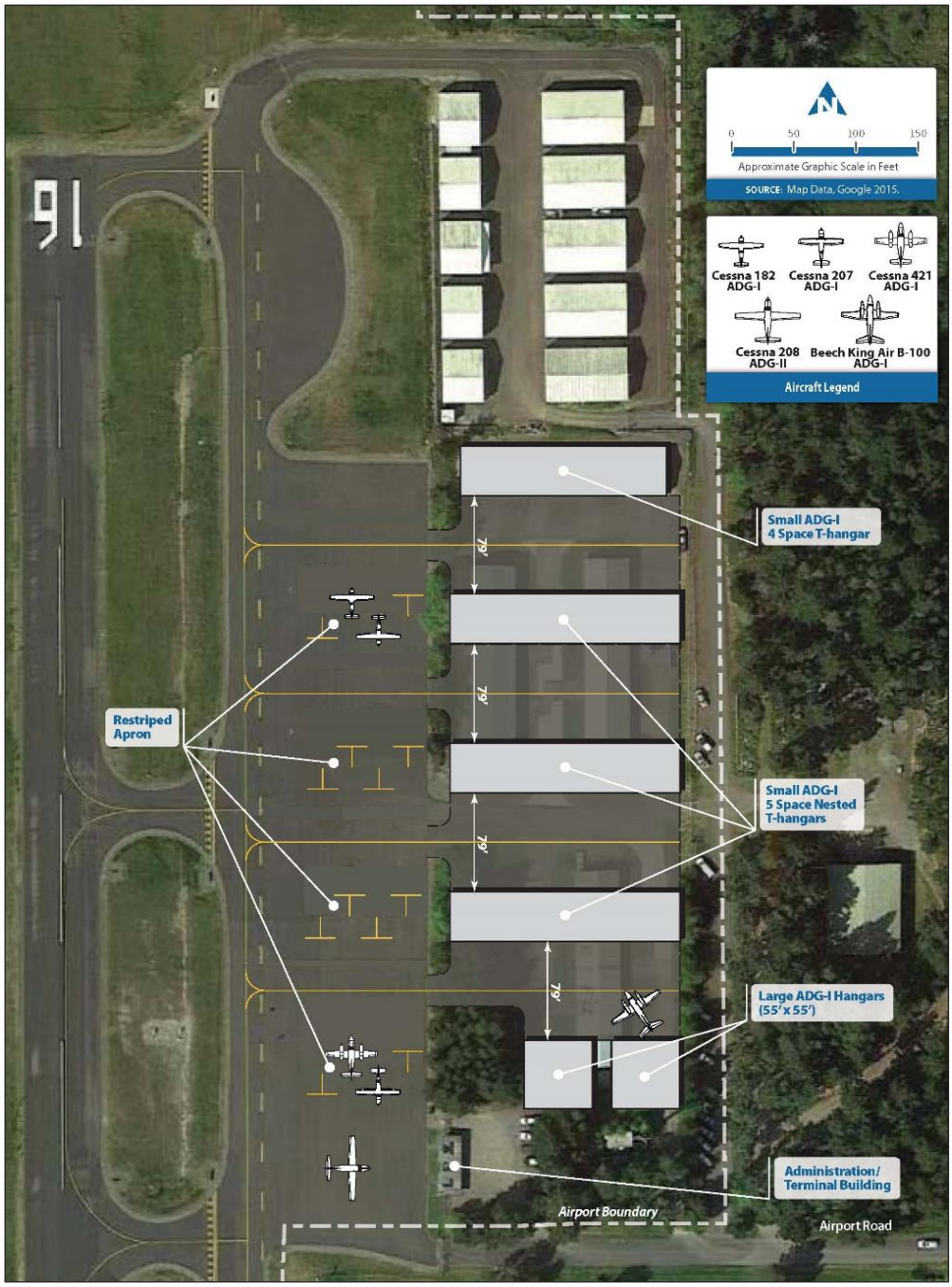
Landside Development Analysis

South Hangar Development Area

As presented in the previous chapter, Lopez Island Airport currently provides sufficient apron and hangar space for aircraft storage needs throughout the planning period. However, because of age and condition, the older hangars may warrant replacement during the planning period. Exhibit 5-2 presents a conceptual re-development alternative for the southern hangar area and the apron. Because of its location, the entire area is recommended for redevelopment in aviation uses such as hangar, apron, and terminal building.

Replacing the three north-south oriented hangars with east-west oriented nested T-hangars provides for the proper Airplane Design Group (ADG) I taxilane OFA widths (i.e., 79 feet) between hangars. Space is allocated for two individual storage hangars accommodating larger ADG I aircraft. Restriping the apron to coincide with the redeveloped hangars also insures ADG I taxilane OFA dimensional standards are met, and also eliminates the direct access to the runway from the apron by the mid-field taxiway connector striping.

Exhibit 5-2. South Hangar Area Conceptual Redevelopment Alternative



North Hangar Development Area

The Port also desires to explore options for reserving and providing additional hangar development to the north of the existing private hangars. Two conceptual alternative development options have been prepared, which are presented in Exhibits 5-3 and 5-4.

North Hangar Development Alternative One. Alternative One provides the same size hangars as the smallest existing hangars (32 feet x 42 feet) along the west edge of the

development area. However, it is recommended that the closest hangar to the existing taxilane centerline be located a minimum of 39.5 feet, and spacing between rows of hangars should be a minimum of 79 feet in accordance with ADG I Taxilane OFA design standards. Larger hangars can be developed along the east edge of the development area, but ample space should be reserved for automobile access and parking along the east side of these hangars. Approximately 2.3 acres of private property will need to be acquired to fully develop this area as illustrated.

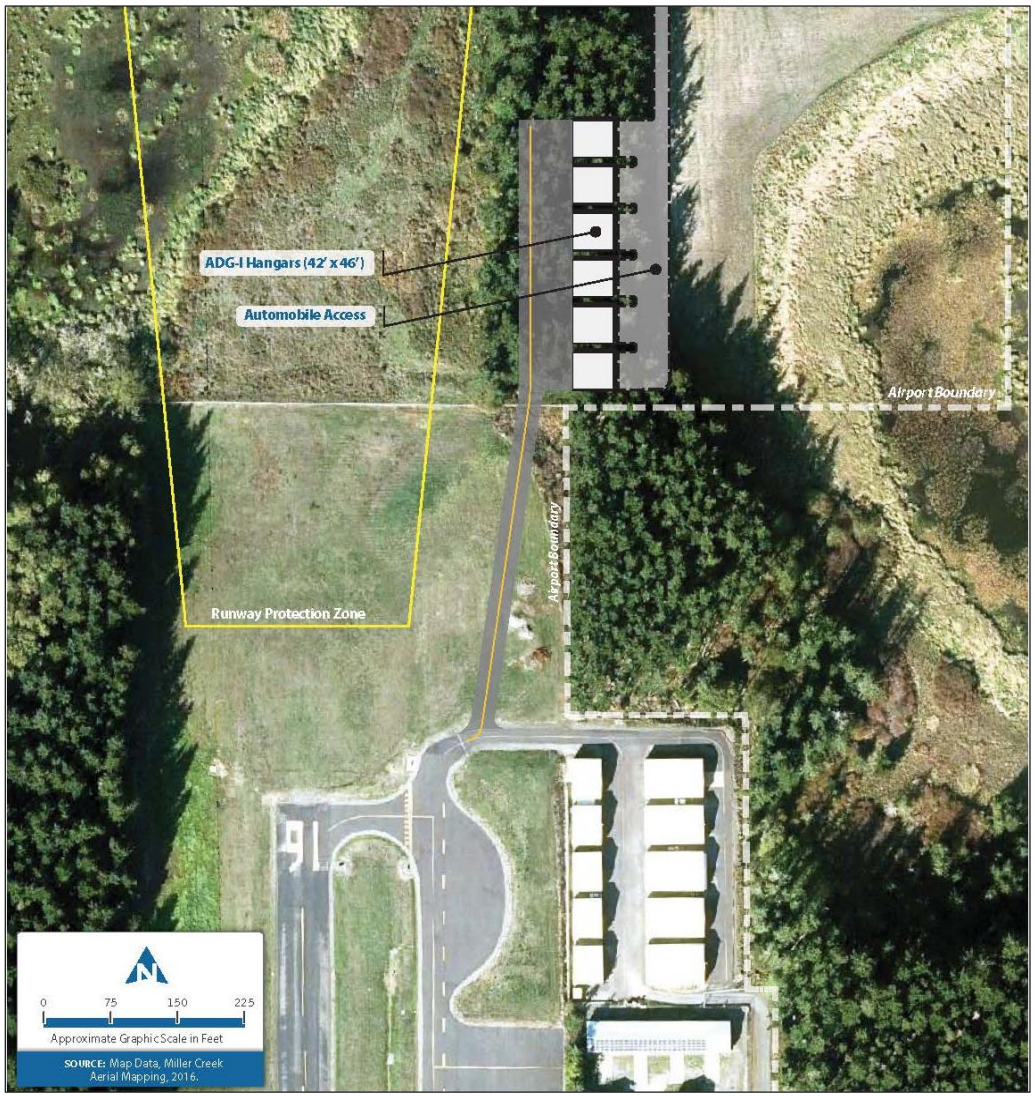
Exhibit 5-3. North Hangar Area Conceptual Development Alternative One

It should be noted that the topography drops to the north and east of the existing private hangars, and water tends to be retained, thus making hangar development in this area more challenging and potentially expensive. Additionally, as previously noted in the preceding chapter, the existing taxilane at the north end of the parallel taxiway providing access to the private hangars exceeds the 2.0% maximum grade for Aircraft Approach Categories A and B. If this alternative

is selected as the preferred option, then the Port should seek solutions to the non-standard taxiway gradient during the design of the facilities.

North Hangar Development Alternative Two. Alternative Two places the hangar development approximately 400 feet north of the existing hangar area on Port owned property. Following the existing Building Restriction Line (BRL) set back restriction of 310 feet from the runway centerline, six smaller hangars (32 feet x 42 feet) are illustrated, although larger hangars can be developed. However, caution must be exercised in developing this area regarding hangar height. Because the development area is near the approach area to Runway 16, hangars should be constructed below the approach surfaces so they are not obstructions and thus effect the Runway 16 approach. Taxiway access can be provided through a connection with the taxilane at the north end of the parallel taxiway. Automobile access would be provided from the north via Channel Road.

Exhibit 5-4. North Hangar Area Conceptual Development Alternative Two



Recommendation: As age and condition warrant, the south hangar area will be redeveloped with the east-west oriented hangar layout and apron making as presented in Exhibit 5-2. The north hangar area will be developed as presented in Alternative Two, Exhibit 5-4.

Recommended Development Plan

A recommended development plan will be prepared and presented following the public input process. The Port of Lopez will consider all facets of the alternatives and public input received before reaching any decision on future development plans.

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