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INTRODUCTION

Pierce County initiated an Airport Master Plan Update study for the Tacoma Narrows Airport in late 2012 with a grant from the Federal Aviation Administration (FAA) to fund 90% of the study with Pierce County funding the 10% balance.

The last Master Plan for Tacoma Narrows Airport was published in 2003, but used 1997 baseline data. The FAA recommends that airports periodically update their master plans as conditions affecting airport operations and development occur—often in unpredictable ways. Consequently, the timeframe to update a master plan varies for different airports.

This is Pierce County’s first master planning study for Tacoma Narrows since the County purchased the Airport from the City of Tacoma in 2008. This Master Plan Update serves as Pierce County’s strategy for development of the airport for the 20-year planning period and beyond, consistent with its long-term vision to be a major provider of transportation services and economic development for Pierce County and the surrounding region.
The Master Plan Update study involved several tasks spanning an estimated 18-month study timeframe. The FAA’s Advisory Circular 150/5070-6B, Airport Master Plans, provided guidance for the planning process. Documentation of the study findings for the Tacoma Narrows Airport are presented in seven chapters to include the following:

1. Inventory
2. Aviation Forecasts
3. Facility Requirements
4. Alternatives Development and Evaluation
5. Environmental Overview
6. Airport Plans
7. Implementation

The chapters were published in draft for review and comment throughout the planning process. Once review comments were incorporated into all draft chapters, a comprehensive report was published. Further, the Tacoma Narrows Airport Layout Plan (ALP), which was last reviewed and approved by the FAA at the conclusion of the 2003 Master Plan, has been updated as part of this study. The ALP update corrects obsolete features, shows facilities constructed more recently and not reflected on the current ALP, and incorporates the County’s long-term development plans so the future improvements will be eligible for Federal funding.

**Airport Issues**

The Tacoma Narrows Airport is a public use general aviation (GA) airport serving its airport users, community, surrounding region, and the air transportation system. Consequently, the Airport is an important asset. Identifying issues and taking action to address those issues is necessary to preserve and enhance this important asset. The following is a list of airport issues identified early in the study for the master plan to address.

- Existing and potential airport users and their needs
- Growing corporate aviation activity
- Runway to taxiway separation
- Runway safety area southeast of Runway 17 end
- Road in Object Free Area (OFA) on west side
- Potential west side development
- Growing vegetation, trees
- Security – fencing, wildlife intrusions
- Growing number of special events – capacity
• Maximizing landside development (functional, long-term)
• Energy efficient & alternative energy opportunities - sustainability
• Stormwater management
• Off-airport compatible land use development
• Continuing community outreach
• Utility infrastructure needs
• Potential grass strip on west side
• NextGen criteria and airport needs
• Potential GA reliever status

Plan Goals

The Master Plan goals guide the County’s near- to long-term development plans for both airside and landside facilities at the Airport. The following plan goals were identified in coordination with the County, public, and other stakeholders:

• Enhance safety and security
• Support economic growth
• Accommodate demand
• Preserve/protect investment
• Promote sustainability

These goals provided the framework for defining evaluation criteria used later in the study to evaluate the various development alternatives for the Airport.

Public Involvement

Historically, public involvement has been vital to the successful planning and implementation of airport master plans. Pierce County committed to a proactive public involvement program for this study, which provided a mechanism for ongoing communication between Pierce County, the Tacoma Narrows Airport Advisory Commission (TNAAC), and the airport tenants, users, local citizens, local agency officials, and other stakeholders and interested parties. As a result, the County identified the following means to facilitate an open and successful public involvement program:

• Planning Advisory Committee Meetings: The County established a Planning Advisory Committee (PAC), which is a 22-member committee representing a cross section of
the community. These PAC members served as community liaisons and participated in four work sessions over the 18-month planning process. They discussed airport issues, study progress, and key findings, and provided input, evaluated development concepts, and provided review comments and questions on all draft materials produced throughout the study process. PAC members were invited to share their knowledge of the study findings with the public at any time, but all PAC work sessions were open to the public. The PAC meetings/work sessions were held on January 30, 2013, June 5, 2013, September 4, 2013, and January 29, 2014. Public Information Workshops: The County held five public information workshops in an open house format—the first four of which followed a PAC meeting held on the same day. The Public Information Workshops included a brief presentation of the study’s findings and progress and invited the public to ask questions, identify concerns, and provide input to the study. The Public Information Workshops were held on January 30, 2013, June 5, 2013, September 4, 2013, January 29, 2014, and June 11, 2014.

- Project Newsletters: Three newsletters were published throughout the study process. Each summarized the study progress at the time of its publishing and advertised the next PAC Meeting and Public Information Workshop. Newsletters were posted online and distributed via email to all subscribers.

- Website: To keep the public informed, the County posted meeting information, public comment sheets, newsletters, draft airport master plan materials, and other pertinent information on their website at www.piercecountywa.org/tacomanarrows.
Chapter One
INVENTORY

The Inventory Chapter documents the existing conditions for the Tacoma Narrows Airport (Airport) to include airport facilities and aviation activity. The information presented represents baseline data and the foundation for the subsequent chapters. Identifying what is available today allows the study to address what facilities are insufficient to meet the projected aviation demand.

AIRPORT LOCATION AND ACCESS

The Tacoma Narrows Airport is on Pierce County property outside the city limits of Gig Harbor, which is located along WA State Highway 16 west of Interstate 5. The Airport is 34 miles or an estimated 45-minute drive from SeaTac International Airport—the closest major air carrier airport. Exhibit 1A depicts the Airport’s general location in the region – across the Tacoma Narrows Bridge west of Tacoma.
AIRPORT HISTORY

Known originally as the Tacoma Industrial Airport, the Airport officially opened for operations in 1963. Within ten years, the Airport had hosted its first air show, received the first state aviation grant (totaling $5,000) provided to a public use airport, and added an air traffic control tower, Instrument Landing System (ILS), and a restaurant in the terminal building. Eighteen years after its opening, the Airport changed its name, in 1981, to Tacoma Narrows Airport. At the time, it was owned by the City of Tacoma; Pierce County purchased the Airport from the City of Tacoma in late 2008.

Since its opening, the Airport has continually improved through airfield development projects, hangar development, and support facilities with funding support from various sources such as federal grants, state grants, local government funds, and private investments. The Airport’s most recent improvement was a major runway safety area improvement project. A tunnel was constructed over Stone Drive to provide an extended runway safety area – that meets the FAA requirements - to the north of the existing runway.

A more detailed sequence of airport development projects, derived from FAA records, is presented below and identified by the year in which the project grant was issued:

- 1962 – Land acquisition, site preparation, construct runway and north portion of parallel taxiway with connectors and apron area; install Medium Intensity Runway Lights (MIRL), beacon and segmented circle; install perimeter fence; extinguish/abandon four on-site road right-of-ways and commence construction of new County road; construct power service system; relocate power lines; remove obstructions
- 1963 – Construct fire, crash and maintenance equipment building, including utilities and access apron
- 1964 – Land acquisition (44 acres) for north approach area
- 1967 – Land acquisition; remove obstructions; clear and grade for Instrument Landing System (ILS)
- 1969 – Extend and mark partial parallel taxiway including connectors, signage, and holding apron; relocate beacon
- 1971 – Construct north access and south access taxiways including fillets, markings
- 1973 – Site grading for ILS and Medium Intensity Approach Lighting System (MALSR), friction seal and mark Runway 17-35, modify runway threshold lights
- 1975 – Land acquisition for airport development (19 acres) and approach protection for Runway 17 (106 acres)
• 1981 – Construct and mark connecting taxiway; expand apron including tiedown anchors; install perimeter fencing
• 1984 – Prepare Airport Master Plan Update
• 1986 - Construct south apron, including tiedowns and connecting taxiway; construct service road, install perimeter fencing
• 1988 - Overlay south ramp extension; widen south connecting taxiway
• 1989 – Install taxiway lighting and apron lighting
• 1992 – Expand apron, including relocation of lighting, construct apron, including lighting, install Runway End Identifier Lights (REIL), install segmented circle and relocated windsock; install signs
• 1997 – Airport Master Plan Update (grant 1997, master plan completed/published 2003)
• 2002 through 2009 – Improve Runway 17 safety area by phase, including fencing
• 2010 – Design an improved Runway 35 safety area including localizer relocation (project was later canceled by FAA due to lack of available federal funding)
• 2013 - Runway 17-35 rehabilitation and runway width reduction

AVIATION ACTIVITY

Aviation activity at a general aviation airport is typically measured by the number of based aircraft and by the number of annual aircraft operations (takeoffs and landings, including touch-and-go operations performed during flight training).

According to Pierce County records, the estimated number of aircraft based at the Airport is 132. The based aircraft fleet includes the following:

• 108 single-engine
• 15 multi-engine
• 5 jets
• 4 helicopters

The Federal Aviation Administration (FAA) defines airport operations by specific categories. For TIW, the operations fall into one of three of these categories—General Aviation (GA), air taxi/commuter, and military. Airport users in these categories include corporate, private GA, government agencies, scheduled cargo, and the occasional cargo and/or passenger charter/air taxi. GA aircraft operations are estimated to represent nearly 95% of total annual operations at the Airport, with air taxi operations representing 2% of the total annual operations and military operations the remaining 3%.
Airport operations are also divided between local and itinerant activity. Local operations refer to aircraft remaining near the airport and include training activity such as touch-and-go operations and aircraft maneuvers in a practice area near the airport. Itinerant activity refers to all other operations that depart to or arrive from another airport. Itinerant operations make up the majority (60%) of the Airport’s operations while local operations represent the remaining 40%.

Tacoma Narrows Airport is used by a variety of transient and based aircraft for a broad range of business and recreational purposes. Total annual operations for calendar year 2012 are estimated at 48,500 operations, which includes the air traffic control count of 44,057 operations plus an additional estimated 10% conducted when the Air Traffic Control Tower (ATCT) is closed from 8 pm to 8 am daily. Operations primarily consist of small, single-engine piston fixed wing aircraft, but many other aircraft types operate at the Airport including corporate jets, helicopters, and turboprops.

Air traffic is heaviest during special events such as fly-ins. The largest event is the Tacoma Freedom Fair Wings and Wheels event held every July that brings an estimated 25 aircraft to the Airport. This event—started in 2011—has been a successful one with airplane flybys, pilot meet and greets, Tuskegee Airmen, airplane and helicopter rides, as well as a car and motorcycle show, displays, and food vendors.

To provide additional insight regarding the aviation activity characteristics at the Airport, an airport user/pilot survey was distributed. Survey results were compiled and are presented in relevant sections of the report. Based on the survey responses, examples of current aviation activity conducted at the Airport include:

- Corporate
- Career Training
- Emergency Medical
- Medical/Patient Transfer
- Search/Rescue
- Police/Law Enforcement
- Military Exercises
- Recreational Flying
- Environmental Patrol
- Aerial Photography
- Real Estate Tours
- Special Events/Airshows (i.e. Wings & Wheels)
- Aerial Inspections

**EXISTING FACILITIES**

The Airport, at an elevation of 294 feet mean sea level (MSL), consists of approximately 568 acres. Existing facilities are depicted on Exhibit 1B and described here within three primary categories: airside, landside, and support facilities. As part of the Inventory element, a boundary survey was completed to confirm the County’s airport property boundary ownership.

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Tacoma Narrows Airport
Master Plan Update

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Inventory
**AIRSIDE FACILITIES**

Airside facilities include active aircraft movement areas such as the runways, taxiways, and aircraft apron areas. The Tacoma Narrows Airport has a single runway, full-length parallel taxiway system, and aircraft apron areas with tiedowns on the east side of the runway adjacent to the building areas.

**Runways**

The Airport’s single runway is at a north-south alignment—designated as Runway 17-35—with dimensions of 5,002 in length by 100 feet in width. The runway is asphalt-paved. A runway rehabilitation project, completed in 2013, reduced the runway width to its current 100 feet—the maximum width necessary to serve the family of aircraft using the Airport on a regular basis—from its previous width of 150 feet. Further, FAA funding was limited to the 100-foot width pavement.

With winds predominantly from the south, average annual runway usage favors Runway 17 at 75 percent with Runway 35 at 25 percent.

**Taxiways**

A full-length parallel taxiway, designated as Taxiway A, serves Runway 17-35 at a 350-foot runway to taxiway centerline separation. The parallel taxiway is 75 feet wide and provides four connecting taxiways to the runway—one at each runway end, a third connector near the midpoint of the runway, and a fourth within the first 1,300 feet of the Runway 35 end. These four connecting taxiways to the runway are designated as A1, A2, A3, and A4 from north to south. Taxiways A1 through A4 are 50 feet wide.

There are also four connecting taxiways between the apron areas and parallel Taxiway A. The width of these taxiways was reduced from 75 feet to 50 feet as part of the 2013 runway rehabilitation project.

**Aprons and Aircraft Parking**

Total aircraft apron area at the Airport is estimated at 58,400 square yards, or an estimated 12.1 acres. A total of 108 tiedowns are provided on the apron serving both based and transient aircraft. According to County lease records, there are 22 based aircraft on the apron. The largest contiguous aircraft apron area spans more than half of the runway length from Taxiway A1 to A2. Taxilanes run alongside the east and west edge of the apron with tiedowns along the center of the apron. The other apron is located to the south.
There is no officially designated helipad or heliport on the airfield so helicopters may arrive on a runway approach and hover-taxi to the apron for parking. There is an unofficial training helipad on the west side of the Runway.

**Airfield Pavements**

Runway 17-35 has a pavement strength rating of 50,000 lbs. single wheel loading (SWL) and 80,000 lbs. dual wheel loading (DWL). The runway rehabilitation project, completed in 2013, did not alter the pavement strengths.

Like the runway, the taxiway and apron pavement strength ratings are estimated at 50,000 lbs. SWL. Taxiway pavements are in good to fair condition. A 2012 pavement inspection assigned a Pavement Condition Index (PCI) rating between 74 and 75 on Taxiway A. The rehabilitated runway is in excellent condition.

**Airfield Lighting**

The runway is equipped with a medium intensity runway lighting (MIRL) system, which was replaced as part of the runway rehabilitation project—a necessary change since the runway pavement width was reduced. A Medium Intensity Approach Lighting System with Runway alignment indicator lights (MALSR) is on Runway 17 and in good operating condition. A Runway End Identifier Lighting (REIL) system is on the Runway 35 end. All taxiway pavements are equipped with medium intensity taxiway lighting (MITL). When the ATCT is closed, the MALSR system on Runway 17 is pilot-activated.

**Airfield Markings and Signage**

Runway 17 is marked for a precision approach while Runway 35 is marked for a nonprecision approach. Taxiways are marked with taxiway centerlines and proper hold bars adjacent to runways. The runway rehabilitation project included new airfield signage, which provides directional guidance that follows FAA standards.

**Airport Navigational Aids**

Airport navigational aids include both visual and instrument approach aids.

The Airport’s visual aids include a beacon, Precision Approach Path Indicator (PAPI) on Runway 17, a 4-box PAPI on Runway 35 which was recently installed as part of the runway rehabilitation project, and a lighted wind indicator.

The beacon, located east of the building area and generally aligned with midfield, is in good operating condition. The lighted wind indicator is contained in a segmented circle near mid-field on the east side of Taxiway A. The PAPI system on Runway 17 and the PAPI system on Runway 35.
35 are in good operating condition. The Runway 17 and Runway 35 PAPI systems are FAA-owned. When the ATCT is closed, the Runway 17 PAPI system is pilot-activated.

Instrument approach aids include the equipment associated with the Airport’s instrument approach. With Runway 17’s precision Instrument Landing System (ILS), there are Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR), a localizer, and glide slope, with visibility minimums for the approach procedure at ½-mile. The FAA maintains the ILS facilities.

Instrument approach procedures published for TIW include the following:

- ILS RWY 17
- RNAV (GPS) RWY 17
- RNAV (GPS) RWY 35
- NDB RWY 35

RNAV GPS = Required Navigation using Global Positioning System satellites. Visibility minimums are as low as one mile for Category A and B aircraft.

**Automated Surface Observing System (ASOS)**

The Airport has an Automated Surface Observing System (ASOS). The purpose of an ASOS is to provide weather conditions for an airport with updates on an hourly basis or when weather conditions change significantly. An ASOS is operated and controlled primarily by the National Weather Service, but in cooperation with the FAA and Department of Defense (DOD).

The ASOS is located on the east side of parallel Taxiway A near the Taxiway A2 connector. Airport users obtain weather data from the Air Traffic Control Tower (ATCT) during its operational hours (8 AM to 8 PM), but obtain weather data from the ASOS when the ATCT is closed. There is a possibility that the federal contract tower may close in the future due to federal budget limitations; should that occur, the ASOS can provide weather information on a 24/7 basis.

**LANDSIDE FACILITIES**

Landside refers to facilities such as the air traffic control tower, aircraft storage hangars, airport maintenance facility, fuel storage, vehicle access, and parking. The Airport’s landside facilities are located on the east side of the airfield. Aviation services provided at the Airport are also addressed in this section.

**Air Traffic Control Tower (ATCT)**

The Air Traffic Control Tower (ATCT) at Tacoma Narrows Airport has been in operation since 1973. It is a federal contract tower and operates daily for 12 hours from 8 AM to 8 PM. The ATCT building, with a top elevation of 339 feet, is in good condition and is located at midfield along the aircraft apron edge to provide adequate line-of-sight to aircraft movement areas.
Hangars

Aircraft hangars at the Airport provide storage for many of the aircraft based at the Airport as well as some limited transient aircraft. There are County-owned hangars as well as tenant-built hangars on ground leases.

Private aircraft owners as well as businesses occupy hangar space at the Airport. According to Pierce County, there are approximately 150 agreements with tenants on the airport, most of which are for hangars. Hangars consist of various sizes of conventional box hangars as well as T-hangars. Two new hangars—one conventional hangar and one T-hangar building—are proposed for construction this year on ground leases with the County. Both new hangars are shown on Exhibit 1B.

Aviation Services/Fixed Base Operations

Two businesses at the Airport presently provide Fixed Base Operator (FBO) services to airport users: Tacoma Narrows Aviation and PAVCO Flight Center. Services offered by one or both of the FBOs include:

- Aviation fuel (100LL, Jet A)
- Oxygen service
- Aircraft maintenance, parts
- Aircraft parking (ramp or tiedown)
- Aircraft storage (hangars)
- Overnight tiedowns
- GPU/Power cart
- Pilot lounge/terminal
- Flight training
- Aircraft rental
- Aircraft charters
- Avionics sales and service
- Aircraft cleaning/washing/detailing
- Catering
- Rental cars
- Courtesy transportation
- Courtesy cars/crew cars
- Public telephone
- Computerized weather
- Internet access, copy & fax service
- Restrooms

Fuel Storage

Both Airport FBOs sell 100LL and Jet A fuel. There are two separate fuel storage locations and each has a 10,000-gallon storage tank of 100LL and 10,000-gallon tank of Jet A, totaling 20,000 gallons of fuel storage capacity for each type of fuel. One FBO uses fuel trucks to provide aircraft fueling; the second FBO is able to directly fuel aircraft parked in front of its facility. A self-serve fuel facility provided by Pierce County is also available at the north end of the parking apron.
Vehicle Access, Parking and Security

Access to the Airport is provided via 26th Avenue NW, which runs north-south along the Airport property boundary adjacent to the landside facilities where auto parking is provided. The main public auto parking area, previously shown on Exhibit 1B, consists of 70 designated auto parking spaces. This parking area primarily serves the Tacoma Narrows Aviation (FBO), Airport staff office, ATCT, restaurant, office tenants, and Customs. Additional parking with 19 designated spaces is located south of the main parking area and serves PAVCO (FBO) and other nearby hangars. Other auto parking is adjacent to many of the hangars with the majority serving other airport businesses, private aircraft owners/tenants and their visitors.

The Airport is fenced with restricted access gates to enhance security. The presence of staff at the ATCT, FBOs, and other businesses also enhances security.

AIRPORT SUPPORT

Airport Support briefly addresses emergency services, airport maintenance, fencing, and ground transportation.

Emergency Services

The Pierce County Sheriff’s Department provides law enforcement support for the Airport. The City of Gig Harbor Fire and Medic One (Pierce County Fire District #5) provides aircraft rescue and firefighting from an off-airport station with a response time to an airfield incident of less than five minutes. There are 12 fire hydrants located on the Airport to serve the building area.

Airport Maintenance

Pierce County staff typically provides routine airport maintenance with County equipment and vehicles, but contracts for such services as needed. Contract maintenance is used for sweeping all paved airfield surfaces and is required twice annually by the Airport’s Industrial Stormwater Permit. County equipment and vehicles are stored in or adjacent to the airport maintenance building at the Airport as well as off-airport with other County equipment.

Fencing

Perimeter fencing encompasses the majority of the Airport. Portions of the airport boundary without fencing are not easily accessible due to terrain and vegetation, but restricted access gates are located near the building areas. A wildlife hazard assessment study planned for 2015 will look at the potential need for fencing improvements.
Ground Transportation

Ground transportation to and from the Airport includes local transit service (on-call), taxi, and rental car service.

The following is an excerpt from the Pierce County Comprehensive Plan:

Transit Service. Pierce County transit service is provided by Pierce Transit and Sound Transit. Pierce Transit provides local fixed-route bus service, express bus service to Olympia and Gig Harbor, a demand response SHUTTLE service for persons with disabilities who are unable to use the fixed-route system, a rideshare program that includes vanpooling, and park-and-ride facilities to support these services. Pierce Transit covers 450 square miles containing an estimated population of 622,875. Sound Transit provides express bus service to Seattle, south King County, and Sea-Tac International Airport.

Sound Transit is in the process of updating its Long-Range Plan for regional transit. The previous plan, ST2, was approved by the region’s voters in 2008 and authorized substantial additions to ST Express bus and Sounder commuter rail service, plus 36 miles of new Link light rail service to form a truly regional system. The new plan, ST3, which is expected to be on the ballot in 2016, is expected to include the extension of commuter rail service to Tacoma.

ENVIRONMENTAL INVENTORY

The purpose of this section is to summarize the environmental setting of the Tacoma Narrows Airport, and identify any potential environmental constraints.

Environmental constraints for airports typically fall into two general categories: human environment and natural environment. Human factors that can constrain airports include existing settlements and incompatible land use, noise, social or socioeconomic conditions, and light and glare. Natural environmental elements include various aspects of air quality, water resources, fish and wildlife, hazardous materials, energy and other resource issues.

HUMAN FACTORS

Noise

The Airport currently supports about 48,500 operations, which are mostly single-engine aircraft. The typical threshold of concern is when the 65 day-night average sound level (DNL) contour extends over noise sensitive land uses. The 65 DNL is the Federal significance threshold for aircraft noise exposure. Typically, no noise analysis is needed if airport operations do not exceed 90,000 annual adjusted propeller operations or 700 annual adjusted jet operations. While usage of the Airport approached the 90,000 operations level in the past, operations have dropped
substantially over the past several years with the economic downturn. Since the number of jet operations at the Airport exceeds the 700 annual operations threshold, a noise analysis is included in the master planning study.

Much of the land adjoining the Airport is dominated by forest. The southern end of the runway is immediately north of the Hale Passage portion of the Puget Sound. The lands north of the runway are dominated by undeveloped forest for approximately 0.5 mile north, and then low density residential lands, a golf course, transportation corridors, and eventually the City of Gig Harbor (approximately 3.75 miles north). There is a school (Harbor Heights Elementary) approximately 1.5 miles northwest of the runway. The closest residences are located 0.15 mile west, 0.25 mile east of the southern end of Runway 35, and less than 0.15 mile to the southeast.

**Land Use**

The Tacoma Narrows Airport is within an unincorporated portion of Pierce County. The Pierce County zoning map designation for the Airport property is within the Rural Airport overlay zone and is zoned as Essential Public Facility Rural Airport. According to Pierce County, the Airport Overlay Zone is intended to minimize incompatible land use. This overlay zone also establishes a buffer between airport uses and land use within rural-residential classified land. The specific airport zoning (Essential Public Facility-Rural Airport South and North) provides for new uses when these uses are appropriate and consistent with the applicable community plan. Additional land use discussion is provided in a later section, Off-Airport Land Use and Development.

**Social Impact and Induced Socioeconomic Issues**

Social impacts are typically related to relocation of businesses, residences or the alteration of established patterns of life (e.g., roadway changes, new facilities that divide a community).

Socioeconomic issues include the potential for the Airport to provide an economic attraction to the community, including on-airport jobs, off-airport jobs that are supported by the Airport, or some attraction that provides incentive to use the Airport (see Economic Impact section for additional information).

**Historic Properties, Cultural Resources (Section 106 Resources)**

No historic properties are readily identified within airport lands. Archaeological resources located on airport grounds are unknown. However, future ground disturbance in native soil will warrant an archaeological survey to determine the potential extent and presence or absence of culturally significant material.

**Recreational Lands (Section 4(f)) Resources**

There is a public golf course (Madrona Links) north of the Airport, approximately 1.15 miles. This facility is zoned as park and recreation land by Pierce County, but is not a 4(f) resource as this category of lands only pertains to public recreation lands.
**Wild and Scenic Rivers**

There are no designated or candidate Wild and Scenic Rivers in the immediate vicinity of the Airport.

**Farmland Preservation**

Certain types of soils are considered prime farmland because of their drainage, mineral, and other characteristics. These soils, when in urbanized or developed areas, are not considered prime due to the compaction and other activities that degrade the potential for farm use. The Natural Resources Conservation Service online soil database map (Soil Survey of Pierce County, Washington) found one primary soil type in the Airport area.

- Unit(s) 16B-16E – Harstine Gravelly Sandy Loam (varying slopes) – Comprises majority of the Airport and adjoining lands. This soil is considered moderately well drained and has a low to moderate capacity to transmit water. This soil is considered prime farmland if irrigated.

FAA Guidelines state that the Farmland Protection Policy Act (FPPA) is not applicable and no formal coordination with the Natural Resource Conservation Service (NRCS) is required if any of the following conditions apply:

- The land was purchased prior to August 6, 1984, for purposes of being converted.
- Acquisition does not directly or indirectly convert farmland (e.g., land acquired for clear zones or noise compatibility). Indirect conversion includes any use of land or operation of the facility which would prohibit the land from being farmed.
- The land is not prime farmland as defined in the FPPA.
- The land is not unique farmland.
- The soils are not considered prime farmland.
- The land has not been determined by a state or local government agency, with concurrence of the Secretary of Agriculture, to be of statewide or local importance.

There are no designated prime and unique farmlands on airport property.

**Light and Glare**

On-airport lighting should be focused for visibility to aviators, without creating a disturbance or distraction. In 2013 (during the planning study), an airfield improvement project was completed that included the removal of the Omnidirectional REIL on the Runway 35 end. This lighting was replaced with a Unidirectional REIL to focus toward approaching aircraft, which maintained the same lighting intensity as the original, but reduced the overall glare.
NATURAL FACTORS

Air Quality

The Tacoma Narrows Airport is not listed within a nonattainment area for air quality parameters. However, in 2009 the Wapato Hills Puyallup River Valley area immediately across the Narrows from the Airport became a nonattainment area for fine particulate matter (PM$_{2.5}$). The Washington Department of Ecology is in the process of developing an attainment strategy for the area.

Also notable is that the Airport falls within a state-recognized arsenic plume area, and more specifically, in the 40 to 100 ppm sampling area, or Zone 3, which is the lowest priority zone.

Any construction impacts will need to consider the impact of particulate material on the local environment, including water quality and other resources.

Water Quality

The Airport sits above the Tacoma Narrows and other portions of the greater Puget Sound. Stormwater from the Airport property ultimately drains to the Puget Sound via three distinct watersheds and four streams. As a result, the airport has a National Pollutant Discharge Elimination System (NPDES) Industrial Permit. Future development of impervious surfaces will likely require stormwater infiltration to comply with stormwater discharge requirements as mandated through Pierce County and the Washington State Department of Ecology. Future advanced treatment of stormwater, incorporating infiltration and heavy metal removal, will also be needed to ensure compliance with, most likely, changes to the NPDES permit as well as, less likely, changes to the Endangered Species Act (ESA, see additional detail below). Construction disturbances of more than one acre will require permitting as well. On very infrequent occasions, discovery of the presence of hazardous materials or contamination has required the Airport to comply with Washington State Department of Ecology Level 1 Corrections; Level 1 Corrections are the least significant of three levels.

Plants and Animals, Including Endangered and Threatened Species and Essential Fish Habitat

Previous surveys and analysis have determined that the Airport provides a range of wildlife habitat for both cosmopolitan and year-round habitat generalists as well as seasonal migrants. Vegetation and general habitat conditions are expected to be comparable to other Puget Sound locales. Extensive forest occurs to the north of the runway and presumably provides significant habitat within a generally urbanized region. The Airport as a whole provides suitable habitat for an abundance of small and large mammals, resident passerines, raptors, shorebirds, and seabirds. Additionally, the Airport likely provides stop-over habitat for migratory waterfowl, shorebirds, and wading birds.
As the ultimate receiving water of Airport runoff, the Puget Sound is a project related habitat that has a potential Endangered Species nexus with Airport activities. At a minimum, the Puget Sound contains Critical Habitat for endangered populations of killer whale, threatened Chinook salmon, and proposed Critical Habitat for threatened Puget Sound steelhead.

Any activity on the Airport would need to consider impacts to these species and associated Critical Habitat under the Endangered Species Act as well as habitat impacts under the Magnuson-Stevens Act.

Wetlands and Floodplains

Previous reviews of the Airport have identified wetlands within the airport property. Wetlands have been identified in the southeast, western, and eastern quadrants of the property. Future development will warrant additional examination of wetland resources and delineation of wetlands in proximity to or within the footprint of planned activities. Wetland impacts could require state and federal permits. There are no surface waters within the footprint of the Airport and there are no mapped floodways or floodplains in association with Airport properties.

Energy Supply and Natural Resources

This category focuses on the impact of airport actions on energy and natural resources used in construction materials. The site has adequate electrical and fuel supply and shortages are not anticipated to be a hindrance to development or function.

Solid Waste

Typically, general aviation airports do not generate significant amounts of solid waste. Often materials include food and beverage containers, or packaging for aircraft maintenance products. Food containers may create a bird and rodent attractant.

During construction, pavement materials are often recycled into the new pavement, reducing the need for disposal.

Plans for future activity at the Airport should consider the manner in which waste is collected and removed to reduce wildlife and aircraft interactions.

Hazardous Materials

The Airport has commercial fueling facilities on site. There is potential for additional contamination anywhere maintenance or fueling takes place, as a result of accidental spills. In addition to fueling, aircraft maintenance activities may also contribute to spills.

Any such areas where construction is proposed would need to undergo some level of due diligence, such as a “Phase One Environmental Site Assessment” to identify any history of possible contamination. The Tacoma Narrows Airport lies within the “Tacoma Smelter Plume,”
an area of potential arsenic and lead contamination due to past operations of an Asarco copper smelter in the community of Ruston (north Tacoma). Site assessment and mitigation may be required before any significant airport developmental work. Additionally, property acquisition may require environmental due diligence to limit liability for development activities.

Construction Impacts

Construction impacts typically include temporary noise, dust or traffic impacts, as well as the potential for erosion and water quality impacts associated with material spills, associated with construction. Once construction activities are identified, construction timing, phasing and mitigation measures need to be considered.

Controversy

Controversy is typically associated with off-airport impacts. In the case of Pierce County, there appears to be minimal, if any, controversy surrounding the existing airport.

Other Issues

There does not appear to be any other environmental-related issues on or around the Tacoma Narrows Airport.

ENVIRONMENTAL CONCLUSION

There may be significant environmental issues on the Airport or in the airport vicinity related to wetlands, cultural resources, and endangered species. Possible hazardous material may also occur within and/or adjacent to airport property, although documentation has not been completed or reviewed. Archaeological surveys are not known to have occurred within airport property, but may be warranted in conjunction with a review of historic properties to ensure compliance with State and Federal law. Additional study regarding these issues should be conducted once a project is defined.

AIRSPACE

For the safety of aircraft operations, it is important to protect the airspace around an airport.

The FAA-approved Airport Layout Plan (ALP) drawing set, prepared in 2003 as part of the last master plan, includes an Airspace Drawing. An Airspace Drawing illustrates the boundaries of imaginary airspace defined by the FAA. An Airspace Drawing is prepared in accordance with Title 14 Code of Federal Regulations Part 77, Objects Affecting Navigable Airspace, which defines a set of "imaginary surfaces" that should be protected from obstructions to air navigation, when possible. One of the most critical of these surfaces is the approach surface to each runway. The surface extending the farthest from the Airport is approximately 50,000 feet from the precision instrument runway end. While the FAA does not have authority to regulate off airport land use
including construction, the FAA has the authority, under Part 77, to review proposed construction through its Form 7460-1, Notice of Proposed Construction or Alteration, process. The FAA reviews compatibility of proposed construction for both on- and off-airport proposed land use to determine whether it will represent a “hazard to air navigation” relative to its defined airspace.

The 2003 Airspace Drawing identified numerous trees as obstructions to be removed. Other obstructions identified included transmission towers, the Tacoma Narrows Bridge (with obstruction lighting), and a few airfield facilities such as navigational aids that are fixed by function. The seven trees at the south end of the airfield and four at the north end that were identified as obstructions during an engineering survey have been removed.

Runway 17 uses a standard left traffic pattern while a non-standard right traffic pattern is used for Runway 35. Non-standard right traffic patterns are often implemented when area obstructions are present, community noise impacts require noise abatement procedures, environmentally sensitive areas must be avoided, or other issues need to be mitigated with traffic pattern adjustments. For Tacoma Narrows Airport, the right traffic pattern is applied as a noise abatement procedure and to avoid conflict between aircraft operating visually with those using the instrument departure procedure.

The Airport is located within controlled Class D airspace during control tower operating hours and aircraft operating within this airspace must maintain radio contact while operating in the airspace. The airspace reverts to Class G uncontrolled airspace during hours the tower is closed. There is no special use airspace in the immediate vicinity of the Airport that restricts or limits aircraft operations. However, Military Operating Areas (MOAs) are located south of the Airport, which include Rainier 1, 2 and 3. A MOA is a type of special use airspace where military operations regularly occur that necessitate separation from civilian aircraft.

**OFF-AIRPORT LAND USE AND DEVELOPMENT**

During the master planning process, it is important to review off-airport land use for compatibility with airport operations. Over the years, residential encroachment around airports has become increasingly common and presenting challenges to meeting development needs and protecting the long-term viability of the Airport. In 1996, WA legislators passed an amendment to the Growth Management Act requiring local jurisdictions with a public use airport to safeguard against incompatible land use development around their airports through their comprehensive plans and development regulations. In 1998, Washington State Department of Transportation (WSDOT) – Aviation provided public use airport communities with guidance to promote compatible land use development, which focused on the following key areas:

- height hazards that may impact critical airspace
- aircraft over-flight and noise
• safety, particularly relative to higher risk areas for aircraft accidents, possible wildlife hazards, and hazardous/explosive materials

WSDOT Aviation also recommended that jurisdictions with public use airports review and consider the findings of the airport master plans or other airport documents, the existing and proposed development shown on the airport layout plans, and any other relevant matters such as airport operations and aircraft and pilot characteristics. Further, these jurisdictions are required to coordinate with WSDOT Aviation when comprehensive plans and development regulations are available for comment prior to adoption or amendment. WSDOT Aviation encourages all jurisdictions surrounding an airport to cooperatively work together to protect the airport environs.

In January 2011, WSDOT Aviation updated its Airport and Compatible Land-Use Program Guidebook to better assist airports, local jurisdictions, elected officials and aviation advocates in meeting planning requirements outlined in state law. The updated guidebook does not change land-use requirements for towns, cities and counties. These requirements, as they relate to GA airports, are expressed in state laws RCW 36.70A.510 and RCW 36.70.547 which states that “every county, city, and town in which there is located a general aviation airport that is operated for the benefit of the general public, whether publicly owned or privately owned public use, shall, through its comprehensive plan and development regulations, discourage the siting of incompatible uses adjacent to such general aviation airport. Such plans and regulations may only be adopted or amended after formal consultation with: Airport owners and managers, private airport operators, general aviation pilots, ports, and the aviation division of the department of transportation. All proposed and adopted plans and regulations shall be filed with the aviation division of the department of transportation within a reasonable time after release for public consideration and comment. Each county, city, and town may obtain technical assistance from the aviation division of the department of transportation to develop plans and regulations consistent with this section.”

The Puget Sound Regional Council (PSRC) published its Airport Compatible Land Use Program Update in late 2011. The PSRC program works “with local planning staff to help them meet their mandates under RCW 36.70.547, RCW 36.70A.510 and regional policy.” To meet the goals of the program, PSRC provides local member agencies with technical guidance materials, in coordination with the WSDOT Aviation Division, and an internal process for reviewing their plans.

According to the Land Use Plan presented in the 2006 Gig Harbor Community Plan Update, the Tacoma Narrows Airport land use designation is Essential Public Facility/Rural Airport. Exhibit 1C is an excerpt from the Community Plan Update that presents a color-coded depiction of the land use plan including the Airport. The land use immediately surrounding the Airport is designated as Rural Airport Overlay. The Gig Harbor Urban Growth Boundary is to the north of the airport.
In February 2012, a new residential subdivision—Eagles Ridge—sought a land use approval decision from Pierce County to commence development. Among other provisions, the Pierce County Hearing Examiner and County Council imposed a detailed avigation easement on the property’s development to address land use compatibility issues of a subdivision within close proximity to the Airport. The avigation easement will be an integral component of all future land use decisions within the Rural Airport Overlay.

**FINANCIAL INVENTORY**

In the last four years since Pierce County purchased the Airport, revenues have averaged $729,000 with expenses averaging $691,000. However, expenses have exceeded revenues in the last few years as Pierce County has funded some much-needed maintenance.

Separate from operational revenues, the County receives grant funding to support capital improvements from the Airport. The Airport Improvement Program (AIP) is the funding source that is administered by the FAA. In the last four years, Pierce County has received an estimated $5.2 million from the FAA for airport improvements.

**RATES AND CHARGES**

The County’s rate and fee structure for 2013 includes hangar rental and tiedowns. The County does not charge landing fees.

Hangars are typically referred to as T-hangars or conventional hangars. However, conventional hangars may cover a wide variety of types/sizes with varying references when identifying them for rental purposes. Smaller conventional hangars may hold one aircraft while larger community hangars may store several aircraft.

Rates quoted below are further subject to a 12.84% Washington State Leasehold Tax.

**T-hangars**

Monthly rent for T-hangar space at Tacoma Narrows is $336.45, but T-hangars with office space are 12% higher with a rent of $377.77.

**Conventional hangars**

Conventional hangars rented at the Airport include various hangar types/size. A conventional hangar with dimensions of 65 by 65 feet is rented monthly for $1,593.76 while one with office space and a bathroom is rented for 30% more at $2,065.97. A smaller conventional hangar with dimensions of 60 by 60 feet is rented for $900.76 monthly.
Quad hangars are also available at the Airport, which refers to a single hangar with four units. The Airport rents these units for $383.68 per month.

Aircraft storage space is also rented in two community hangars. Each has some internal walls, but one has 40-foot doors and the other has 50-foot doors. Aircraft storage space within the 40-foot door hangar rents for $247.39 monthly. The 50-foot door hangar includes a shared bathroom with rental rates as follows:

- Hangar space - $289.23
- Hangar space with office - $413.19
- Hangar space with storage - $354.16

**Tiedowns**

The monthly tiedown rate at Tacoma Narrows is $49.60 for based aircraft, which are located on the north apron. The County charges $5 per night for transient aircraft tiedown space located adjacent to the ATCT.

**Economic Impact**

Completed in 2012 (with 2010 data), the WSDOT Economic Impact Study for airports in the Washington State Airport System calculated each airport’s economic impact by reviewing economic activity directly tied to the Airport, such as jobs and visitors. A multiplier is applied to this activity to estimate indirect/induced impacts, which represent dollars re-spent in the local economy; these dollars are a portion of the Airport wages and the business and visitor spending. For Tacoma Narrows Airport, the following estimated regional economic impacts were presented for airport businesses and visitor spending:

**Airport businesses**

- 26 direct jobs, 14 indirect jobs
- $1.5 million labor income paid to direct jobs; $574,000 indirect
- $2.3 million direct output (estimated visitor spending that remains in the state); $1.6 million indirect

**Visitor Spending**

- $1.473 million total estimated visitor spending
- 15 direct jobs, 7 indirect jobs
- $422,000 labor income paid to direct jobs; $346,000 indirect
- $1.2 million direct output (estimated visitor spending that remains in the state); $1.1 million indirect
Chapter Two

FORECASTS

Forecasting aviation demand helps determine the size and timing of needed airport improvements. This chapter indicates the types and levels of aviation activity expected at the Tacoma Narrows Airport (Airport) during a 20-year forecast period. Projections of aviation activity for the Airport were prepared for the following timeframes:

- Near-term (2017)
- Mid-term (2022)
- Long-term (2032)

The primary objective of forecasting is to define the magnitude of change that can be expected over time. Because of the cyclical nature of the economy, it is impossible to predict with certainty year-to-year fluctuations in activity when looking 20 years into the future. However, a trend can be established that characterizes long-term potential. While a single line expresses the anticipated growth for each element of aviation activity, actual growth may fluctuate above and
Forecasts serve only as guidelines, and planning must remain flexible to respond to unforeseen changes in aviation activity and resultant facility needs.

This chapter presents forecasts for the following components of aviation activity:

- **Based Aircraft, Including Fleet Mix.** The number and type of aircraft based at the Airport helps determine the future aircraft hangar, apron, and auto parking facility requirements. Fleet Mix refers to the distribution of aircraft by type.

- **Aircraft Operations, Including Annual, Peak, Local vs. Itinerant, and Fleet Mix.** An operation is defined as an aircraft either landing or taking off (i.e., an aircraft landing then taking off counts as two operations). Local operations are touch-and-go and other training operations that stay near the airport. Itinerant operations are those arriving from outside the traffic pattern or those that depart the airport traffic pattern. Commercial (air taxi), general aviation, and military aircraft operations are included. The operations forecast helps in analyzing runway capacity and determining runway, taxiway, and navigational aid requirements.

- **Critical Aircraft and Airport Reference Code.** The critical, or design, aircraft is derived from the operational fleet mix. The critical aircraft and its airport reference code determine many airfield design requirements, such as runway and taxiway size and pavement strength, and safety clearances around aircraft movement areas.

The forecasts presented in this chapter are consistent with the Airport’s role as defined by the Washington State Aviation System Plan. That role is a Regional Service Airport, which is one that typically serves the general aviation needs of multiple communities and can accommodate high aviation activity levels. In further describing the Regional Service Airports, the Washington State Aviation System Plan says, “their ability to accommodate jet traffic and larger general aviation aircraft makes them vital assets for regional economic development and quality of life.” The Tacoma Narrows Airport is one of 18 airports with this role in the state.

**TRENDS AFFECTING AVIATION**

This section describes trends in national, state, and local general aviation activity as well as area socioeconomic trends—all of which may influence activity at the Tacoma Narrows Airport.

**NATIONAL AVIATION TRENDS**

General aviation (GA) refers to a wide range of flight activity and, by general definition, is all activity that is not commercial airline or military. GA aircraft are also widely varied, although the majority of general aviation aircraft are piston-powered, fixed wing airplanes. Table 2A shows the nationwide distribution of general aviation aircraft by type and hours flown. Not surprisingly, higher performance, more expensive airplanes were flown more hours than piston airplanes. Exhibit 2A illustrates the variation in the fleet mix versus hours flown.
### Table 2A. U.S. GA and Air Taxi Active Fleet and Hours Flown

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<th>Aircraft Type</th>
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<th>Hours Flown</th>
<th>% Hours Flown</th>
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<td><strong>183,760</strong></td>
<td><strong>100%</strong></td>
<td><strong>22,853,505</strong></td>
<td><strong>100%</strong></td>
<td><strong>124.4</strong></td>
</tr>
<tr>
<td>Experimental</td>
<td>24,410</td>
<td>66.1%</td>
<td>1,232,253</td>
<td>70.6%</td>
<td>50.5</td>
</tr>
<tr>
<td>Sport Aircraft</td>
<td>6,825</td>
<td>18.5%</td>
<td>330,816</td>
<td>19.0%</td>
<td>48.5</td>
</tr>
<tr>
<td>Other</td>
<td>5,675</td>
<td>15.4%</td>
<td>182,058</td>
<td>10.4%</td>
<td>32.1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>36,910</strong></td>
<td><strong>100%</strong></td>
<td><strong>1,745,127</strong></td>
<td><strong>100%</strong></td>
<td><strong>47.3</strong></td>
</tr>
</tbody>
</table>

*Source: FAA Aerospace Forecast 2013-2033, (dated Mar2013); figures are 2012 estimates. SE=single engine, ME=multi-engine*

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### Exhibit 2A. Comparison of U.S. GA and Air Taxi Active Fleet versus Hours Flown

The business aviation segment of General Aviation (GA) grew rapidly in the 1990s and into the first part of the 21st century. While aircraft used for business tend to be larger and faster than those limited to personal use, business use of GA aircraft ranges from small, single-engine aircraft rentals to multiple aircraft corporate fleets supported by dedicated flight crews and mechanics. After September 11, 2001, business aviation benefited from airline service problems—the additional airline passenger and baggage security imposed and reductions in air service, particularly to smaller communities. Until 2008, business aviation grew rapidly as various
chartering, leasing, time-sharing, fractional ownership, interchange agreements, partnerships and management contracts emerged.

With an economic recession that officially began in late 2007, GA activity saw declines in 2008 and 2009. Speculator-driven soaring fuel prices in mid-2008 also contributed to the decline. Post-recession recovery of GA traffic has been slow—evident by the continuing decline in GA aircraft manufacturing in 2010 and 2011.

The recession affected all aspects of GA such as recreational activity, flight training, aircraft production, number of pilots and the hours aircraft were flown. The harm to the development of new aviation technology and businesses is exemplified by the Eclipse/DayJet story. Eclipse Aviation was the leading developer and manufacturer of a new aircraft type, the Very Light Jet (VLJ). The VLJ is a small, low-cost jet capable of using short runways and offering the speed and comfort of high-altitude jet flight. Eclipse was the first to deliver a VLJ in late 2006. DayJet, operating a fleet of Eclipse aircraft in the Southeastern U.S., employed a unique air taxi business model—“per seat, on-demand”—that was a radical change from the tradition of a single customer chartering a whole aircraft. DayJet ceased operating in September 2008, blaming the tight credit market for its demise. After producing 260 VLJs, Eclipse Aviation declared bankruptcy in November 2008. Fortunately, a new company, Eclipse Aerospace, purchased Eclipse Aviation’s assets, restarted production in June 2012, and is anticipating its first delivery in the third quarter of 2013, according to www.eclipse.aero.

The General Aviation Manufacturers Association (GAMA) reported that in 2012 worldwide shipments for general aviation airplanes increased for a second year in a row following a three-year decline. However, the increase is attributed to increased shipments in turboprops and single engine piston aircraft shipments while business jets saw a 3.4% decrease. Consequently, general aviation billings saw a slight 1% decrease due to the type of aircraft that made up the growth in shipments.

In the first quarter of 2013, optimism is returning as total airplane shipments are up 9.6% over the first quarter of 2012, with growth in all segments: piston (3.8%), turboprops (26%), and business jets (4.0%). According to Honeywell’s Business Aviation Outlook, an average annual growth rate of three to four percent is anticipated from 2012 to 2022. After surveying more than 1,500 flight departments around the world, Honeywell indicated that 30% of operators have plans to purchase a new business jet as a replacement aircraft or new addition within the next five years.

GA flying has also seen a slow in the declining trend with the most recent activity indicators showing flat or modest growth. While GA operations at air traffic control towers showed a declining trend in the last few years, GA operations for 2012 increased by 0.6%. The FAA estimates that the active general aviation fleet decreased by 1.2% in 2011, and then remained

---

1 Fractional aircraft ownership is somewhat similar to real estate time-sharing.
unchanged in 2012. General aviation flight hours also saw an estimated decrease in 2011 and then flat growth in 2012. A long-term declining trend in the number of student pilots reversed in 2010, with a 64.8% increase, which was largely due to the FAA’s issuance of a rule increasing the duration of certificates for student pilots under age 40. Two years later, 2012 figures reveal that student pilots increased 1.1% over 2011.

According to FAA Aerospace Forecasts Fiscal Years 2013-2033, published in March 2013, the FAA noted that the timing and strength of a recovery in aviation demand remains highly uncertain as the operational environment continues to evolve. Still, the long-term outlook remains favorable. The FAA predicts business aviation will continue to show stronger growth than the personal and recreational aviation segments as businesses consider factors such as possible commercial airline flight delays, and safety and security issues. The number of active general aviation and air taxi aircraft is projected to grow 0.5% annually over the next two decades. Annual growth rates vary by type of aircraft and the FAA projects that the more expensive and sophisticated turbine-powered fleet (including helicopters) will grow at an average of 2.8% annually over the next two decades; of that fleet, the turbine jets will see the strongest growth of 3.5% annually. In contrast, the piston-powered aircraft fleet is projected to decrease at 0.2% annually.

As the active aircraft fleet grows, the number of general aviation hours flown is projected to increase at 1.5% per year for the same timeframe (2033), which is a more conservative growth rate than the 2.2% that the FAA projected just a couple of years ago. FAA annual growth rate projections vary for hours flown, from a declining rate of -0.2% for piston aircraft, to a high growth of 4.3% for jet aircraft.

The industry continues to point out that promising technological developments coupled with the economic recovery will slow past declines and support positive growth trends.

One of the emerging and much anticipated technological advancements is NextGen—short for Next Generation. NextGen, a national initiative, is anticipated to modernize aviation and is already being implemented by airlines and at large air carrier airports. NextGen is transitioning our air traffic management from a ground-based system to a satellite-based system—Global Positioning System (GPS). In May 2013, the Puget Sound Regional Council published Preparing Busy General Aviation Airports for Next Generation Technologies, which provides a current look at emerging aviation technologies that will benefit airports like Tacoma Narrows.

The basic benefits of NextGen are increased airspace capacity (reduced congestion), enhanced safety and economic benefits. The economic benefit could make doing business in GA airport communities more attractive as it will handle a wide range of aircraft types and eliminate the need for costly instrument landing equipment. The Wide Area Augmentation System (WAAS) available for the last decade augments GPS to provide more precise navigational guidance. This is anticipated to provide a continued positive growth trend in business aviation activity.

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2 An active aircraft is one that has a current registration and was flown at least one hour during the calendar year.
As trends shift, and often in unpredictable ways, the FAA cautions its forecasts depend on many unknown factors. Some of these factors include the national and world economies, U.S. unemployment, price of oil, and national fiscal issues.

**STATE AND LOCAL AVIATION TRENDS**

The primary source for discussion of state and local aviation trends is the Long-term Air Transportation Study (LATS) published in July 2009, as part of the Washington Aviation System Plan, and local aviation activity information and data. The LATS was conducted from 2006 to 2009, with base year data taken from 2005.

According to the LATS, there are 138 airports in the state airport system with an estimated 8,100 based aircraft (2005). For comparison, the aircraft registry shows 11,038 aircraft registered in the state of Washington. However, the number of aircraft registered can often differ from based aircraft counts, particularly if many of the aircraft are inactive, stored at private airfields, or spend the majority of time at airports outside the state. The LATS projected that statewide based aircraft would grow an estimated 1.49% yearly to 9,700 by 2015, and 11,800 by 2030. For the same timeframe, GA operations are projected to grow from 3.0 million (2005) to 4.4 million total operations—an estimated 1.60% yearly, which is slightly above the based aircraft growth rate.

In 2005, the Tacoma Narrows Airport accounted for an estimated 2.4% of total based aircraft and 3.1% of total GA operations in the state airport system.

The FAA Terminal Area Forecast (TAF)—for airports in the federal airport system like Tacoma Narrows—is projecting an increase in based aircraft in the state at an average annual growth rate of 0.9%, less aggressive than the 1.49% growth rates that LATS projected. However, the FAA projections are more recent and considered the economic recession. According to the estimated GA operations reported in the FAA TAF, operations declined in Washington from 2008 to 2011, but the FAA is projecting growth in operations over the next two decades ranging from 0.7% to 0.9%—also more conservative than the 1.6% growth projected in the LATS.

According to the Puget Sound Regional Council (PSRC) Airport System Plan (2001), three of the busiest GA airports in the region—Boeing Field, Paine Field, and Renton Municipal Airport—provide “…infrastructure that directly supports the Boeing Company’s manufacture, testing, certification, and customer delivery of its passenger and cargo jet aircraft.” The region’s GA airports also support a multitude of other aviation activity such as business, aerial surveying and photography, agricultural spraying (rural areas), media (traffic and news reporting), community airshows and aviation education, all levels of flight training, personal, recreational, military, law enforcement, firefighting, medical evacuation, and other disaster response staging.
While airports with an Air Traffic Control Tower (ATCT) like Tacoma Narrows Airport have easy access to aviation activity data and can monitor changes, fuel sales records also provide a measure in aviation activity. This may become more important to Pierce County in the near future with the proposed ATCT closure at the Airport. Exhibit 2B shows the aviation gasoline (100LL) and jet fuel (Jet A) levels sold at the Airport in the last four years—Pierce County’s available records since purchasing the Airport from the City of Tacoma.

Not surprisingly, total fuel flowage decreased after the economic recession began. Total airport operations have also decreased. While the majority of airplanes based at Tacoma Narrows Airport use 100LL instead of Jet A, more Jet A is sold than 100LL. Common reasons for this scenario include:

- The transient (visiting) fleet includes more turboprop and turbojet aircraft than the based aircraft fleet.
- Aircraft that use jet fuel tend to be larger and so have greater fuel capacity and they tend to be flown more hours than the piston aircraft that use aviation gasoline, as Table 2A showed.

Exhibit 2B. Historical Fuel Sales at Tacoma Narrows Airport (gallons)

Source: Pierce County Records

Note: Records for separate 100LL and Jet A fuel flowage were limited to 2010-2012. Fuel flowage in 2009 totaled approximately 283,600 gallons (100LL and Jet A percentage split are estimated for 2009).
SOCIOECONOMIC TRENDS

Air transportation use and aircraft ownership typically rise and fall with an airport’s local population and economy. Higher income often relates to higher levels of aircraft ownership, pilots per capita, and aircraft use. Higher income relates to increased use of air transportation for business and more discretionary income for personal aviation use. Consequently, an understanding of the economy around Tacoma Narrows Airport is useful for forecasting aviation demand.

Table 2B shows that over the last 20 years, the populations of Washington, Pierce County and Tacoma have all risen. Also of interest is the fact that adjacent counties such as King, Kitsap, Thurston, and Lewis have grown more than one percent annually over the last two decades with Thurston actually exceeding an average annual growth rate of two percent.

### Table 2B. Historical State, County, and City Population

<table>
<thead>
<tr>
<th></th>
<th>Washington</th>
<th>Pierce County</th>
<th>Tacoma</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>4,866,692</td>
<td>586,203</td>
<td>176,664</td>
</tr>
<tr>
<td>2000</td>
<td>5,894,121</td>
<td>700,820</td>
<td>193,556</td>
</tr>
<tr>
<td>2010</td>
<td>6,724,540</td>
<td>795,225</td>
<td>198,397</td>
</tr>
</tbody>
</table>

Average Annual Growth Rates

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Washington</td>
<td>1.93%</td>
<td>1.33%</td>
<td>1.63%</td>
</tr>
<tr>
<td>Pierce County</td>
<td>1.80%</td>
<td>1.27%</td>
<td>1.54%</td>
</tr>
<tr>
<td>Tacoma</td>
<td>0.92%</td>
<td>0.25%</td>
<td>0.58%</td>
</tr>
</tbody>
</table>

Source: U.S. Census Bureau

Historical income trends for the nation, state and county are presented in Exhibit 2C. As illustrated, Washington State has been above the national per capita personal income (PCPI) level in recent history and Pierce County has exceeded the PCPI for the state.

Economic reports also indicate that while median family income for Washington state grew an average of 2.21% annually from 2000 to 2010, Pierce County exceeded that growth at an annual average of 2.70% for the same decade. Today, Pierce County median family income is an estimated 1.1% higher than the state median family income.
Recovery from the economic recession is also monitored by trends in unemployment. Exhibit 2D illustrates the low unemployment rates in 2008, the jump in unemployment in 2009 to 2010, and the gradual improvement in the last two years.

While reviewing historical socioeconomic trends provides a measure of the region’s economic health in the past, future projections are reviewed to assess support for future aviation growth.
Table 2C depicts population projections for the state and county published by the Washington State Office of Financial Management in 2012.

### Table 2C. Population Projections for State and County

<table>
<thead>
<tr>
<th>Year</th>
<th>Washington</th>
<th>Pierce County</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>6,724,540</td>
<td>795,225</td>
</tr>
<tr>
<td>2020</td>
<td>7,411,977</td>
<td>876,565</td>
</tr>
<tr>
<td>2030</td>
<td>8,154,193</td>
<td>967,601</td>
</tr>
</tbody>
</table>

Average Annual Growth Rates

| 2010-2030 | 0.97% | 0.99% |


As shown above, the state and county population is projected to increase at an average annual rate of 0.97% and 0.99%, respectively. In comparison to the growth projections from 2007 (before the recession), the 2012 published projections are lower. In the 2007 report, both Washington and Pierce County annual growth rates were projected to exceed one percent.

**BASED AIRCRAFT FORECAST**

The FAA Terminal Area Forecast (TAF) maintains records of the numbers and types of aircraft based at the Airport since 1990. Table 2D shows these historical figures. Between 1990 and 2003, aircraft based at the Airport increased from 132 to 200. Since that time, this figure has declined and presently estimated at 132. The accuracy of numbers of based aircraft has improved since the FAA sponsored a nationwide inventory in 2007. In the past, the numbers were estimates updated around every three years. The FAA defines a based aircraft as one that is active—flown at least one hour per year. In the past, inactive aircraft may have been included as based aircraft.
Table 2D. Historical Based Aircraft at Tacoma Narrows Airport

<table>
<thead>
<tr>
<th>Year</th>
<th>Single Engine</th>
<th>Multi-Engine</th>
<th>Jet</th>
<th>Helicopter</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>117</td>
<td>14</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>132</td>
</tr>
<tr>
<td>1991</td>
<td>117</td>
<td>14</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>132</td>
</tr>
<tr>
<td>1992</td>
<td>117</td>
<td>14</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>132</td>
</tr>
<tr>
<td>1993</td>
<td>117</td>
<td>14</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>132</td>
</tr>
<tr>
<td>1994</td>
<td>117</td>
<td>14</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>132</td>
</tr>
<tr>
<td>1995</td>
<td>147</td>
<td>31</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>185</td>
</tr>
<tr>
<td>1996*</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1997</td>
<td>162</td>
<td>31</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>200</td>
</tr>
<tr>
<td>1998</td>
<td>162</td>
<td>31</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>200</td>
</tr>
<tr>
<td>1999</td>
<td>162</td>
<td>31</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>200</td>
</tr>
<tr>
<td>2000</td>
<td>162</td>
<td>31</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>200</td>
</tr>
<tr>
<td>2001</td>
<td>162</td>
<td>31</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>200</td>
</tr>
<tr>
<td>2002</td>
<td>162</td>
<td>31</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>200</td>
</tr>
<tr>
<td>2003</td>
<td>162</td>
<td>31</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>200</td>
</tr>
<tr>
<td>2004</td>
<td>162</td>
<td>31</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>198</td>
</tr>
<tr>
<td>2005</td>
<td>162</td>
<td>31</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>198</td>
</tr>
<tr>
<td>2006</td>
<td>150</td>
<td>10</td>
<td>6</td>
<td>3</td>
<td>0</td>
<td>169</td>
</tr>
<tr>
<td>2007</td>
<td>150</td>
<td>10</td>
<td>6</td>
<td>3</td>
<td>0</td>
<td>169</td>
</tr>
<tr>
<td>2008</td>
<td>124</td>
<td>17</td>
<td>7</td>
<td>8</td>
<td>0</td>
<td>156</td>
</tr>
<tr>
<td>2009</td>
<td>124</td>
<td>17</td>
<td>7</td>
<td>8</td>
<td>0</td>
<td>156</td>
</tr>
<tr>
<td>2010</td>
<td>124</td>
<td>17</td>
<td>7</td>
<td>8</td>
<td>0</td>
<td>156</td>
</tr>
<tr>
<td>2011</td>
<td>108</td>
<td>15</td>
<td>7</td>
<td>8</td>
<td>0</td>
<td>138</td>
</tr>
<tr>
<td>2012</td>
<td>108</td>
<td>15</td>
<td>5</td>
<td>4</td>
<td>0</td>
<td>132</td>
</tr>
</tbody>
</table>

Source: FAA Terminal Area Forecast (TAF), dated 2012, for TIW historical figures 1990-2011; Pierce County provided estimated figures for 2012. *No figures reported for 1996 in TAF.

Using 132 as the existing based aircraft count, various forecasting models are applied. Exhibit 2E graphically illustrates the recent historical numbers of based aircraft, along with the forecast based aircraft from 2013 to 2032. The preferred forecast is the population growth model—descriptions of the forecasting models follow Exhibit 2E.
Exhibit 2E. Based Aircraft Forecast Comparison

**Master Plan 2003.** In the Tacoma Narrows Airport Master Plan published in 2003, the preferred forecast for based aircraft used an average annual growth rate of 2.0%. While the based aircraft count was higher at the time, the existing 132 aircraft count is used for this model. As a result, the based aircraft count by 2032, is projected to reach 196 or an increase of 64 aircraft—the highest increase of the models presented above. It is recognized that the 2003 Plan’s baseline figures are over 10 years old and well before the numerous economic and aviation industry changes that have occurred in recent years.

**State System Plan.** The latest airport system plan projected statewide based aircraft to grow at an average annual rate of 1.49%. This model assumes that the Tacoma Narrows Airport will maintain its current share of the state based aircraft count over the 20-year planning period so the 1.49% growth rate is applied producing a forecast of 177 based aircraft for the 20-year planning period.

**Terminal Area Forecast (TAF).** The FAA’s most recent forecast for the Tacoma Narrows Airport, published in March 2013 used the 2011 based aircraft figure of 138 as the baseline and projected no growth for the Airport over the next 20 years. Consequently, the forecast in the TAF indicates the Airport will remain at 138 based aircraft by 2032.

**U.S. Growth Rate for GA Aircraft.** This forecast model assumed that the number of based aircraft at the Airport would grow at 0.5% per year, which is the growth rate the FAA forecast for GA aircraft, nationwide, in March 2013. While much lower than the 2003 Master Plan and State...
System Plan forecast, this model projects that an additional 14 aircraft will be based at the Airport by 2032, for a total of 146 aircraft.

**Population Growth Rate (Preferred).** The preferred forecast follows the Pierce County population growth rate of 0.99%, which is slightly above the Washington state anticipated growth rate of 0.97%, but below the more aggressive population growth projections for some, but not all, of adjacent counties. Considering the FAA and aviation industry projections published more recently are more conservative than projections a couple of years ago, a growth rate of under one percent is well-aligned with trends and industry expectations. This preferred forecast model results in a based aircraft total of 161 by 2032, which is an increase of 29 aircraft over 2012. This translates to an average of nearly three additional based aircraft every couple of years. In comparison, the 161 based aircraft forecast still remains below the 169 reported in 2007 before the economic recession. Consequently, this forecast model projects that recovery to the highest historical based aircraft figures will be gradual over the 20-year planning period reaching 95% of the pre-recession peak.

In a letter dated February 4, 2014, the FAA approved the based aircraft forecast (Appendix C).

**Table 2E** lists the fleet mix projected for the based aircraft in the next 5-, 10-, and 20-year timeframes.

<table>
<thead>
<tr>
<th>Year</th>
<th>Single Engine</th>
<th>Multi-engine</th>
<th>Jet</th>
<th>Helicopter</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>108</td>
<td>15</td>
<td>5</td>
<td>4</td>
<td>0</td>
<td>132</td>
</tr>
<tr>
<td>2017</td>
<td>114</td>
<td>15</td>
<td>6</td>
<td>4</td>
<td>0</td>
<td>139</td>
</tr>
<tr>
<td>2022</td>
<td>118</td>
<td>16</td>
<td>7</td>
<td>5</td>
<td>0</td>
<td>146</td>
</tr>
<tr>
<td>2032</td>
<td>129</td>
<td>16</td>
<td>10</td>
<td>6</td>
<td>0</td>
<td>161</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Single Engine</th>
<th>Multi-engine</th>
<th>Jet</th>
<th>Helicopter</th>
<th>Other</th>
<th>Total</th>
<th>Fleet Mix</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>82%</td>
<td>11%</td>
<td>4%</td>
<td>3%</td>
<td>0%</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td>82%</td>
<td>11%</td>
<td>4%</td>
<td>3%</td>
<td>0%</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>2022</td>
<td>81%</td>
<td>11%</td>
<td>5%</td>
<td>3%</td>
<td>0%</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>2032</td>
<td>80%</td>
<td>10%</td>
<td>6%</td>
<td>4%</td>
<td>0%</td>
<td>100%</td>
<td></td>
</tr>
</tbody>
</table>

**AIRCRAFT OPERATIONS FORECAST**

**Table 2F** shows the history of aircraft operations at Tacoma Narrows Airport from 1990 to 2012. Similar to based aircraft figures, operations dropped substantially during the recession—from the low 70,000 operations range before the recession to less than 54,000 thereafter. According to ATCT records, 2012 operations total 44,057. However, an estimated 10% of operations are not counted since the ATCT is closed for 12 hours (8 PM to 8AM).
### Table 2F. Historical Aircraft Operations at Tacoma Narrows Airport

<table>
<thead>
<tr>
<th>Year</th>
<th>Air Carrier</th>
<th>Air Taxi &amp; Commuter</th>
<th>GA</th>
<th>Military</th>
<th>Itinerant Total</th>
<th>GA</th>
<th>Military</th>
<th>Local Total</th>
<th>TOTAL Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>0</td>
<td>105</td>
<td>44,693</td>
<td>140</td>
<td>44,938</td>
<td>44,966</td>
<td>24</td>
<td>44,990</td>
<td>89,928</td>
</tr>
<tr>
<td>1991</td>
<td>0</td>
<td>194</td>
<td>54,144</td>
<td>280</td>
<td>54,618</td>
<td>49,220</td>
<td>366</td>
<td>49,586</td>
<td>104,204</td>
</tr>
<tr>
<td>1992</td>
<td>0</td>
<td>91</td>
<td>60,989</td>
<td>261</td>
<td>61,341</td>
<td>55,519</td>
<td>27</td>
<td>55,546</td>
<td>116,887</td>
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<tr>
<td>1993</td>
<td>0</td>
<td>411</td>
<td>54,602</td>
<td>239</td>
<td>55,252</td>
<td>52,751</td>
<td>63</td>
<td>52,814</td>
<td>108,066</td>
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<tr>
<td>1994</td>
<td>0</td>
<td>416</td>
<td>55,310</td>
<td>215</td>
<td>55,941</td>
<td>50,907</td>
<td>32</td>
<td>50,939</td>
<td>106,880</td>
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<td>1995</td>
<td>0</td>
<td>262</td>
<td>52,008</td>
<td>226</td>
<td>52,496</td>
<td>46,710</td>
<td>23</td>
<td>46,733</td>
<td>99,229</td>
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<tr>
<td>1996</td>
<td>0</td>
<td>543</td>
<td>47,732</td>
<td>101</td>
<td>48,376</td>
<td>40,067</td>
<td>14</td>
<td>40,081</td>
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<tr>
<td>1997</td>
<td>0</td>
<td>498</td>
<td>39,860</td>
<td>94</td>
<td>40,452</td>
<td>35,670</td>
<td>30</td>
<td>35,700</td>
<td>76,152</td>
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<tr>
<td>1998</td>
<td>0</td>
<td>1623</td>
<td>49,997</td>
<td>377</td>
<td>51,997</td>
<td>48,203</td>
<td>130</td>
<td>48,333</td>
<td>100,330</td>
</tr>
<tr>
<td>1999</td>
<td>0</td>
<td>2352</td>
<td>45,578</td>
<td>550</td>
<td>48,480</td>
<td>41,130</td>
<td>111</td>
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<td>2000</td>
<td>0</td>
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<td>51,918</td>
<td>474</td>
<td>53,985</td>
<td>46,735</td>
<td>15</td>
<td>46,750</td>
<td>100,735</td>
</tr>
<tr>
<td>2001</td>
<td>0</td>
<td>1457</td>
<td>53,331</td>
<td>524</td>
<td>55,312</td>
<td>46,166</td>
<td>47</td>
<td>46,213</td>
<td>101,525</td>
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<tr>
<td>2002</td>
<td>0</td>
<td>671</td>
<td>45,065</td>
<td>437</td>
<td>46,173</td>
<td>38,166</td>
<td>99</td>
<td>38,715</td>
<td>84,888</td>
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<tr>
<td>2003</td>
<td>0</td>
<td>580</td>
<td>43,255</td>
<td>365</td>
<td>44,200</td>
<td>30,304</td>
<td>29</td>
<td>30,333</td>
<td>74,533</td>
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<td>2004</td>
<td>0</td>
<td>805</td>
<td>45,242</td>
<td>463</td>
<td>46,510</td>
<td>37,255</td>
<td>60</td>
<td>37,315</td>
<td>83,825</td>
</tr>
<tr>
<td>2005</td>
<td>0</td>
<td>1106</td>
<td>51,609</td>
<td>437</td>
<td>53,152</td>
<td>39,957</td>
<td>50</td>
<td>40,007</td>
<td>93,159</td>
</tr>
<tr>
<td>2006</td>
<td>122</td>
<td>1141</td>
<td>42,017</td>
<td>399</td>
<td>43,679</td>
<td>28,306</td>
<td>60</td>
<td>28,366</td>
<td>72,045</td>
</tr>
<tr>
<td>2007</td>
<td>0</td>
<td>1256</td>
<td>36,862</td>
<td>599</td>
<td>38,717</td>
<td>32,850</td>
<td>269</td>
<td>33,119</td>
<td>71,836</td>
</tr>
<tr>
<td>2008</td>
<td>3</td>
<td>1415</td>
<td>33,632</td>
<td>387</td>
<td>35,437</td>
<td>36,466</td>
<td>82</td>
<td>36,548</td>
<td>71,985</td>
</tr>
<tr>
<td>2009</td>
<td>9</td>
<td>838</td>
<td>30,026</td>
<td>460</td>
<td>31,333</td>
<td>22,197</td>
<td>101</td>
<td>22,298</td>
<td>53,631</td>
</tr>
<tr>
<td>2010</td>
<td>0</td>
<td>561</td>
<td>29,031</td>
<td>649</td>
<td>30,241</td>
<td>22,222</td>
<td>158</td>
<td>22,380</td>
<td>52,621</td>
</tr>
<tr>
<td>2011</td>
<td>20</td>
<td>945</td>
<td>30,273</td>
<td>898</td>
<td>32,136</td>
<td>22,628</td>
<td>78</td>
<td>22,706</td>
<td>54,842</td>
</tr>
<tr>
<td>2012</td>
<td>5</td>
<td>701</td>
<td>24,811</td>
<td>861</td>
<td>26,378</td>
<td>17,167</td>
<td>512</td>
<td>17,679</td>
<td>44,057</td>
</tr>
</tbody>
</table>

Source: Federal Aviation Administration Terminal Area Forecast used for 1990-2011 figures; Air Traffic Control Tower operations used for 2012 figures. (Note: These figures exclude an estimated 10% of operations conducted when the ATCT is closed.)

The preferred forecast for operations examined each component of traffic individually, as explained in the following paragraphs.

**Air Carrier Aircraft Operations.** Air carrier aircraft are 60-passenger seat-sized and larger. Table 2F shows that operations by this size aircraft have historically been sporadic. In the last five years, air carrier operations have ranged from zero to 20. The preferred forecast for this segment is consistent with the FAA’s Terminal Area Forecast of no anticipated increase. The air carrier operations figure is inconsequential as it assumes an estimated three air carrier aircraft flying into and out of the Airport each year over the 20-year planning period.
Air Taxi Aircraft Operations. These are primarily passenger/cargo charter or air taxi, fractional jet operations, and air ambulance. IFR records show that several companies used the Tacoma Narrows Airport in 2012 for air taxi service operations. Some examples included AIRPAC, Angel Flight, Bombardier Business Jet Solutions, Citation Shares, and Executive Jet Aviation (aka NetJets). AIRPAC Airlines is a contract cargo operator based out of Seattle’s Boeing Field that typically flies a Piper Seneca in the Tacoma Narrows Airport; AIRPAC states that their customers typically include banks, health labs and courier companies. Angel Flight is an organization that matches patients in need of medical transport who cannot afford it with pilots and companies willing to provide transport as a charitable service. The other air taxi operators mentioned are companies providing fractional jet ownership and/or jet time cards, which a type of an advanced-pay air taxi time card without a contract commitment.

Table 2F shows that annual air taxi operations have ranged from an estimated 100 in the early 1990s, to nearly 2,400 in 1999, with a current total of 701 operations in 2012. While the 2012 figure represents 1.6% of the Airport’s total annual operations, this percentage has also fluctuated over the years reaching 2.6% of total operations in 1999.

Air taxi flights are usually Instrument Flight Rules (IFR). However, air traffic data has reported both IFR and VFR air taxi counts, particularly since pilots sometimes file their IFR flight plans after takeoff or cancel them before landing. The Terminal Area Forecast for Tacoma Narrows Airport projects 0% growth in air taxi operations through 2032, which is similar to the flat to negative decline the FAA projected for commuter/air taxi nationwide. In contrast, the TAF projects air taxi operations for the state of Washington to grow at an average annual rate of 0.86%. Further, the FAA’s national forecast projects GA and Air Taxi hours flown to increase at an average of 1.5% annually. The 1.5% annual growth for air taxi aircraft operations was selected for the preferred forecast. By 2032, air taxi operations are projected to reach 1,039—up from an estimated 771 (701 operations per ATCT records plus 10%) in 2012. This results in moderate growth that remains below historical peak activity in air taxi operations.

GA Aircraft Operations. One method for forecasting aircraft operations at GA airports is to apply a ratio of Operations per Based Aircraft (OPBA) to the based aircraft forecast. For each year in the forecast, operations equal the forecast number of based aircraft multiplied by an OPBA ratio. Some of the operations in an OPBA ratio are by based aircraft and some are by transient, or visiting, aircraft. The FAA has provided the following guidelines for OPBA ratios:³

- 250 OPBA is typical at a rural GA airport with little itinerant traffic
- 350 OPBA is typical at a busier GA airport with more itinerant traffic
- 450 OPBA is typical at a busy reliever airport with a large amount of itinerant traffic.

³ FAA Order 5090.3C, Field Formulation of the National Plan of Integrated Airport Systems (NPIAS).
The average OPBA ratio for GA aircraft operations at Tacoma Narrows Airport from 1990 through 2012 was 505. In the last decade (2003 through 2012)—which included peak activity, the recession, and the recent slow recovery—the average OPBA was 390. The current OPBA is estimated at 350, but as GA continues its slow recovery, the OPBA is expected to increase—not to the 505 average over the last two decades, but to the lower OPBA of 390 average of the most recent decade. This translates to an average annual growth rate of 1.55% for a total of 62,751 GA operations by 2032—90% of the GA operations level from 2007 before the economic recession. In contrast, the TAF projections for GA operations and based aircraft indicate that the Airport’s OPBA will decrease to 308 in the short-term and then slowly increase to 323 over the next two decades—less than the current 2012 OPBA of 350.

As discussed earlier, *FAA Aerospace Forecasts Fiscal Years 2013-2033* projects GA hours flown to grow 1.5% annually, but the drop in piston aircraft and strong increase in jet activity is part of the mix to be considered for individual airport forecasts. The WA Aviation System Plan projected a stronger growth of 1.6%, but this projection occurred prior to the economic recession and the resulting impacts to GA. While population growth has not shown a correlation with GA activity in the past since numerous factors affecting aviation do not affect population, forecast population is still an important consideration to validate aviation growth. With Washington population projections of 0.97% annually and Pierce County projections at 0.99%, this offers another supporting factor for the anticipated recovery in GA.

For over 20 years, the number of GA itinerant operations has exceeded the number of GA local operations. Before the economic recession, GA itinerant operations were an estimated 60% of total GA operations and then decreased. In 2012, the GA itinerant operations increased to 59% of total operations. The preferred forecast assumes the itinerant GA portion will return to 60% of total GA operations with local operations at 40% and remain at this estimated split through the 20-year forecast period.

**Military Aircraft Operations.** In 2012, military operations represented an estimated 3% of total airport operations, but represented a smaller portion in the past and fluctuated over the years. Future military aircraft operations are difficult to predict, and the FAA typically projects no growth or decline in military aircraft operations in its annual Terminal Area Forecasts and national aerospace forecast. For the Tacoma Narrows Airport, the FAA TAF projects a total of 1,389 military operations in 2013 with no change through the planning period. Further, military operations are projected to be 65% itinerant military and 35% local military—a slight variance of the 2012 split of 63% and 37%, respectively.

The preferred forecast for military operations uses the FAA TAF’s zero-growth forecast, but is based on the 2012 estimate of military operations totaling 1,510 operations (ATCT records of 1,373 plus 10% outside of ATCT operating hours).
Preferred Forecast for Total Operations. The preferred forecast for aircraft operations, shown in Table 2G, sums up the individual component forecasts.

Table 2G. Aircraft Operations Forecast for Tacoma Narrows Airport

<table>
<thead>
<tr>
<th>Year</th>
<th>Air Carrier</th>
<th>Air Taxi</th>
<th>GA</th>
<th>Military</th>
<th>Total Itinerant</th>
<th>Civil</th>
<th>Military</th>
<th>Total Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>6</td>
<td>771</td>
<td>27,292</td>
<td>947</td>
<td>29016</td>
<td>18,884</td>
<td>563</td>
<td>48,463</td>
</tr>
<tr>
<td>2017</td>
<td>6</td>
<td>831</td>
<td>29,914</td>
<td>947</td>
<td>31,697</td>
<td>19,942</td>
<td>563</td>
<td>52,203</td>
</tr>
<tr>
<td>2022</td>
<td>6</td>
<td>895</td>
<td>32,298</td>
<td>947</td>
<td>34,146</td>
<td>21,532</td>
<td>563</td>
<td>56,241</td>
</tr>
<tr>
<td>2032</td>
<td>6</td>
<td>1,039</td>
<td>37,651</td>
<td>947</td>
<td>39,642</td>
<td>25,101</td>
<td>563</td>
<td>65,306</td>
</tr>
</tbody>
</table>

Note: 2012 figures are from ATCT records plus 10% for estimated operations when ATCT is closed for 12 hours.

In a letter dated February 4, 2014, the FAA approved the forecast (Appendix C).

OPERATIONS FLEET MIX FORECAST

The Airport’s operations fleet mix is not the same as its based aircraft fleet mix. One reason is that the operations include those by transient aircraft—those based at other airports—as well as operations by aircraft based at the Airport. Another reason is that different aircraft types are typically flown different amounts. Nationally, piston aircraft comprise a much smaller portion of the hours flown than of the active aircraft fleet mix, as shown earlier in Table 2A.

Table 2H presents the estimated current and projected future operations fleet mix for Tacoma Narrows Airport. Consistent with national trends, piston aircraft have a declining share of operations.

Table 2H. Operations Fleet Mix Forecast for Tacoma Narrows Airport

<table>
<thead>
<tr>
<th>Aircraft Type</th>
<th>2012</th>
<th>2017</th>
<th>2022</th>
<th>2032</th>
</tr>
</thead>
<tbody>
<tr>
<td>Piston Fixed Wing</td>
<td>67%</td>
<td>66%</td>
<td>64%</td>
<td>62%</td>
</tr>
<tr>
<td>Turboprop Fixed Wing</td>
<td>24%</td>
<td>24%</td>
<td>25%</td>
<td>26%</td>
</tr>
<tr>
<td>Turbojet Fixed Wing</td>
<td>5%</td>
<td>5%</td>
<td>6%</td>
<td>7%</td>
</tr>
<tr>
<td>Rotorcraft</td>
<td>4%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

PEAK AIRCRAFT OPERATIONS FORECAST

As airport activity fluctuates from month to month, day to day, and hour to hour, airside and landside facilities should be designed to accommodate peak levels of use. Peak demand is usually expressed as “Peak Month” (the month in a calendar year when the highest level of activity...
occurs), “Design Day” (the average daily level of activity during the Peak Month), and “Design Hour” (the busiest hour within the Design Day).

From 2011 and 2012 ATCT records, the peak month at the Airport contains 11% of annual activity. The peak day is calculated by dividing the peak month by 31 days. The design hour is estimated to be 15% of the peak day, consistent with guidance in FAA Advisory Circular 150/5060-5, Airport Capacity and Delay. The peak operations forecast appears in Table 2I.

**Table 2I. Peak Operations Forecast for Tacoma Narrows Airport**

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2017</th>
<th>2022</th>
<th>2032</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Operations</td>
<td>48,463</td>
<td>52,203</td>
<td>56,241</td>
<td>65,306</td>
</tr>
<tr>
<td>Peak Month (11% of Annual)</td>
<td>5,331</td>
<td>5,742</td>
<td>6,187</td>
<td>7,184</td>
</tr>
<tr>
<td>Design Day</td>
<td>172</td>
<td>185</td>
<td>200</td>
<td>232</td>
</tr>
<tr>
<td>Design Hour (15% of Peak Day)</td>
<td>26</td>
<td>28</td>
<td>30</td>
<td>35</td>
</tr>
</tbody>
</table>

While the design day for the Tacoma Narrows Airport shown in Table 2I indicates a range of 172 to 232 operations over the 20-year period, Pierce County’s ongoing efforts to attract special events to the Airport could certainly result in activity much greater than this range of operations. Pierce County is committed to continuing its efforts to attract such special events for community outreach purposes and to generate additional revenue for the region.

**INSTRUMENT OPERATIONS FORECAST**

Forecasting instrument operations helps the FAA plan air traffic control workload. In addition, instrument operations occurring in the design hour can be the limiting factor for an airfield’s capacity, because an airport has a lower capacity for aircraft operations in instrument conditions (poor visibility weather) than when the weather is clear. Based on data for 2012, itinerant operations at the Airport are estimated at 35% IFR (instrument flight rules) and 65% VFR (visual flight rules), but the IFR percentage is anticipated to increase due to anticipated changes in fleet mix (Table 2J). In 2012, 35% of itinerant operations translates to 21% of total operations, which is used to calculate the number of design hour instrument operations.

**Table 2J. Instrument Operations Forecast for Tacoma Narrows Airport**

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2017</th>
<th>2022</th>
<th>2032</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Instrument Operations</td>
<td>10,156</td>
<td>11,094</td>
<td>12,292</td>
<td>15,064</td>
</tr>
<tr>
<td>Percentage of Total Operations</td>
<td>21%</td>
<td>21%</td>
<td>22%</td>
<td>23%</td>
</tr>
<tr>
<td>Design Hour Instrument Operations</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
</tbody>
</table>
CRITICAL AIRCRAFT AND AIRPORT REFERENCE CODE

According to FAA criteria, an airport’s design is based on the characteristics of the critical aircraft, which is the most demanding aircraft that uses the airport “regularly” or “substantially.” The FAA defines regular or substantial use as at least 500 annual itinerant operations. The Airport Reference Code (ARC) is the main criterion for determining applicable FAA airport design standards for dimensions such as runway and shoulder widths; separations of runways, taxiways, and taxilanes; and cleared areas. However, new FAA guidance provides guidance for runway design codes and taxiway design groups, for example, by providing standards to serve different design aircraft on different runways and taxiways.

The Airport Reference Code is defined by the Aircraft Approach Category and the Airplane Design Group of the critical aircraft. The Aircraft Approach Category is determined by the approach speed, or 1.3 times the stall speed of the aircraft in its landing configuration at its maximum landing weight. The letters A, B, C, D, and E represent the Aircraft Approach Category. The Airplane Design Group of the aircraft is based on the wingspan or tail height, and is defined by Roman numerals I, II, III, IV, V and VI. **Table 2K** shows the ARC component definitions and typical aircraft that meet these definitions.

**Table 2K. Airport Reference Code (ARC) Components**

<table>
<thead>
<tr>
<th>Approach Category</th>
<th>Approach Speed</th>
<th>Typical Aircraft</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Less than 91 knots</td>
<td>Cessna 150, 172, 206, Beech Bonanza</td>
</tr>
<tr>
<td>B</td>
<td>91 to 120 knots</td>
<td>King Air, Piper Navajo, Gulfstream I</td>
</tr>
<tr>
<td>C</td>
<td>121 to 140 knots</td>
<td>Boeing 727, 737, Learjet, Challenger</td>
</tr>
<tr>
<td>D</td>
<td>141 to 165 knots</td>
<td>Boeing 747, Gulfstream V</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Airplane Design Group</th>
<th>Wingspan</th>
<th>Typical Aircraft</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Less than 49 feet</td>
<td>King Air, Cessna 150, 172, 206, Gates Learjet, Beech Bonanza</td>
</tr>
<tr>
<td>II</td>
<td>49 to 78 feet</td>
<td>King Air, Super King Air, Cessna Citation, Dassault Falcon, Gulfstream I, Challenger</td>
</tr>
<tr>
<td>III</td>
<td>79 to 117 feet</td>
<td>Boeing 727, 737, DC-3, DC-6, Gulfstream V</td>
</tr>
</tbody>
</table>

Airplane Design Group may be determined by tail height, if more demanding than wingspan:

<table>
<thead>
<tr>
<th>Airplane Design Group</th>
<th>Tail Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Less than 20 feet</td>
</tr>
<tr>
<td>II</td>
<td>20 to 29 feet</td>
</tr>
<tr>
<td>III</td>
<td>30 to 44 feet</td>
</tr>
</tbody>
</table>

Source: FAA AC 150/5300-13A, Airport Design. Notes: 1) The above ARC information represents the Airport’s highest runway design code, which is defined by the above as well as visibility minimums. 2) Aircraft Approach Category E (166 knots or more) and Airplane Design Groups IV, V, and VI (118 feet or more) are not shown.
According to air traffic data for 2012, there were at least 516 jet operations by Approach Category C or D jet aircraft during ATCT operational hours of 8 am to 8 pm. Adding an additional 10% for the remaining 12 hours when the ATCT is closed brings the total to an estimated 568 operations. Of this total, Approach Category C makes up the large majority of the operations (over 97%) while Approach Category D is 2.7%. This is in contrast to the past Approach Category D designation when airport operations were much higher and more than 500 annual operations were conducted by aircraft within Approach Category D.

The same air traffic data reveals that the Airplane Design Group for the Airport is Group II aircraft with wingspans less than 79 feet. Operations by Group III aircraft occurs, but is infrequent.

Consequently, the Airport Reference Code for the Tacoma Narrows Airport is presently C-II. Further, C-II is the forecast ARC for the 20-year planning period according to the aircraft operations fleet mix forecast, which follows aviation industry trends. While increases in Approach Category D and Design Group III operations are anticipated, they are not substantial increases and, therefore, are not anticipated to exceed the 500 annual itinerant operations threshold to change the ARC from C-II.

The current critical aircraft at Tacoma Narrows Airport is the Cessna Citation. The Cessna Citation is a business jet with various models. The ARC for this aircraft is C-II. Many other business jets that use the Airport are also Approach Category C and/or Airplane Design II. In addition to the Cessna Citation, some examples of other business jets that operated at the Airport in 2012 included various Learjet models (B-I to C-I) Bombardier Challenger models (C-II), and Gulfstream models (D-II to D-III). As previously stated, activity by such Approach Category D and Airplane Design Group III is infrequent and does not meet the FAA guidelines to designate the current ARC as anything above C-II. Based on the forecast of operations, aircraft within Approach Category D or Airplane Design Group III will remain at low levels through the planning period supporting the continued ARC designation of C-II as the critical family of aircraft. If D-II operations continue to grow beyond the 2032 planning window of this airport master plan, a return to an ARC of D-II beyond 2032 is possible.
Chapter Three
REQUIREMENTS

The previous chapter provided a forecast of the aviation demand levels that are expected at Tacoma Narrows Airport throughout the 20-year planning period. This chapter will examine the capacity of the existing airport facilities and their adequacy in accommodating the forecast demand. The chapter will identify the need for new facilities and/or existing facilities improvements as well as the activity level at which these facilities and improvements are needed in the near-, mid- and long-term, which corresponds to 2017, 2022, and 2032. It is important that actual improvements are based on demand rather than specific time intervals, since actual airport activity may fall below or accelerate above the forecasts.

The requirements identified in this chapter will provide the framework for identifying possible long-term development concepts for the airport in the next chapter. For comprehensive planning purposes, the needs discussed in this chapter are not limited to those facilities and services that might be funded or provided by the County, State or FAA, but also anticipate facilities and services that private entities might provide.

Table 3A outlines the forecast level of activity associated with the various planning timeframes.
Table 3A. Planning Activity Levels

<table>
<thead>
<tr>
<th>Planning Activity Level</th>
<th>Near-Term</th>
<th>Mid-Term</th>
<th>Long-Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
<td>2017</td>
<td>2022</td>
<td>2032</td>
</tr>
<tr>
<td>Based Aircraft</td>
<td>139</td>
<td>146</td>
<td>161</td>
</tr>
<tr>
<td>Number of operations</td>
<td>52,203</td>
<td>56,241</td>
<td>65,306</td>
</tr>
<tr>
<td>ARC</td>
<td>C-II</td>
<td>C-II</td>
<td>C-II</td>
</tr>
</tbody>
</table>

Source: Chapter 2, Forecasts

EXECUTIVE SUMMARY OF REQUIREMENTS

While a discussion of individual facility needs at the Airport is presented throughout the chapter, this section provides a brief summary of those needs. Many Airport facilities provide sufficient capacity to accommodate demand forecast throughout the planning period. However, a number of facilities will need to be modified or expanded to accommodate future activity, improve the airport’s operational capabilities, and satisfy evolving airfield and building design standards.

The requirements, provided below, are divided into airside and landside requirements.

AIRSIDE REQUIREMENTS

- Airport Runway Design Code (RDC) is currently C-II/2400; the RDC is expected to remain the same for the remainder of the planning period. The Taxiway Design Group (TDG) is 2.
- The airfield operational capacity is more than adequate to accommodate the demand throughout the planning period and beyond.
- Runway 17-35 orientation provides excellent wind coverage.
- Runway length is adequate for small airplanes using the airport. However, the 5,002 feet length is insufficient for the projected growth in the jet operations at the Airport. A runway extension up to 1,000 feet is recommended for the long-term.
- Runway width of 100 feet is adequate to serve the forecast traffic throughout the planning period.
- Taxiway A does not meet the runway to taxiway centerline separation. Relocation of Taxiway A to a distance of 400 feet from the runway is recommended.
- An outer portion of Runway Safety Area (RSA) for Runway 35 does not meet the requirement for RDC C-II due to several factors (terrain drop-off, access road and equipment location). Although the FAA cancelled a project and funding to address the RSA issues, the RSA project may be reconsidered in the future depending on funding and the cost/benefit ratio of the improvement. Trees are located within the runway object free area on the South side of the airport. Trimming of these trees to at or below the RSA elevation is recommended.
• A portion of each Runway Protection Zones for both runway ends extends beyond airport property. These areas should be under the County’s control through an avigation easement or fee simple acquisition.
• All taxiways meet or exceed taxiway width requirements.
• Connecting Taxiway C lines up directly with Taxiway A3 allowing aircraft to taxi from parking apron directly to the runway. Relocation of connector C is recommended.

LANDSIDE REQUIREMENTS

• A total of 5,640 square feet of general aviation terminal space is needed by the end of the planning period (2032), which can be accommodated by FBO facilities and/or a dedicated GA terminal facility.
• The additional based aircraft forecast for the 20 year planning period will require a total of 56,610 square feet of hangar space. With newly constructed hangars and current vacant hangar spaces, these based aircraft will be accommodated.
• Existing tiedowns on the apron areas are more than sufficient for the planning period. However, FBO input suggests additional apron area is needed for circulation in FBO areas.
• Fuel Storage Capacity is sufficient for planning period.
• Airport access and parking spaces are adequate for the planning period.

PLANNING CRITERIA

The planning criteria or planning parameters ensure that any proposed developments or improvements at Tacoma Narrows Airport are in line with the goals and objectives of the national, state, regional, and local air transportation systems, the appropriate aviation industry segments, and the airport sponsor’s vision for the airport and its role.

The planning criteria for the Tacoma Narrows Airport are drawn from various sources that include:

• Federal Aviation Administration (FAA) – FAA design guidelines found in AC 150/5300-13A Airport Design provide the planning criteria, with respect to the current as well as future critical or design aircraft, for the runway, taxiways and apron areas.

• Transportation Security Administration (TSA) – Although TSA does not regulate general aviation airports like Tacoma Narrows, they do provide guidance for security at general aviation airports. The guidelines provided by the TSA are tailored to an airport’s size and risk level.
- **Washington State Aviation System Plan (including the Washington State Long-Term Air Transportation Study)** - Provides a distribution of airports by classification as well as recommendations and direction on how to meet the state’s long term commercial and general aviation needs. This Plan is prepared by Washington State Department of Transportation (WSDOT) Aviation.

- **Regional Airport System Plan (RASP)** – This plan, completed by the Puget Sound Regional Council (PSRC), provides guidance for airports within the context of the four-county Central Puget Sound Region. The Plan “presents a 20-year general aviation airport system improvement program that focuses on maintaining and preserving the existing system combined with strategic investments in system enhancement.”

- **Business Aviation Industry** – The National Business Aviation Association (NBAA) represents the industry and provides recommendations for airports’ facilities and services to accommodate business aviation needs.

- **Pierce County and Airport Users** – Planning Advisory Committee members, other meeting participants and survey respondents provided input specific to the Tacoma Narrows Airport. The local airport community is an important source since its operational issues, community relationships, and future vision for the airport help shape the list of future facility needs.

**AIRPORT ROLE**

The determination of an airport’s role is an important first step in determining the planning criteria. This section will examine the Tacoma Narrows Airport role in the National System as well as in the State System.

The National Plan of Integrated Airport Systems (2013-2017) classifies Tacoma Narrows as a general aviation facility. Further, FAA’s General Aviation Airports: A National Asset, published in May 2012, classifies Tacoma Narrows as one of 467 Regional airports. The report describes the role of Regional airports as “supporting regional economies by connecting communities to statewide and interstate markets.” The report created four new categories of general aviation airports: National, Regional, Local and Basic. Further, the report explains that the existing definitions (i.e. reliever airport, general aviation airport) do not adequately describe the roles of these general aviation airports. For example, the report states that “most airports currently designated as relievers are not primarily engaged in relieving congestion at another airport.” Although the FAA publication acknowledges that “it is difficult to properly convey needs of airports with a single term, it does state that the new classifications are more representative of the airports’ activity and “other data in existing Federal databases.”
Below is a list of Washington State airports previously classified as Commercial Service and Reliever (second column) with their new classification (third column) as provided in FAA’s General Aviation Airports: A National Asset. As shown, only one reliever airport, Paine Field, is classified as a National Airport. All other reliever airports are classified as Regional; the Commercial Service airport of Orcas Island is classified as Local.

<table>
<thead>
<tr>
<th>Airport</th>
<th>Service Level Classification</th>
<th>New FAA Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auburn Municipal</td>
<td>Reliever</td>
<td>Regional</td>
</tr>
<tr>
<td>Orcas Island</td>
<td>Commercial Service</td>
<td>Local</td>
</tr>
<tr>
<td>Paine Field</td>
<td>Reliever</td>
<td>National</td>
</tr>
<tr>
<td>Renton Municipal</td>
<td>Reliever</td>
<td>Regional</td>
</tr>
<tr>
<td>Harvey Field</td>
<td>Reliever</td>
<td>Local</td>
</tr>
<tr>
<td>Tacoma Narrows</td>
<td>General Aviation</td>
<td>Regional</td>
</tr>
</tbody>
</table>

The Washington Aviation System Plan (WASP) and the Washington State Long-Term Air Transportation Study (LATS) classify Tacoma Narrows as a Regional Service Airport. “WSDOT’s goal for providing access to Regional Service Airports is that nearly every Washington resident should be able to reach a “jet-capable” Regional Service or comparable Commercial service Airport within 90 minutes.” Also noteworthy is that all Reliever airports listed above have the same state classification as Tacoma Narrows. In fact, although Tacoma Narrows does not have “Reliever” status, its runway is longer than Auburn Municipal Airport and Harvey Field runways. Additionally, services offered at Tacoma Narrows are at least comparable and in many cases better than those offered at reliever airports (for example, Auburn Municipal Airport does not offer Jet A fuel).

WASP designates a role for each airport within the system, helping to distinguish between the various levels of service and activities associated with each airport across the state. WASP 2009 defined six different roles or classifications for the 138 airports considered in the statewide system. These six classifications are:

- Commercial Service – 16
- Community Service – 23
- Rural Essential – 38
- Regional Service – 19
- Local Service – 33
- Seaplane Bases – 9

WASP recommends a set of performance objectives for the statewide airports. These objectives are divided into five categories: Operational Factors, Planning, Land Use Compatibility Protection, Facilities and Services. The objectives for Operational Factors, Planning, and Land Use Compatibility Protection are the same (where applicable) regardless of the airport’s classification. The performance objectives for Facilities and Services are dependent on the airport’s classification.

---

1 Due to airport closures, the WA statewide system is down to 135 airports in 2013.
Table 3B provides an overview of WASP’s performance objectives for Regional Service Airports and of the existing conditions at Tacoma Narrows Airport. The table focuses on the two categories of Facilities and Services.

Table 3B: Performance Objectives and Existing Conditions

<table>
<thead>
<tr>
<th>Performance Objective</th>
<th>TIW Existing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runway Length</td>
<td>5,000 feet</td>
</tr>
<tr>
<td>Taxiway</td>
<td>Parallel</td>
</tr>
<tr>
<td>Instrument Approach</td>
<td>Lower than ¾ mile Visibility Minimum</td>
</tr>
<tr>
<td>Lighting</td>
<td>Medium Intensity</td>
</tr>
<tr>
<td>Visual Glide Slope Indicators</td>
<td>Must be Provided</td>
</tr>
<tr>
<td>Weather Reporting</td>
<td>AWOS or ASOS</td>
</tr>
<tr>
<td>Fuel Sales</td>
<td>100LL and Jet A</td>
</tr>
<tr>
<td>Maintenance Service</td>
<td>Major</td>
</tr>
</tbody>
</table>

Source: Washington Aviation System Plan, 2009 (WSDOT Aviation), and Airport Inventory

As Table 3B indicates, Tacoma Narrows Airport meets all of the performance objectives provided by WASP Plan for a Regional Service Airport.

To assist airport communities with understanding and serving the needs of the corporate jets, the NBAA also publishes a set of facilities and services to consider. The publication, titled NBAA Airports Handbook, outlines both optimum and acceptable criteria. Examples of optimum criteria include a full taxiway system, approach lighting, high intensity runway lighting, ASOS, full-service FBO, transient hangar space, major aircraft maintenance, and nearby restaurant and hotel/motel. The Tacoma Narrows Airport meets these optimum standards with the exception of the HIRL, but NBAA identifies medium intensity runway lighting and runway end identifier lighting as acceptable facilities, which the Airport provides. The NBAA also identifies a 24-hour Air Traffic Control Tower (ATCT) as optimum, but no ATCT is considered acceptable. As previously mentioned, the ATCT at the Airport is open between the hours of 8 AM and 8 PM and closes during the night hours.

In addition to the published guidance and criteria for facilities and services, it is important to consider the local community’s needs and the airport owner’s vision for the Airport. Pierce County’s general vision for the Airport is to continue to be a convenient alternative to the more congested SeaTac International Airport for general aviation activity including the growing business aviation segment, and to support and promote the community’s economic growth.
AIRSIDE DESIGN STANDARDS

FAA design standards listed in AC 150/5300-13A, Airport Design, guide the planning and development of airside facilities at an airport. This section provides a brief description of some of these design standards contained in 150/5300-13A, and identifies the conditions unique to Tacoma Narrows Airport that influence design recommendations.

The FAA is responsible for the overall safety of civil aviation in the United States and all of the design standards in 150/5300-13A are primarily driven by safety. Other factors that influence the design standards included in the AC are efficiency and utility.

AC 150/5300-13A issued in September 2012 replaced and cancelled AC 150/5300-13, Airport Design, dated September 29, 1989, with changes published through 2012. The changes that affect the safety and efficiency of aviation are constantly evolving as the aviation industry continues its rapid development.

AC 150/5300-13A includes various clarifications and introduces new terms and concepts. This section will provide a brief summary of some of these new concepts and discuss their application to Tacoma Narrows Airport.

DESIGN AIRCRAFT

The design aircraft is the most demanding aircraft that operates or is forecast to operate at the Airport on a “regular” basis (at least 500 annual itinerant operations). The design aircraft may be a specific aircraft or a composite of aircraft characteristics. This is due to the fact that the different characteristics of the design aircraft influence different airside design components. Table 3C provides a summary of the various aircraft characteristics and the design components they influence.
### Table 3C. Aircraft Characteristics and Design Components

<table>
<thead>
<tr>
<th>Aircraft Characteristics</th>
<th>Design Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approach Speed</td>
<td>RSA, ROFA, RPZ, runway width, runway-to-taxiway separation, runway-to-fixed object</td>
</tr>
<tr>
<td>Landing and Takeoff Distance</td>
<td>Runway Length</td>
</tr>
<tr>
<td>Cockpit to Main Gear Length (CMG)</td>
<td>Fillet design, apron area, parking layout</td>
</tr>
<tr>
<td>Outer to Outer Main Gear Width (MGW)</td>
<td>Taxiway width, fillet design</td>
</tr>
<tr>
<td>Wingspan/Tail Height</td>
<td>Taxiway and apron OFA, parking configuration, hangar locations, taxiway-to-taxiway separation, runway to taxiway separation</td>
</tr>
</tbody>
</table>

*Source: FAA AC 150/5300-13A*

### Runway Design Code (RDC)

In addition to the Airport Reference Code (ARC) mentioned in the forecast chapter, AC 150/5300-13A introduced the Runway Design Code (RDC) which is based on planned development and signifies the design standards to which the runway is to be built. The RDC is composed of three components, the Aircraft Approach Category (AAC), the Airplane Design Group (ADG) and visibility minimums.

The first component, AAC, is depicted by a letter (A through E) and relates to the approach speed of the design aircraft. The second component, ADG, is depicted by a Roman numeral (I through VI) and relates to either the aircraft wingspan or tail height (physical characteristics), whichever is most restrictive. The third component relates to runway visibility minimums as expressed in Runway Visual Range (RVR) equipment measurements. RVR-derived values represent feet of forward visibility that have statute mile equivalents (e.g. 2400 RVR = ½-mile). The third component should read “VIS” for runways that are designed for visual approach use only. **Table 3D** provides a summary of the Runway Design Code (RDC) classifications.
### Table 3D. Runway Design Code Classifications

<table>
<thead>
<tr>
<th>Aircraft Approach Category (AAC)</th>
<th>Approach Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Approach Speed less than 91 knots</td>
</tr>
<tr>
<td>B</td>
<td>Approach speed 91 knots or more but less than 121 knots</td>
</tr>
<tr>
<td>C</td>
<td>Approach speed 121 knots or more but less than 141 knots</td>
</tr>
<tr>
<td>D</td>
<td>Approach speed 141 knots or more but less than 166 knots</td>
</tr>
<tr>
<td>E</td>
<td>Approach speed 166 knots or more</td>
</tr>
</tbody>
</table>

#### Airplane Design Group (ADG)

<table>
<thead>
<tr>
<th>Group #</th>
<th>Tail Height (ft)</th>
<th>Wingspan (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>&lt; 20'</td>
<td>&lt; 49'</td>
</tr>
<tr>
<td>II</td>
<td>20’ - &lt; 30’</td>
<td>49’ - &lt; 79’</td>
</tr>
<tr>
<td>III</td>
<td>30’ - &lt; 45’</td>
<td>79’ - &lt; 118’</td>
</tr>
<tr>
<td>IV</td>
<td>45’ - &lt; 60’</td>
<td>118’ - &lt; 171’</td>
</tr>
<tr>
<td>V</td>
<td>60’ - &lt; 66’</td>
<td>171’ - &lt; 214’</td>
</tr>
<tr>
<td>VI</td>
<td>66’ - &lt; 80’</td>
<td>214’ - &lt; 262’</td>
</tr>
</tbody>
</table>

#### Approach Visibility Minimums

<table>
<thead>
<tr>
<th>RVR (ft)</th>
<th>Flight Visibility Category (statute mile)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4000</td>
<td>Lower than 1 mile but not lower than ¾ mile (APV ¼ but &lt; 1 mile)</td>
</tr>
<tr>
<td>2400</td>
<td>Lower than ¾ mile but not lower than ½ mile (CAT-I PA)</td>
</tr>
<tr>
<td>1600</td>
<td>Lower than ½ mile but not lower than ¾ mile (CAT-II PA)</td>
</tr>
<tr>
<td>1200</td>
<td>Lower than ¼ mile (CAT-III PA)</td>
</tr>
</tbody>
</table>

Source: FAA AC 150/5300-13A

### Taxiway Design Group (TDG)

Under former guidance (AC 150/5300-13), taxiway design was based on Airplane Design Groups (ADG). In the updated Advisory Circular AC 150/5300-13A, taxiway design is based on the newly established Taxiway Design Group (TDG), which is based on the overall Main Gear Width (MGW) and the Cockpit to Main Gear (CMG) distance. There are seven (1 through 7) TDG classifications. With respect to Tacoma Narrows Airport, the design aircraft belongs to TDG 2. Aircraft that belong to TDG group 3 do use the airport, although not on a “regular” basis (at least 500 annual itinerant operations).

### Other Design Considerations

Additional design criteria are determined based on aircraft weight and type of approach. A small aircraft is defined in Advisory Circular 150/5300-13A, Airport Design, as “an airplane of 12,500 pounds or less maximum certificated takeoff weight”. An aircraft weighing more than 12,500 pounds is considered a large aircraft. Aircraft weight affects the required Part 77 surfaces and pavement design strength. Part 77 of the Federal Aviation Regulations defines “Objects Affecting
Navigable Airspace” and establishes imaginary surfaces around airfields and approach/departure slopes to and from runways.

**TACOMA NARROWS AIRPORT DESIGN STANDARDS**

As discussed in Chapter 2, forecasts, the current critical aircraft is the Cessna Citation business jet that belongs to the C-II AAC and ADG categories. The previous master plan identified the Airport’s ARC (AAC and ADG) as D-II. Aircraft that belong to an AAC of D and/or an ADG of III do use the airport although their operations are not “regular” and are not expected to cross the 500 operations threshold within the 20-year planning period. It is important to note that if the operations by D-II aircraft continue to grow, a return to an AAC and ADG of D-II is possible beyond the planning period.

Runway 17 has a published instrument approach procedure (ILS) with a visibility minimum of ½ mile. Additionally, both runways have published RNAV (GPS) procedures which have visibility minimums as low as one mile. The Washington Aviation System Plan (WASP) recommends a minimum visibility lower than ¾ mile for Regional Service Airports; the ILS on Runway 17 does meet this recommendation.

Based on the results of the forecast Chapter and the above explanation of the RDC classification, Tacoma Narrows current RDC is C-II/2400. Further, Tacoma Narrows is expected to maintain the same RDC through the 20-year planning period.

Also, as previously mentioned, Tacoma Narrows Taxiway Design Group is 2. This classification affects various taxiway design standards that will be discussed later in the chapter.

**AIRSIDE REQUIREMENTS**

This section of the report will address the requirements of the airside facilities. Airside facilities include all aircraft movement areas such as the runways, taxiways, and aprons.

**AIRSIDE CAPACITY/DEMAND ANALYSIS**

Before the need for improvements and new facilities can be identified, the capacity of the existing facilities must be analyzed and determined. This capacity is then compared to the forecast demand throughout the planning period and deficiencies are determined.

The capacity analysis is based on FAA AC 150/5060-5, Airport Capacity and Delay. Additionally, ACRP Report 79 published by the Transportation Research Board (TRB) in 2012 provides a Prototype Airfield Capacity Spreadsheet Model that is “built on base calculations following the theory in the FAA Airfield Capacity Model (ACM) and applies variable separation, spacing and
clearance standards following the guidelines included in FAA JO 7110.65, Air Traffic Control, and FAA EM-78-8A, Parameters of Future ATC Systems Relating to Airport Capacity/Delay.” The spreadsheet model provided by the TRB was used to calculate the airfield capacity at Tacoma Narrows Airport.

Two measures of airfield capacity are commonly used in airport planning, they are:

- **Hourly capacity**: considers the throughput during a typical busy hour. Factors such as percentage of arrivals, runway crossings, and taxiway exit locations are considered to arrive at an hourly number of aircraft that can use the airfield without undue delays.

- **Annual Service Volume (ASV)**: is an estimate of the number of aircraft operations that can be accommodated in one year. This measure is used to program additional runways, and/or modified taxiway exits.

Generally, planning of capacity improvements starts when an airport reaches 60 percent of its capacity and capacity improvements construction starts at or before the airfield reaching 80 percent of its calculated capacity. It must be mentioned that airfield capacity deficiencies are more common at large commercial service airports. General aviation airports similar to Tacoma Narrows may not even reach 30% of their capacity during the 20-year planning period.

Washington Aviation State Plan (WASP) indicates that the Puget Sound Region, where Tacoma Narrows is located, shows the highest utilization at 36% of the ASV. WASP also lists the airports that are forecast to exceed at least 60% of their capacity by 2030; Tacoma Narrows is not listed as one of these airports.

In calculating the Airport’s ASV, the projections of annual operations by the fleet mix specified in Chapter 2 were used. The analysis considered various factors including airfield layout, meteorological conditions, runway conditions, runway use, aircraft mix, percent arrivals, percent touch-and-go’s, and exit taxiway locations. The demand characteristics that are relevant to calculating airfield capacity are the mix of aircraft types that utilize the airport in the design hour along with the percentage of arrivals and the percentage of touch-and-go operations as well as the percentage of IFR operations. Aircraft types are classified according to size as shown below.

- **Class A**: Small single engine aircraft weighing less than 12,500 pounds
- **Class B**: Small twin-engine aircraft weighing less than 12,500 pounds.
- **Class C**: Aircraft weighing between 12,500 pounds and 300,000 pounds
- **Class D**: Aircraft weighing more than 300,000 pounds

The Annual Service Volume for Tacoma Narrows Airport was calculated at 230,000 operations which is considerably higher than the 65,306 operations expected by 2032.
RUNWAY REQUIREMENTS

Number and Orientation of Runways

The number of runways on an airfield is typically driven by the activity levels and/or the wind coverage. Busy airports often require parallel runways to accommodate their high activity levels while minimizing delays. Tacoma Narrows activity levels, current and forecast, are easily accommodated by a single runway.

The most desirable runway orientation based on wind is one that has the largest wind coverage and the minimum crosswind components. Wind coverage is defined as the percent of time crosswind velocities are below an acceptable velocity. That velocity is determined by the type of aircraft that uses the runway. The crosswind component is the resultant vector of the runway direction and existing wind that acts at a right angle to the runway. FAA Advisory Circular (AC) 150/5300-13A recommends that at least 95 percent crosswind coverage be provided by the runway system (one or more runways) of the airport.

As previously mentioned, the appropriate crosswind component is based on the Airplane Design Group (ADG) component of the RDC. The RDC for Tacoma Narrows was determined to be C-II/2400 and is forecast to stay as such for the remainder of the 20-year planning period. Smaller aircraft (ADG I) do use the airport on a regular basis. Wind speeds were evaluated for Airplane Design Group (ADG) I and ADG II. Aircraft in ADG I have the smallest wingspans and are more susceptible to crosswind conditions. The 95 percent wind coverage is computed on the basis of the crosswind component not exceeding 10.5 knots (12 mph) for AAC and ADG of A-I and B-I; 13 knots (15 mph) for AAC and ADG of A-II and B-II; 16 knots (18 mph) for AAC and ADG of C-I through D-II; and 20 knots for AAC and ADG of A-IV through D-VI.

Wind data obtained from the National Climatic Data Center (NCDC) was extracted from the onsite Automated Surface Observing System (ASOS) at Tacoma Narrows Airport. The FAA requires a minimum of 10 years of wind data to assess whether an airport has at least 95% coverage on the primary runway. Tacoma Narrows’ wind data covers the period from 2000 to 2009.

Based on this all-weather wind analysis for Tacoma Narrows Airport, utilizing the FAA Airport Design Software supplied with AC 150/5300-13A, the existing single runway configuration provides excellent wind coverage (i.e., in excess of 99.59%) for each of the crosswind components (10.5 knots, 13 knots and 16 knots). Therefore, the single-runway airfield is sufficient for wind coverage. Table 3E illustrates the results of the wind analysis. Additionally, Exhibit 3A illustrates the All-weather wind rose for Tacoma Narrows Airport.
Table 3E. Wind Coverage Analysis

<table>
<thead>
<tr>
<th>Crosswind Component (knots)</th>
<th>10.5</th>
<th>13</th>
<th>16</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Weather Wind Coverage (%)</td>
<td>99.59</td>
<td>99.87</td>
<td>99.99</td>
</tr>
</tbody>
</table>

Source: National Oceanic and Atmospheric Administration, National Climatic Data Center, 72793 Tacoma Narrows, WA. Period of Record: 2000-2009

Exhibit 3A. All-Weather Wind Rose Tacoma Narrows Airport

Source: National Oceanic and Atmospheric Administration, National Climate Data Center 72793 Tacoma Narrows, WA. Period of Record: 2000-2009

Runway Length

The runway length requirements for Tacoma Narrows Airport, and for all airports, are influenced by several factors that include the Airport’s elevation, mean maximum daily temperature of the hottest month, runway gradient, critical aircraft and the stage length of the longest nonstop trip destination.

Runway length requirements are determined based on the guidance provided by AC 150/5325-4B, Runway Length Requirements for Airport Design, which specifies the use of the 5-Step procedure for determining runway length requirements for purposes of airport design.
It must be noted that, for small aircraft with a maximum takeoff weights (MTOW) of 12,500 pounds or less and larger aircraft with an MTOW of more than 12,500 pounds (up to and including 60,000 pounds), the use of the runway length curves specified by AC 150/5325-4B generates runway lengths equivalent to those generated using the FAA Airport Design Computer Program.

The airport’s 294 feet elevation above mean sea level (MSL), its 75.4 degrees Fahrenheit (F) mean maximum temperature of the hottest month and its runway ends elevation difference of 6.4 feet were among the variables that were inputted into the FAA’s Airport Design Computer Program. The results of the analysis are illustrated in Table 3F.

The current runway length of 5,002 feet is adequate for small airplanes. The first category of large aircraft runway length requirements listed in Table 3F identifies a length of 4,660 feet for dry conditions and 5,290 feet for wet and slippery conditions, which is adequate for 75% of large aircraft of 60,000 pounds or less, at 60% useful load. At 90% useful load, the required runway length requirement would increase to 5,890 feet for dry conditions and 6,710 feet for wet and slippery conditions.

### Table 3F. Runway Length Requirements

<table>
<thead>
<tr>
<th>Aircraft Category</th>
<th>Required Length (feet)</th>
<th>Dry</th>
<th>Wet</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Small airplanes with less than 10 passenger seats</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75 percent of these small airplanes</td>
<td>2450</td>
<td>2450</td>
<td></td>
</tr>
<tr>
<td>95 percent of these small airplanes</td>
<td>2980</td>
<td>2980</td>
<td></td>
</tr>
<tr>
<td>100 percent of these small airplanes</td>
<td>3550</td>
<td>3550</td>
<td></td>
</tr>
<tr>
<td><strong>Small airplanes with 10 or more passenger seats</strong></td>
<td>4070</td>
<td>4070</td>
<td></td>
</tr>
<tr>
<td><strong>Large airplanes of 60,000 pounds or less</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75 percent of these large airplanes at 60 percent useful load</td>
<td>4660</td>
<td>5290</td>
<td></td>
</tr>
<tr>
<td>75 percent of these large airplanes at 90 percent useful load</td>
<td>5890</td>
<td>6710</td>
<td></td>
</tr>
<tr>
<td>100 percent of these large airplanes at 60 percent useful load</td>
<td>5070</td>
<td>5500</td>
<td></td>
</tr>
<tr>
<td>100 percent of these large airplanes at 90 percent useful load</td>
<td>7320</td>
<td>7320</td>
<td></td>
</tr>
</tbody>
</table>

*Source: FAA Airport Design Software*

Additionally, since the Airport is currently serving business jet traffic and the forecasts project increases in this activity, a sample of business jets and their associated runway length requirements for the Airport is presented in Table 3G.

### Table 3G

Table 3G lists the aircraft from shortest to longest runway required at maximum takeoff weight and 75.4 degrees (mean maximum temperature of the hottest month). Runway 17-35’s 5,002-foot length can accommodate many of the listed aircraft, up through the Mitsubishi MU-300 Diamond at the Airport’s design temperature, but weight restrictions would apply on hotter days when the aircraft’s calculated runway length requirement is above 5,002 feet. Likewise, more aircraft listed in Table 3G can use the Airport at cooler temperatures, less than maximum fuel loads or less than maximum payloads. Longer runway lengths than shown in the table may be
required by company policy or federal regulations covering fractional jet ownership or charter operations.

**Runway Width**

The required runway width is a function of the Runway Design Code (RDC). As previously mentioned, Tacoma Narrows’ RDC is C-II/2400 and is forecast to remain the same through the 20-year planning period.

The required runway width for an RDC of C-II/2400 is 100 feet. Additionally, this runway width requirement is the same for runways where the first two components of the RDC (AAC and ADG) are C-II regardless of the third component (visibility minimum).

The existing runway width is 100 feet. The runway width of 100 feet would be sufficient for aircraft in the D-II category as well. Aircraft with an ADG component of III require a runway width of 150 feet.
Table 3G. Business Jet Runway Length Requirements at Tacoma Narrows (TIW)

<table>
<thead>
<tr>
<th>Business Jets</th>
<th>AAC and ADG</th>
<th>Approach Speed (knots)</th>
<th>Wing Span (ft)</th>
<th>Max. Takeoff Wt (MTOW) (lbs)</th>
<th>Runway Length TIW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cessna 551 Citation II/SP</td>
<td>B-II</td>
<td>108</td>
<td>51.8</td>
<td>12,500</td>
<td>2,997</td>
</tr>
<tr>
<td>Cessna 501 Citation I/SP</td>
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<td>112</td>
<td>46.8</td>
<td>10,600</td>
<td>3,198</td>
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<tr>
<td>Cessna 500 Citation</td>
<td>B-I</td>
<td>108</td>
<td>47.1</td>
<td>11,850</td>
<td>3,309</td>
</tr>
<tr>
<td>Cessna 550 Citation II</td>
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<td>108</td>
<td>51.7</td>
<td>13,300</td>
<td>3,376</td>
</tr>
<tr>
<td>Cessna 525 Citation II</td>
<td>B-I</td>
<td>107</td>
<td>46.7</td>
<td>10,400</td>
<td>3,476</td>
</tr>
<tr>
<td>Cessna 552/T-47A</td>
<td>B-II</td>
<td>107</td>
<td>52.2</td>
<td>16,300</td>
<td>3,588</td>
</tr>
<tr>
<td>Cessna 560 Citation V Ultra</td>
<td>B-II</td>
<td>108</td>
<td>52.2</td>
<td>16,300</td>
<td>3,588</td>
</tr>
<tr>
<td>Learjet 31</td>
<td>C-I</td>
<td>124</td>
<td>43.1</td>
<td>16,500</td>
<td>3,845</td>
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<tr>
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<td>B-II</td>
<td>118</td>
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<td>Sabreliner 60</td>
<td>C-I</td>
<td>134</td>
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</tr>
<tr>
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</tr>
<tr>
<td>Cessna 560 Citation Excel</td>
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<tr>
<td>Raytheon 390 Premier</td>
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<td>44</td>
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<tr>
<td>Learjet 23</td>
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<td>BeechJet 400A/T/ T-1A Jayhawk</td>
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<tr>
<td>Learjet 45</td>
<td>C-I</td>
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<td>Mitsubishi MU-300 Diamond</td>
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<td>16,400</td>
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<td>Dassault Falcon 900</td>
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<tr>
<td>Dassault Falcon 50</td>
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<td>61.9</td>
<td>37,480</td>
<td>5,301</td>
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<tr>
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<td>Learjet 35/36</td>
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<tr>
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<tr>
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<td>63.5</td>
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<tr>
<td>Learjet 60</td>
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<td>6,020</td>
</tr>
<tr>
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<td>120</td>
<td>51.3</td>
<td>28,000</td>
<td>6,043</td>
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<tr>
<td>Gulfstream IV</td>
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<td>77.8</td>
<td>71,780</td>
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<td>Sabreliner 65</td>
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<td>Sabreliner 75</td>
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<td>137</td>
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<td>Galaxy 1126</td>
<td>C-II</td>
<td>140</td>
<td>58.2</td>
<td>34,850</td>
<td>6,177</td>
</tr>
<tr>
<td>Bombardier CL-600/601 Challenger</td>
<td>C-II</td>
<td>125</td>
<td>61.8</td>
<td>41,250</td>
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</tr>
<tr>
<td>Gulfstream V</td>
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<td>NA</td>
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<tr>
<td>Bombardier BD-700 Global Express</td>
<td>C-III</td>
<td>126</td>
<td>94</td>
<td>96,000</td>
<td>6,400</td>
</tr>
</tbody>
</table>

Source: Runway lengths derived from Airport NEWS, October 2001, FAA Central Region, which includes business jets modeled for standard conditions. Standard conditions were corrected for TIW conditions.
Other Runway Design Standards

Several additional design standards outlined by the FAA should be considered in the planning and design of airports. These include:

Runway to Parallel Taxiway Separation: The purpose of the runway to taxiway separation standard is to provide adequate wingtip clearance. Tacoma Narrows does have a full-length parallel taxiway, designated as Taxiway A, at a 350-foot runway to taxiway centerline separation. For an RDC of C-II/2400, the recommended runway to taxiway separation is 400 feet. The existing 350 feet separation does not meet the requirement. This means that some new approaches associated with the NextGen technology, such as the Required Navigation Performance (RNP) approach cannot be written unless the standard 400-foot separation standard is met.

Runway Safety Area: The identification of the existing and future RSA at an airport is important to ensure the RSA is located on airport property and is properly cleared and graded to comply with FAA standards. RSA’s are of particular importance to the FAA and receive high priority funding since they enhance the safety of aircraft that overshoot, undershoot or veer off the runway. The RSA also helps firefighting and rescue equipment to reach aircraft accidents. The RSA is a cleared and graded area centered about the runway centerline. The dimensions of the RSA are determined by the aircraft type and approach visibility minimums; The RSA runs the full length of the runway plus an extended distance beyond each runway end. Based on the RDC of C-II/2400, a RSA that is 500 feet wide and extends 1,000 feet beyond runway ends is required. The RSA for Runway 17 does meet this requirement, as a result of the Runway 17 Safety Area project completed in 2011. This project included the construction of a tunnel for Stone Drive. There is an access road within the Runway 17 Safety Area, but it is restricted access tower clearance required.

The RSA for Runway 35 does not meet the RSA requirement, due to a steep terrain drop-off, an access road within the safety area boundary, and a localizer shack, Antenna, and utility transformer located within the RSA. To bring the RSA into compliance, the County started a project in 2010, but the FAA cancelled the project due to the high cost to low benefit ratio. The RSA project may be reconsidered in the future depending on funding and the future cost/benefit of the improvement as activity at the Airport grows. Despite the project cancellation, only a small portion of the RSA is not in compliance. A modification to standards request should be submitted.

Runway Object Free Area (OFA): Like the RSA, the OFA is centered on the runway centerline, extends beyond the runway ends, and is determined by the design aircraft type and approach visibility minimums. The OFA is wider than the RSA (800 feet wide required for Tacoma Narrows) but it is the same length. The ROFA must remain clear of objects at the RSA elevation, but does not have a grading requirement. There are trees located within the OFA on the southwest side of the airport. Some of the trees are above the RSA elevation, so the OFA does not meet standards. The OFA surface off the north end meets the design standard.
**Runway Protection Zone (RPZ):** The purpose of the RPZ is enhancing the protection of people and property on the ground. The RPZ is a trapezoidal area centered about the extended runway centerline and beginning 200 feet from the runway end. Pierce County should have full control of the RPZ through fee simple ownership and/or easements, but there are small portions outside of the County’s control—these should be acquired. Three parcels to be acquired within the RPZ for Runway 17 are located to the northwest across Point Fosdick Drive. All objects should be clear of the RPZ but limited uses are permitted.

**Obstacle Free Zone (OFZ):** The runway OFZ is airspace centered on the runway centerline and extending 200 feet beyond each runway end. It is a three dimensional volume of airspace which protects for the transition of aircraft to and from the runway. The OFZ clearing standard precludes taxiing and parked airplanes and object penetrations, except for frangible NAVAID locations that are fixed by function. Additionally, vehicles, equipment, and personnel may be authorized by air traffic control to enter the area using the provisions of FAAO JO 7110.65, Para 3-1-5, VEHICLES/EQUIPMENT/PERSOONNEL ON RUNWAYS. The runway OFZ and the inner-approach OFZ, and, when applicable, the inner-transitional OFZ, comprise the OFZ. The OFZ for Tacoma Narrows Runway is 400 feet wide.

**Inner Approach OFZ:** For runways with an approach lighting system, an Inner-approach OFZ is required. The Inner-approach OFZ is airspace centered on the approach area at the same width as the Runway OFZ, beginning at 200 feet from the runway end, and extending at a 50:1 slope out 200 feet past the light unit in the approach lighting system, as outlined in FAA AC 150/5300-13A. An Inner-transitional Approach OFZ is only required for precision instrument approach runways with less than ¾-mile visibility and is located along the sides of the Runway OFZ and Inner-approach OFZ.

**Threshold Siting Surface:** The Threshold Siting Surface (TSS) is utilized to locate runway threshold in order to meet approach obstacle clearance requirements. The dimensions of TSS vary with the type of aircraft operations, the approach visibility minimums, and the types of navigational instrumentation. For Runway 17-35, the starting point and the clearance slope are different for each runway. The following describes the TSS for each runway in accordance with FAA AC 150/5300-13A (Para. 303).

- For Runway 17, the threshold siting surface starts 200 feet from the approach end of the runway at 800 feet wide, and extends out at a 34:1 obstacle clearance scope for 10,000 feet where its ultimate width is 3,800 feet wide.

- For Runway 35, the threshold siting surface starts at the approach end of the runway at 400 feet wide and extends out at a 20:1 obstacle clearance scope for 10,000 feet where its ultimate width is 1,000 feet wide.
**Surface Gradient:** The maximum allowable longitudinal grade on the existing runways is 1.5%, which is associated with Aircraft Approach Category C and D. Based on the recently completed runway rehabilitation project, maximum longitudinal grade on the runway is 0.5%, well below the grading threshold.

**GRASS STRIP**

In the early stages of the planning process, airport users identified several issues to address in the Master Plan including a possible grass strip on the west side of the airfield to better serve the broad range of aviation activity in the community. These grass strips are often used by gliders, ultralights, or taildraggers. The subsequent development alternatives element will look at a possible location. The grass strip/turf runway location must satisfy FAA design standards, as outlined in this chapter, to ensure airfield operations are conducted in a safe and effective manner.

**HELICOPTER FACILITIES**

Helicopter operations currently represent an estimated 4% of total airport operations, which is nearly 1,938 annual operations. Helicopter operations are forecast to represent 5% of the total operations (3,266 operations) by 2032. There is no officially designated helipad or heliport on the airfield so helicopters may arrive on a runway approach and hover-taxi to the apron for parking. There is an unofficial training helipad on the west side of the runway. Although rotor wash damage has not affected fixed wing aircraft in the past and due to the high current and forecast levels of helicopter activity, providing a separate helicopter area should be considered to minimize interaction with fixed-wing aircraft.

**TAXIWAYS**

The primary function of taxiways is to facilitate aircraft movements to and from the runway system. While some taxiways are simply necessary to provide access between the aprons and runways, others are necessary, as activity increases, to provide for the safe and efficient use of the airfield.

As detailed in Chapter One, Draft Inventory, Tacoma Narrows’ taxiway system consists of a full-length parallel taxiway, designated as Taxiway A, at a 350-foot runway to taxiway centerline separation. The parallel taxiway is 75 feet wide and provides four connecting taxiways to the runway, designated as Taxiways A1, A2, A3 and A4. The four connecting taxiways are 50 feet wide. However, Taxiway A4 includes a hold apron, which widens up to 155 feet wide.

The western portion of the apron is designated as Taxiway B, between the north end of the apron and extending to the south. There are also four connecting taxiways between the apron areas.
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Requirements

and parallel Taxiway A. The apron to Taxiway A connectors are designated as B1, B2, B3, and C, from north to south; Taxiway C is 50 feet wide while others are 75 feet wide.

FAA guidance recommends that connecting taxiways be offset rather than provide a direct line access from the apron to the runway. Taxiway C and A3 are aligned so this configuration should be modified.

Taxiway width is a function of the newly established Taxiway Design Group. As previously mentioned, all taxiways at Tacoma Narrows belong to TDG 2. The required width for TDG 2 is 35 feet. TDG 3 and 4 require a taxiway width of 50 feet.

All taxiways at TIW meet or exceed the width requirements for TDG 2. As part of the recent pavement rehabilitation project, Pierce County reviewed taxiway width needs. The County elected to keep the connector taxiways at 50 feet wide in lieu of reducing them to the minimum standard of 35 feet. Since the additional 15 feet of pavement was not eligible for federal funding, the County paid for the additional pavement width.

As previously mentioned, the 350-foot separation between the runway and Taxiway A centerline is short of the 400-foot separation required for RDC C-II/2400. The relocation of Taxiway A to comply with the 400 feet separation requirement is needed.

Taxiway and taxilane object free area (TOFA) are a function of the design aircraft ADG. Taxiways accommodating ADG II aircraft require 131 feet (65.5 feet on either side of the centerline) while taxilanes serving ADG II aircraft require 115 feet (57.5 feet on either side of centerline) for object free area clearance. All taxiways and taxilanes at the Airport meet the TOFA standards as described above.

APRONS AND AIRCRAFT PARKING

The parking apron should provide enough space for locally-based aircraft that are not housed in hangars, transient aircrafts and for maintenance activity. Since the calculation of apron space is dependent on the availability or lack of hangar space, the calculation will be provided in the landside requirements section following the hangar space narrative and calculations.

AIRPORT PAVEMENT STRENGTH AND CONDITION

The most important feature of an airfield pavement is its ability to withstand repeated use by aircraft of significant weight. Pavement strength requirements are based on three primary factors:

- The weight of aircraft anticipated to use the airport;
• The landing gear type; and,
• The number of aircraft operations.

As detailed in Chapter One of this Master Plan, Runway 17-35 has a pavement strength rating of 50,000 lbs. single wheel loading (SWL) and 80,000 lbs. dual wheel loading (DWL). The taxiway and apron pavement strength ratings are estimated at 50,000 lbs. SWL. The pavement strength ratings are considered adequate for the type of aircraft that is expected to use the airport on a regular basis.

The FAA requires the airport sponsor receiving and/or requesting federal funds for pavement improvement projects to implement a pavement maintenance management program. The pavement maintenance management program must, among other things, develop Pavement Condition Index (PCI) rating. The rating is based on the guidelines contained in FAA Advisory Circular 150/5380-6, Guidelines and Procedures for Maintenance of Airport Pavements. WASP recommends a minimum PCI of 75 for runways and 70 for taxiways and aprons, where a PCI of 100 represents brand new pavement in perfect condition and a PCI of 0 represents completely failed pavement.

Runway 17-35 and the connecting taxiways (A1, A2, A3) between the runway and Taxiway A are in good condition, and were rehabilitated as part of the 2013 runway rehabilitation project. The pavement inspection conducted in August 2012 found that Taxiway A has a PCI rating between 74 and 75. Based on the above recommendation for relocating Taxiway A in order to provide the required 400 feet runway to taxiway centerline separation, this master plan recommends that the next pavement rehabilitation project for Taxiway A include the relocation of the Taxiway to 400 feet away from the runway.

NAVIGATIONAL AIDS

Airport and runway navigational aids are based on FAA recommendations, as defined in DOT/FAA Handbook 7031.2B, Airway Planning Standard Number One, and FAA Advisory Circular 150/5300-2D, Airport Design Standards-Site Requirements for Terminal Navigation Facilities.

Navigational aids provide two primary services to airport operations: precision guidance to a specific runway and/or non-precision guidance to a runway or the airport itself. The basic difference between a precision and non-precision navigational aid is that the former provides electronic descent (vertical guidance) alignment (course) and position guidance, while the non-precision navigational aid provides only alignment and position location information. The necessity of such equipment is usually determined by design standards predicated on safety considerations and operational needs. The type, purpose and volume of aviation activity expected at the airport are factors in determination of the airport's need for and eligibility for navigational aids.
The Washington Aviation System Plan (WASP) establishes the instrument approach objective for Commercial Service and Regional Service Airports as:

- At least one runway end has instrument approach with approach visibility minimums lower than \( \frac{3}{4} \) mile.

Runway 17-35 is equipped with medium intensity runway lights and precision approach path indicators (PAPI) on both ends, which provide pilots with vertical guidance to the runway. Both PAPI systems are pilot-activated when the ATCT is closed (8PM to 8AM) and are in good operating condition. The FAA owns and maintains the PAPI systems. Runway 17 is equipped with a medium intensity approach lighting system (MALSR) with runway alignment indicator lights, which, in conjunction with a localizer, a glide slope (GS) and an instrument landing system (ILS), provide this runway end with a CAT I precision approach. The visibility minimums for the approach procedure are at \( \frac{1}{2} \) mile, which meets the performance objective of WASP. Runway 17 also has a RNAV (GPS) approach.

Runway 35 is equipped with runway end indicator lights. This runway end has a published NDB and RNAV (GPS) non-precision approach. The beacon is located east of the building area and generally aligned with midfield, is in good operating condition and will meet the airport’s needs through the planning period.

Additionally, a lighted wind indicator, contained in a segmented circle near mid-field on the east side of Taxiway A, and supplemental wind indicators are providing pilots with visual guidance on wind conditions. The County is in the process of installing two new supplemental wind cones. All such equipment should be periodically checked and replaced, as needed.

**WEATHER REPORTING**

The airport is equipped with an Automated Surface Observing System (ASOS), which provides automated aviation weather observations 24 hours a-day. The system updates weather observations every hour, or when significant changes in weather conditions occur. The ASOS is operated and controlled by the National Weather Service, in cooperation with the FAA and Department of Defense (DOD).

The ASOS system reports cloud ceiling, visibility, temperature, dew point, wind direction, wind speed, altimeter setting (barometric pressure), and density altitude (airfield elevation corrected for temperature).

The ASOS is located on the east side of parallel Taxiway A near the Taxiway A connector. Airport users obtain weather data from the ATCT during its operational hours (8AM to 8PM), but obtain weather data from the ASOS when the ATCT is closed. The ASOS is capable of providing weather information to airport users on a 24/7 basis.
AIRFIELD LIGHTING

The runway is equipped with a medium intensity runway lighting (MIRL) system, which was installed in 2013.

A Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR) is on Runway 17 and is found in good operating condition. The system can be controlled by pilots of properly equipped aircraft by using a series of clicks on their radio transmitter. Aircraft on approach at night, after the ATCT has closed, can activate the system through the approach procedure.

A Runway End Identifier Lighting (REIL) system is on the Runway 35 end. The REIL system is recommended by the NBAA for airports serving business aviation.

Airports with greater than 100 based aircraft are generally required to provide taxiway lighting. All taxiway pavements are equipped with medium intensity taxiway lighting (MITL).

AIRFIELD MARKING AND SIGNING

Runway markings are designed according to the type of instrument approach available on the runway. FAA AC 150/5340-1F, Marking of Paved Areas on Airports, provides guidance necessary to design an airport’s markings.

As part of the ongoing airport 2013 runway rehabilitation project, all runway signs and markings were replaced. Markings on Taxiways A, A1, A2, A3, and A4 were also restriped. The new airfield signage provides directional guidance that follows FAA standards. All taxiways are marked with taxiway centerlines and proper hold bars adjacent to runways.

LANDSIDE REQUIREMENTS

Landside facilities are those located beyond the aircraft movement areas and are necessary for the handling of aircraft and passengers while on the ground. These facilities provide the interface between the air and ground transportation modes. Landside facilities include the terminal building(s), air traffic control tower (ATCT), hangars, and other aviation facilities, services and support.

GENERAL AVIATION TERMINAL(S)
The general aviation terminal space requirements include the space required for a pilot lounge, flight planning room, management, storage, vending machines and various other needs. The estimation of the terminal facilities needs is based on the number of airport users that are expected to use these facilities during the design hour. Industry practices are to provide 120 square feet per design hour itinerant passenger. The number of passengers is determined by multiplying design hour itinerant operations by the number of passengers per aircraft (occupancy factor). An increasing occupancy factor was used (1.8 in 2013 to 2.2 in 2032) to account for the industry trend moving towards larger, more sophisticated aircraft using the airport.

Table 3I illustrates the terminal area facilities requirements.

Table 3I. General Aviation Terminal Space Requirements

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<th>2022</th>
<th>2032</th>
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<td>35</td>
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<td>Design Hour Itinerant</td>
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<tr>
<td>Occupancy Factor</td>
<td>1.8</td>
<td>1.9</td>
<td>2.0</td>
<td>2.2</td>
</tr>
<tr>
<td>Design Hour Itinerant</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Passengers</td>
<td>30</td>
<td>33</td>
<td>36</td>
<td>47</td>
</tr>
<tr>
<td>Required Space (s.f.)</td>
<td>3,600</td>
<td>3,960</td>
<td>4,320</td>
<td>5,640</td>
</tr>
</tbody>
</table>

Source: WHPacific

The general aviation terminal facilities space at Tacoma Narrows Airport is generally provided by the two FBOs operating at the airport, Tacoma Narrows Flight Center and PAVCO. However, FBO input suggests that airport users need a designated GA terminal to meet the long-term needs of pilots, passengers, and airport visitors. Table 3I space requirements could be served by a combination of FBO facilities and a small terminal with expansion potential in the future.

AIR TRAFFIC CONTROL TOWER

The ATCT at Tacoma Narrows has been in operation since 1973 and is a federal contract tower that operates daily for 12 hours (8AM to 8PM). The ATCT has a top elevation of 339 feet. The ATCT is in good condition and its location at midfield along the aircraft apron edge provides adequate line of sight to all aircraft movement areas.

Although Tacoma Narrows ATCT’s was on the list of 149 towers across the nation identified to close due to budget restrictions resulting from the government sequestration, recent legislation to end air traffic controller furloughs has afforded the FAA enough flexibility to keep funding air traffic control towers that were on the closure list.
HANGARS

The space required for hangar facilities is dependent upon the number and type of aircraft expected to be based at the airport. Other factors that can influence hangar use include the intensity of weather conditions, security concern, hangar lease rates and hangar space availability.

Aircraft hangars at the Airport provide storage for many of the based aircraft at the Airport as well as for some limited transient aircraft. There are County-owned hangars as well as tenant-built hangars on ground leases.

Hangar space at the Airport is occupied by private aircraft owners as well as businesses. According to the County, there are approximately 150 agreements with tenants on the airport, most of which are for hangars. Two new hangars, one conventional and one T-hangar building, are proposed for construction this year on ground leases with the County.

Currently, 109 (83%) based aircraft at the Airport are stored in hangars with the remaining 23 (17%) using tiedown space. The forecast chapter estimated that the number of based aircraft will increase by 29 aircraft by 2032. This increase includes 21 single engine aircraft, 1 multi-engine aircraft, 5 jets and two helicopters.

The analysis assumes that all newly based aircraft will require hangar space, which is the preferred method of storage, particularly with the newer and more expensive aircraft. Additionally, it is assumed that 90 percent of single engine aircraft will require T-hangar space with the remaining 10 percent of single engine aircraft and 100 percent of multi-engine aircraft, jets and helicopters requiring conventional hangar space.

A planning standard of 1,200 square feet per single engine aircraft has been used along with a planning standard of 3,000 square feet per multi-engine aircraft, jet or helicopter. Since portions of conventional hangars are also used for aircraft maintenance and servicing, requirements for maintenance/service hangar area were estimated using a planning standard of approximately 15 percent of the total hangar space needs.

Table 3J outlines the additional hangar space needed throughout the 20 year planning period.
Table 3J. Additional Hangar Space Needed (square feet)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ADDITIONAL AIRCRAFT:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Additional Single Engine</td>
<td>6</td>
<td>4</td>
<td>11</td>
<td>21</td>
</tr>
<tr>
<td>Additional Multi-engine</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Additional Jets</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Additional Helicopters</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>7</td>
<td>7</td>
<td>15</td>
<td>29</td>
</tr>
<tr>
<td><strong>HANGAR POSITIONS:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T-hangar</td>
<td>5</td>
<td>4</td>
<td>10</td>
<td>19</td>
</tr>
<tr>
<td>Conventional</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>7</td>
<td>7</td>
<td>15</td>
<td>29</td>
</tr>
<tr>
<td><strong>HANGAR AREA REQUIREMENTS (s.f.):</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T-hangar Area</td>
<td>6,000</td>
<td>4,800</td>
<td>12,000</td>
<td>22,800</td>
</tr>
<tr>
<td>Conventional Hangar Area</td>
<td>4,200</td>
<td>9,000</td>
<td>16,200</td>
<td>29,400</td>
</tr>
<tr>
<td>Maintenance Area</td>
<td>630</td>
<td>1,350</td>
<td>2,430</td>
<td>4,410</td>
</tr>
<tr>
<td><strong>Total Area Required for New Based Aircraft</strong></td>
<td>10,830</td>
<td>15,150</td>
<td>30,630</td>
<td>56,610</td>
</tr>
<tr>
<td>Existing Hangar Area Available</td>
<td>&gt; 60,000</td>
<td>&gt; 60,000</td>
<td>&gt; 60,000</td>
<td>&gt; 60,000</td>
</tr>
<tr>
<td><strong>Total Additional Area Needed</strong></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: WHPacific

As provided in Table 3J, a total of 56,610 square feet of hangar space would accommodate the 29 additional based aircraft during the planning period. With excess hangar capacity today, no additional hangar construction is needed during the planning period. However, future hangar development areas should be designated for long-term planning purposes.

County-owned hangars are in fair to good condition with some facilities needing improvements in the near-term, and several County-owned hangar doors need repair/replacement. As all facilities age, more improvements will be needed in the mid- to long-term, too.

**OTHER BUILDINGS**

A building adjacent to the ATCT has historically served as a restaurant. The previous restaurant closed its doors in January 2013 after 16 months, but a new tenant is moving in with plans to open their restaurant in mid-September. No specific facility requirements are identified for the building as improvements will be made by the new tenant, which are presently under way.

Runway and taxiway regulators are installed in an electrical vault, which were constructed as part of the runway rehabilitation project. There is also a generator which provides backup power to the runway and taxiway lighting. The newly constructed structure is in good condition and will serve the needs of the Airport through the planning period.
AIRCRAFT PARKING APRON

An aircraft parking apron should be designed to accommodate transient aircraft as well as locally based aircraft that are not stored in hangars. The number of tiedowns required is based on the number of potential based aircraft as well as an estimated percentage of transient aircraft requiring tiedown space.

As noted in the analysis of hangar space requirements above, it is expected that all future based aircraft will prefer enclosed hangar storage facilities. If hangars are not provided, additional apron space may be required. However, the Airport has an estimated 20 vacant tiedown spaces for aircraft parking on the apron.

Transient apron space is determined by estimating the percentage of busy-day operations that will require tiedown space at a given time.

A planning criterion of 360 square yards per based aircraft and 500 square yards per transient aircraft was used to determine the apron requirements. These dimensions take into the account the space needed for circulation, taxilane Object Free Areas (OFA) and wingtip clearances.

Table 3K illustrates the analysis of apron space need for the planning period.

<table>
<thead>
<tr>
<th>Operations</th>
<th>Existing</th>
<th>2017</th>
<th>2022</th>
<th>2032</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual operations</td>
<td>48,463</td>
<td>52,203</td>
<td>56,241</td>
<td>65,306</td>
</tr>
<tr>
<td>Peak Month</td>
<td>5,331</td>
<td>5,742</td>
<td>6,187</td>
<td>7,184</td>
</tr>
<tr>
<td>Design Day (Average Day of Peak Month)</td>
<td>172</td>
<td>185</td>
<td>200</td>
<td>232</td>
</tr>
<tr>
<td>Itinerant Operations (60% of Design Day)</td>
<td>104</td>
<td>111</td>
<td>120</td>
<td>140</td>
</tr>
<tr>
<td>Itinerant Aircraft Landing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aircraft Simultaneously Parked (50%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Based Aircraft</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Existing Based Aircraft Using Apron</td>
<td>23</td>
<td>23</td>
<td>23</td>
<td>23</td>
</tr>
<tr>
<td>Apron Tiedowns - Required Positions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Aircraft Parked</td>
<td>49</td>
<td>51</td>
<td>53</td>
<td>58</td>
</tr>
<tr>
<td>Existing Aircraft Tiedowns (Capacity)</td>
<td>108</td>
<td>108</td>
<td>108</td>
<td>108</td>
</tr>
<tr>
<td>Demand/Capacity Ratio</td>
<td>45%</td>
<td>47%</td>
<td>49%</td>
<td>54%</td>
</tr>
</tbody>
</table>

Source: WHPacific
As illustrated in Table 3J, the existing apron area, which includes 108 tiedowns (and 58,400 square yards), is sufficient for the planning period to serve tiedown needs. Despite the calculated demand/capacity results, FBO input specifically outlined the need for more apron area, particularly for circulation during day-to-day operations. Since apron area circulation improvements may be a combination of configuration and expansion, the development alternatives should look at future apron needs.

**AVIATION BUSINESSES AND SERVICES**

*Fixed Base Operators*

An FBO provides various aeronautical services such as fueling, parking transient aircraft, hangars, flight training, and aircraft maintenance. The FAA defines Fixed Base Operator (FBO) as “an individual or firm operating at an airport and providing general aircraft services such as maintenance, storage, and ground and flight instruction.” FBO services at Tacoma Narrows Airport are provided by two private companies, Tacoma Narrows Flight Center and PAVCO Flight Center. As noted in the Inventory Chapter, the FBOs offer numerous services. According to discussion with each FBO as part of the planning study, there are no expansion plans at this time since demand for their facilities and services is adequately served, primarily due to the substantial drop in operations and slow return to historical levels.

*Fuel Storage and Provision*

Both Airport FBOs provide and sell 100LL and Jet A fuel. There are two separate fuel storage locations and each has a 10,000-gallon storage tank of 100LL and 10,000-gallon tank of Jet A, totaling 20,000 gallons of fuel storage capacity for each type of fuel. One FBO uses fuel trucks to provide aircraft fueling; the second FBO is able to directly fuel aircraft parked in front of its facility. A self-serve fuel facility is also available at the north end of the parking apron with 20,000 gallons storage. In total, the Airport has a fuel storage capacity of 60,000 gallons.

Fuel sales records collected from the FBOs show that a total of 186,784 gallons of fuel were sold in 2012. This represents, on average, 4.24 gallons per operation. It is expected, due to the trend of increasing size of based aircraft and distances they travel, that the average of gallons per operation will increase.

The forecasts estimated that total annual operations will reach 65,306 annual operations by 2032 with the peak month operations reaching 7,184 operations. Expecting that the fuel usage per operation will increase by 25% to 5.3 gallons per operation by 2032, the peak month operations will require a total of 37,885 gallons.

It is generally required that an airport have enough fuel storage capacity for two weeks of operations. The fuel storage capacity at Tacoma Narrows exceed, currently and for the remainder of the planning period, the fuel required for the peak month operations.
Aircraft Maintenance

The Washington Aviation System Plan recommends that Regional Service airports provide full-service FBO and major maintenance services. The system plan defines major maintenance services as “repairs that may affect weight, balance, structural length, power plant operations, flight characteristics, or other qualities affecting airworthiness.”

The maintenance services offered by the FBOs at Tacoma Narrows qualify as major maintenance services based on the above definition and do meet the WASP objectives for a Regional Service Airport.

Road Access and Vehicle Parking

A single roadway provides access into the Airport via 26th Avenue NW, which runs north-south along the Airport property boundary adjacent to the landside facilities where auto parking is provided. Air traffic and, consequently, auto traffic has decreased in recent years so access roadway capacity is not an issue. However, a secondary roadway into the Airport would enhance access to facilities and better serve future airport development. Development alternatives presented in the next master planning element will assess the potential need for additional access to the Airport and specific development areas.

The existing number of auto parking spaces is expected to be adequate for the planning period. However, space should be reserved for expansion of the vehicle parking area should parking needs outpace anticipated demand. Presently, the main public auto parking area provides 70 auto parking spaces to serve nearby Tacoma Narrows Flight Center (FBO), the Airport staff office, ATCT, restaurant, office tenants, and Customs. Additional parking, which consists of 19 spaces is south of the main parking area and serves PAVCO (FBO) and Tosch Aircraft. Other auto parking is adjacent to many of the hangars with the majority serving the private aircraft owners/tenants and their visitors.

The existing number of parking spaces is expected to be adequate for the planning period. However, space should be reserved for expansion of the vehicle parking area should parking needs outpace anticipated demand.

Special Land Uses for Businesses

Tacoma Narrows Airport’s proximity to Seattle, convenient access to major surface transportation roadways, and more efficient air transportation access for corporate aviation than SeaTac Airport make the Airport more attractive to future business tenants. These business tenants might include a manufacturer of aircraft or aircraft parts, or other aviation-related businesses. The County recognizes the revenue-generating possibilities at the Airport and should consider identifying one or more parcels of property for aviation-related tenants. While non-aeronautical development on the Airport could help diversify revenue sources, all such
development must be compatible with existing and planned aviation development and all revenues generated must go back into the Airport. The development alternatives should consider the opportunities to better serve the community’s economic growth in an aviation-compatible manner.

**EMERGENCY SERVICES AND SECURITY**

*Firefighting and Law Enforcement*

Emergency services include firefighting and law enforcement for the Airport. Fire and Medic One (Pierce County Fire District #5) provides aircraft rescue and firefighting from an off airport station with a response time to an airfield incident of less than five minutes. There are 12 fire hydrants located on the Airport to serve the buildings area. The Pierce County Sheriff’s Department provides law enforcement support for the Airport.

Tacoma Narrows is not required to provide Aircraft Rescue and Fire Fighting (ARFF) since the Airport does not have the commercial passenger service that would require a Part 139 certificate.

It is important to note that as part of the WASP, electronic town hall meetings were conducted in which more than half of the respondents (58%) placed a high funding priority on supporting emergency services such as fire control.

*Security*

General aviation airports have very different security needs and limited resources in comparison to airports with airline service. The TSA, recognizing these differences, created an office focused specifically on security issues affecting general aviation. In order to guide airport sponsors like Tacoma Narrows in determining what security enhancements they should consider, the TSA published Security Guidelines for General Aviation Airports (IP A-001) in May 2004. The document contains an “Airport Characteristics Measurement Tool” that uses points to assess security risks for different airport characteristics.

**Table 3L** summarizes the results of the security assessment for Tacoma Narrows Airport.
### Table 3L. GA Airport Security Assessment for Tacoma Narrows Airport

<table>
<thead>
<tr>
<th>Security Characteristics</th>
<th>Public Use Airport (Existing Conditions)</th>
<th>Public Use Airport (Ultimate Conditions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within 30 nm of mass population areas</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Within 30 nm of a sensitive site</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Greater than 101 Based Aircraft</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Based Aircraft over 12,500 lbs.</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Runway 5,000 feet or greater</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Asphalt or Concrete Runway</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Over 50,000 annual aircraft operations</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Part 135 Operations</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Flight Training</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Rental Aircraft</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>31</strong></td>
<td><strong>35</strong></td>
</tr>
</tbody>
</table>

*Source: Security Guidelines for General Aviation Airports (IP A-001), May 2004, and Tacoma Narrows Airport Conditions*

Based on the current and future score of Tacoma Narrows on the GA Airport Security Assessment, the TSA recommends the following:

- Perimeter Control
- Protective Lighting Systems
- Personnel and vehicle Identification Systems
- Airport Community Watch program

It must be noted that Tacoma Narrows is presently fenced with restricted access gates to enhance security, but there are gaps in the fencing allowing unauthorized entry that should be addressed with fencing improvements in the near-term. According to FBO input, aircraft in County-owned hangars to the north have been broken into on multiple occasions. The County stated that there have been thefts at the south end of the Airport as well. The Airport used to have night security, which was later discontinued. However, the presence of staff at the ATCT, FBOs, and other businesses enhances the day-to-day security at the Airport.
DRAINAGE AND UTILITIES

Drainage

The airport is located within the Gig Harbor Basin. The basin is located on a peninsula extending southward into Puget Sound. It is bound on the west by the Carr Inlet and Henderson Passage, on the east by the Tacoma Narrows, and on the south by Hale Passage. As defined in the Gig Harbor Basin Plan, the airport lies within four subbasins: Point Evans, Sullivan Gulch, Magnolia, and Doc Weathers Drainage Basins.

The eastern portion of the airport, including the apron area, lies within subbasin 25: Doc Weathers. Runoff is collected by a system of catch basins and pipes, and flows to the east.

East of the Runway 17-35 centerline, the airport lies within subbasin 15: Point Evans. Runoff is collected by a system of catch basins and pipes. The main storm drainage trunk line runs between Runway 17-35 and Parallel Taxiway A. This conveyance system flows to the south, to an outfall at the south end of the airport.

West of the Runway 17-35 centerline, the airport lies within subbasin 16: Magnolia. Stormwater sheet flows off of the pavement and grassed areas, and is collected in a ditch. The ditch begins at the northern end of Subbasin 16, and extends approximately 2,400’ to the south, where it outfalls at the base of a slope. Stormwater then appears to sheet flow west, down a hillside, where it is collected in a gulch and conveyed in an unnamed stream to Wollochet Bay.

The northwest portion of the airport lies within subbasin 14: Sullivan Gulch. Surface water flows northwest, and is discharged into the Stone Drive NW conveyance system. The system flows under Pt. Fosdick Drive and continues in a northwest direction to a creek located in Sullivan Gulch, which flows into Wollochet Bay.

There is an existing stormwater facility located east of Taxiway A, between Taxiway B3 and C. Based on conversations with County staff, this stormwater facility does not appear to be used, even during significant storm events. The facility should be evaluated to determine if it is oversized, or if it can accommodate stormwater runoff from future airport development.

Water

The Tacoma Narrows Airport water system includes a single groundwater well with a submersible pumping system, two concrete water storage tanks, two domestic supply booster pumps, liquid chlorination system, two diesel engine-driven pumps for fire protection flow, and distribution mains and hydrants. These elements are generally located at or near the south end of the airport, along the east side. Components of the system vary in age from approximately 11 to 50 years.
An analysis of the water system was completed by Kennedy/Jenks Consultants in 2010. The final report included recommendations for immediate, short-term, and long-term improvements to the water system.

A peer review of the Kennedy/Jenks Report was completed in 2011 by Northwest Water Systems. This review included modified recommendations for immediate, short-term, and long-term improvements to the water system. In general, the scope of the improvements recommended was less than the improvements recommended in 2010.

In March of 2013, Kennedy/Jenks Consultants completed a seismic evaluation of the existing water tanks, and concluded that the existing tanks do not have the strength to withstand the loads prescribed by the current building code. The report included proposed system retrofits to permit continued use of the water tanks after a seismic event.

All future development at the Airport should consider water improvement needs.

**Sanitary Sewer**

There is currently no sanitary sewer service at the airport; sanitary sewer drains to a system of septic tanks and drain fields. The Gig Harbor Sanitary Sewer Treatment Plant does not serve the Airport, as the Airport is not within City limits. The Chambers Creek Regional Wastewater Treatment Plant does not serve the Airport either. At this time, additional development at the Airport will require additional septic tanks/drain fields or other on-site treatment and disposal system.
Chapter Three
REQUIREMENTS

The previous chapter provided a forecast of the aviation demand levels that are expected at Tacoma Narrows Airport throughout the 20-year planning period. This chapter will examine the capacity of the existing airport facilities and their adequacy in accommodating the forecast demand. The chapter will identify the need for new facilities and/or existing facilities improvements as well as the activity level at which these facilities and improvements are needed in the near-, mid- and long-term, which corresponds to 2017, 2022, and 2032. It is important that actual improvements are based on demand rather than specific time intervals, since actual airport activity may fall below or accelerate above the forecasts.

The requirements identified in this chapter will provide the framework for identifying possible long-term development concepts for the airport in the next chapter. For comprehensive planning purposes, the needs discussed in this chapter are not limited to those facilities and services that might be funded or provided by the County, State or FAA, but also anticipate facilities and services that private entities might provide.

Table 3A outlines the forecast level of activity associated with the various planning timeframes.
Table 3A. Planning Activity Levels

<table>
<thead>
<tr>
<th>Planning Activity Level</th>
<th>Near-Term</th>
<th>Mid-Term</th>
<th>Long-Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
<td>2017</td>
<td>2022</td>
<td>2032</td>
</tr>
<tr>
<td>Based Aircraft</td>
<td>139</td>
<td>146</td>
<td>161</td>
</tr>
<tr>
<td>Number of operations</td>
<td>52,203</td>
<td>56,241</td>
<td>65,306</td>
</tr>
<tr>
<td>ARC</td>
<td>C-II</td>
<td>C-II</td>
<td>C-II</td>
</tr>
</tbody>
</table>

Source: Chapter 2, Forecasts

EXECUTIVE SUMMARY OF REQUIREMENTS

While a discussion of individual facility needs at the Airport is presented throughout the chapter, this section provides a brief summary of those needs. Many Airport facilities provide sufficient capacity to accommodate demand forecast throughout the planning period. However, a number of facilities will need to be modified or expanded to accommodate future activity, improve the airport’s operational capabilities, and satisfy evolving airfield and building design standards.

The requirements, provided below, are divided into airside and landside requirements.

AIRSIDE REQUIREMENTS

- Airport Runway Design Code (RDC) is currently C-II/2400; the RDC is expected to remain the same for the remainder of the planning period. The Taxiway Design Group (TDG) is 2.
- The airfield operational capacity is more than adequate to accommodate the demand throughout the planning period and beyond.
- Runway 17-35 orientation provides excellent wind coverage.
- Runway length is adequate for small airplanes using the airport. However, the 5,002 feet length is insufficient for the projected growth in the jet operations at the Airport. A runway extension up to 1,000 feet is recommended for the long-term.
- Runway width of 100 feet is adequate to serve the forecast traffic throughout the planning period.
- Taxiway A does not meet the runway to taxiway centerline separation. Relocation of Taxiway A to a distance of 400 feet from the runway is recommended.
- An outer portion of Runway Safety Area (RSA) for Runway 35 does not meet the requirement for RDC C-II due to several factors (terrain drop-off, access road and equipment location). Although the FAA cancelled a project and funding to address the RSA issues, the RSA project may be reconsidered in the future depending on funding and the cost/benefit ratio of the improvement. Trees are located within the runway object free area on the South side of the airport. Trimming of these trees to at or below the RSA elevation is recommended.
• A portion of each Runway Protection Zones for both runway ends extends beyond airport property. These areas should be under the County’s control through an avigation easement or fee simple acquisition.
• All taxiways meet or exceed taxiway width requirements.
• Connecting Taxiway C lines up directly with Taxiway A3 allowing aircraft to taxi from parking apron directly to the runway. Relocation of connector C is recommended.

LANDSIDE REQUIREMENTS

• A total of 5,640 square feet of general aviation terminal space is needed by the end of the planning period (2032), which can be accommodated by FBO facilities and/or a dedicated GA terminal facility.
• The additional based aircraft forecast for the 20 year planning period will require a total of 56,610 square feet of hangar space. With newly constructed hangars and current vacant hangar spaces, these based aircraft will be accommodated.
• Existing tiedowns on the apron areas are more than sufficient for the planning period. However, FBO input suggests additional apron area is needed for circulation in FBO areas.
• Fuel Storage Capacity is sufficient for planning period.
• Airport access and parking spaces are adequate for the planning period.

PLANNING CRITERIA

The planning criteria or planning parameters ensure that any proposed developments or improvements at Tacoma Narrows Airport are in line with the goals and objectives of the national, state, regional, and local air transportation systems, the appropriate aviation industry segments, and the airport sponsor’s vision for the airport and its role.

The planning criteria for the Tacoma Narrows Airport are drawn from various sources that include:

• **Federal Aviation Administration (FAA)** – FAA design guidelines found in AC 150/5300-13A Airport Design provide the planning criteria, with respect to the current as well as future critical or design aircraft, for the runway, taxiways and apron areas.

• **Transportation Security Administration (TSA)** – Although TSA does not regulate general aviation airports like Tacoma Narrows, they do provide guidance for security at general aviation airports. The guidelines provided by the TSA are tailored to an airport’s size and risk level.
• **Washington State Aviation System Plan (including the Washington State Long-Term Air Transportation Study)** - Provides a distribution of airports by classification as well as recommendations and direction on how to meet the state’s long term commercial and general aviation needs. This Plan is prepared by Washington State Department of Transportation (WSDOT) Aviation.

• **Regional Airport System Plan (RASP)** – This plan, completed by the Puget Sound Regional Council (PSRC), provides guidance for airports within the context of the four-county Central Puget Sound Region. The Plan “presents a 20-year general aviation airport system improvement program that focuses on maintaining and preserving the existing system combined with strategic investments in system enhancement.”

• **Business Aviation Industry** – The National Business Aviation Association (NBAA) represents the industry and provides recommendations for airports’ facilities and services to accommodate business aviation needs.

• **Pierce County and Airport Users** – Planning Advisory Committee members, other meeting participants and survey respondents provided input specific to the Tacoma Narrows Airport. The local airport community is an important source since its operational issues, community relationships, and future vision for the airport help shape the list of future facility needs.

**AIRPORT ROLE**

The determination of an airport’s role is an important first step in determining the planning criteria. This section will examine the Tacoma Narrows Airport role in the National System as well as in the State System.

The National Plan of Integrated Airport Systems (2013-2017) classifies Tacoma Narrows as a general aviation facility. Further, FAA’s General Aviation Airports: A National Asset, published in May 2012, classifies Tacoma Narrows as one of 467 Regional airports. The report describes the role of Regional airports as “supporting regional economies by connecting communities to statewide and interstate markets.” The report created four new categories of general aviation airports: National, Regional, Local and Basic. Further, the report explains that the existing definitions (i.e. reliever airport, general aviation airport) do not adequately describe the roles of these general aviation airports. For example, the report states that “most airports currently designated as relievers are not primarily engaged in relieving congestion at another airport.” Although the FAA publication acknowledges that “it is difficult to properly convey needs of airports with a single term, it does state that the new classifications are more representative of the airports’ activity and “other data in existing Federal databases.”
Below is a list of Washington State airports previously classified as Commercial Service and Reliever (second column) with their new classification (third column) as provided in FAA’s General Aviation Airports: A National Asset. As shown, only one reliever airport, Paine Field, is classified as a National Airport. All other reliever airports are classified as Regional; the Commercial Service airport of Orcas Island is classified as Local.

<table>
<thead>
<tr>
<th>Airport</th>
<th>Service Level Classification</th>
<th>New FAA Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auburn Municipal</td>
<td>Reliever</td>
<td>Regional</td>
</tr>
<tr>
<td>Orcas Island</td>
<td>Commercial Service</td>
<td>Local</td>
</tr>
<tr>
<td>Paine Field</td>
<td>Reliever</td>
<td>National</td>
</tr>
<tr>
<td>Renton Municipal</td>
<td>Reliever</td>
<td>Regional</td>
</tr>
<tr>
<td>Harvey Field</td>
<td>Reliever</td>
<td>Local</td>
</tr>
<tr>
<td>Tacoma Narrows</td>
<td>General Aviation</td>
<td>Regional</td>
</tr>
</tbody>
</table>

The Washington Aviation System Plan (WASP) and the Washington State Long-Term Air Transportation Study (LATS) classify Tacoma Narrows as a Regional Service Airport. “WSDOT’s goal for providing access to Regional Service Airports is that nearly every Washington resident should be able to reach a “jet-capable” Regional Service or comparable Commercial service Airport within 90 minutes.” Also noteworthy is that all Reliever airports listed above have the same state classification as Tacoma Narrows. In fact, although Tacoma Narrows does not have “Reliever” status, its runway is longer than Auburn Municipal Airport and Harvey Field runways. Additionally, services offered at Tacoma Narrows are at least comparable and in many cases better than those offered at reliever airports (for example, Auburn Municipal Airport does not offer Jet A fuel).

WASP designates a role for each airport within the system, helping to distinguish between the various levels of service and activities associated with each airport across the state. WASP 2009 defined six different roles or classifications for the 138 airports considered in the statewide system. These six classifications are:

- Commercial Service – 16
- Community Service – 23
- Rural Essential – 38
- Regional Service – 19
- Local Service – 33
- Seaplane Bases – 9

WASP recommends a set of performance objectives for the statewide airports. These objectives are divided into five categories: Operational Factors, Planning, Land Use Compatibility Protection, Facilities and Services. The objectives for Operational Factors, Planning, and Land Use Compatibility Protection are the same (where applicable) regardless of the airport’s classification. The performance objectives for Facilities and Services are dependent on the airport’s classification.

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1 Due to airport closures, the WA statewide system is down to 135 airports in 2013.
Table 3B provides an overview of WASP’s performance objectives for Regional Service Airports and of the existing conditions at Tacoma Narrows Airport. The table focuses on the two categories of Facilities and Services.

Table 3B: Performance Objectives and Existing Conditions

<table>
<thead>
<tr>
<th>Performance Objective</th>
<th>TIW Existing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runway Length</td>
<td>5,000 feet</td>
</tr>
<tr>
<td></td>
<td>5,002 feet</td>
</tr>
<tr>
<td>Taxiway</td>
<td>Parallel</td>
</tr>
<tr>
<td></td>
<td>Parallel</td>
</tr>
<tr>
<td>Instrument Approach</td>
<td>Lower than ¾ mile Visibility</td>
</tr>
<tr>
<td></td>
<td>Minimum</td>
</tr>
<tr>
<td></td>
<td>ILS RWY 17: ½ Mile Visibility</td>
</tr>
<tr>
<td></td>
<td>Minimum</td>
</tr>
<tr>
<td>Lighting</td>
<td>Medium Intensity</td>
</tr>
<tr>
<td></td>
<td>MIRL, MALSR, REIL</td>
</tr>
<tr>
<td>Visual Glide Slope</td>
<td>Must be Provided</td>
</tr>
<tr>
<td>Indicators</td>
<td>PAPI on RWY 17 &amp; 35</td>
</tr>
<tr>
<td>Weather Reporting</td>
<td>AWOS or ASOS</td>
</tr>
<tr>
<td></td>
<td>ASOS</td>
</tr>
<tr>
<td>Fuel Sales</td>
<td>100LL and Jet A</td>
</tr>
<tr>
<td></td>
<td>100LL and Jet A</td>
</tr>
<tr>
<td>Maintenance Service</td>
<td>Major</td>
</tr>
<tr>
<td></td>
<td>Major</td>
</tr>
</tbody>
</table>

Source: Washington Aviation System Plan, 2009 (WSDOT Aviation), and Airport Inventory

As Table 3B indicates, Tacoma Narrows Airport meets all of the performance objectives provided by WASP Plan for a Regional Service Airport.

To assist airport communities with understanding and serving the needs of the corporate jets, the NBAA also publishes a set of facilities and services to consider. The publication, titled NBAA Airports Handbook, outlines both optimum and acceptable criteria. Examples of optimum criteria include a full taxiway system, approach lighting, high intensity runway lighting, ASOS, full-service FBO, transient hangar space, major aircraft maintenance, and nearby restaurant and hotel/motel. The Tacoma Narrows Airport meets these optimum standards with the exception of the HIRL, but NBAA identifies medium intensity runway lighting and runway end identifier lighting as acceptable facilities, which the Airport provides. The NBAA also identifies a 24-hour Air Traffic Control Tower (ATCT) as optimum, but no ATCT is considered acceptable. As previously mentioned, the ATCT at the Airport is open between the hours of 8 AM and 8 PM and closes during the night hours.

In addition to the published guidance and criteria for facilities and services, it is important to consider the local community’s needs and the airport owner’s vision for the Airport. Pierce County’s general vision for the Airport is to continue to be a convenient alternative to the more congested SeaTac International Airport for general aviation activity including the growing business aviation segment, and to support and promote the community’s economic growth.
AIRSIDE DESIGN STANDARDS

FAA design standards listed in AC 150/5300-13A, Airport Design, guide the planning and development of airside facilities at an airport. This section provides a brief description of some of these design standards contained in 150/5300-13A, and identifies the conditions unique to Tacoma Narrows Airport that influence design recommendations.

The FAA is responsible for the overall safety of civil aviation in the United States and all of the design standards in 150/5300-13A are primarily driven by safety. Other factors that influence the design standards included in the AC are efficiency and utility.

AC 150/5300-13A issued in September 2012 replaced and cancelled AC 150/5300-13, Airport Design, dated September 29, 1989, with changes published through 2012. The changes that affect the safety and efficiency of aviation are constantly evolving as the aviation industry continues its rapid development.

AC 150/5300-13A includes various clarifications and introduces new terms and concepts. This section will provide a brief summary of some of these new concepts and discuss their application to Tacoma Narrows Airport.

DESIGN AIRCRAFT

The design aircraft is the most demanding aircraft that operates or is forecast to operate at the Airport on a “regular” basis (at least 500 annual itinerant operations). The design aircraft may be a specific aircraft or a composite of aircraft characteristics. This is due to the fact that the different characteristics of the design aircraft influence different airside design components. Table 3C provides a summary of the various aircraft characteristics and the design components they influence.
Table 3C. Aircraft Characteristics and Design Components

<table>
<thead>
<tr>
<th>Aircraft Characteristics</th>
<th>Design Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approach Speed</td>
<td>RSA, ROFA, RP, runway width, runway-to-taxiway separation, runway-to-fixed object</td>
</tr>
<tr>
<td>Landing and Takeoff Distance</td>
<td>Runway Length</td>
</tr>
<tr>
<td>Cockpit to Main Gear Length (CMG)</td>
<td>Fillet design, apron area, parking layout</td>
</tr>
<tr>
<td>Outer to Outer Main Gear Width (MGW)</td>
<td>Taxiway width, fillet design</td>
</tr>
<tr>
<td>Wingspan/Tail Height</td>
<td>Taxiway and apron OFA, parking configuration, hangar locations, taxiway-to-taxiway separation</td>
</tr>
</tbody>
</table>

Source: FAA AC 150/5300-13A

Runway Design Code (RDC)

In addition to the Airport Reference Code (ARC) mentioned in the forecast chapter, AC 150/5300-13A introduced the Runway Design Code (RDC) which is based on planned development and signifies the design standards to which the runway is to be built. The RDC is composed of three components, the Aircraft Approach Category (AAC), the Airplane Design Group (ADG) and visibility minimums.

The first component, AAC, is depicted by a letter (A through E) and relates to the approach speed of the design aircraft. The second component, ADG, is depicted by a Roman numeral (I through VI) and relates to either the aircraft wingspan or tail height (physical characteristics), whichever is most restrictive. The third component relates to runway visibility minimums as expressed in Runway Visual Range (RVR) equipment measurements. RVR-derived values represent feet of forward visibility that have statute mile equivalents (e.g., 2400 RVR = ½-mile). The third component should read “VIS” for runways that are designed for visual approach use only. Table 3D provides a summary of the Runway Design Code (RDC) classifications.
### Table 3D. Runway Design Code Classifications

<table>
<thead>
<tr>
<th>Aircraft Approach Category (AAC)</th>
<th>Approach Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Approach Speed less than 91 knots</td>
</tr>
<tr>
<td>B</td>
<td>Approach speed 91 knots or more but less than 121 knots</td>
</tr>
<tr>
<td>C</td>
<td>Approach speed 121 knots or more but less than 141 knots</td>
</tr>
<tr>
<td>D</td>
<td>Approach speed 141 knots or more but less than 166 knots</td>
</tr>
<tr>
<td>E</td>
<td>Approach speed 166 knots or more</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Airplane Design Group (ADG)</th>
<th>Tail Height (ft)</th>
<th>Wingspan (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>&lt; 20’</td>
<td>&lt; 49’</td>
</tr>
<tr>
<td>II</td>
<td>20’ - &lt; 30’</td>
<td>49’ - &lt; 79’</td>
</tr>
<tr>
<td>III</td>
<td>30’ - &lt; 45’</td>
<td>79’ - &lt; 118’</td>
</tr>
<tr>
<td>IV</td>
<td>45’ - &lt; 60’</td>
<td>118’ - &lt; 171’</td>
</tr>
<tr>
<td>V</td>
<td>60’ - &lt; 66’</td>
<td>171’ - &lt; 214’</td>
</tr>
<tr>
<td>VI</td>
<td>66’ - &lt; 80’</td>
<td>214’ - &lt; 262’</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Approach Visibility Minimums</th>
<th>Flight Visibility Category (statue mile)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RVR (ft)</td>
<td></td>
</tr>
<tr>
<td>4000</td>
<td>Lower than 1 mile but not lower than ¾ mile (APV ¼ but&lt; 1 mile)</td>
</tr>
<tr>
<td>2400</td>
<td>Lower than ¼ mile but not lower than ½ mile (CAT-I PA)</td>
</tr>
<tr>
<td>1600</td>
<td>Lower than ½ mile but not lower than ¾ mile (CAT-II PA)</td>
</tr>
<tr>
<td>1200</td>
<td>Lower than ¾ mile (CAT-III PA)</td>
</tr>
</tbody>
</table>

*Source: FAA AC 150/5300-13A*

**Taxiway Design Group (TDG)**

Under former guidance (AC 150/5300-13), taxiway design was based on Airplane Design Groups (ADG). In the updated Advisory Circular AC 150/5300-13A, taxiway design is based on the newly established Taxiway Design Group (TDG), which is based on the overall Main Gear Width (MGW) and the Cockpit to Main Gear (CMG) distance. There are seven (1 through 7) TDG classifications. With respect to Tacoma Narrows Airport, the design aircraft belongs to TDG 2. Aircraft that belong to TDG group 3 do use the airport, although not on a “regular” basis (at least 500 annual itinerant operations).

**Other Design Considerations**

Additional design criteria are determined based on aircraft weight and type of approach. A small aircraft is defined in Advisory Circular 150/5300-13A, Airport Design, as “an airplane of 12,500 pounds or less maximum certificated takeoff weight”. An aircraft weighing more than 12,500 pounds is considered a large aircraft. Aircraft weight affects the required Part 77 surfaces and pavement design strength. Part 77 of the Federal Aviation Regulations defines “Objects Affecting
Navigable Airspace” and establishes imaginary surfaces around airfields and approach/departure slopes to and from runways.

**TACOMA NARROWS AIRPORT DESIGN STANDARDS**

As discussed in Chapter 2, forecasts, the current critical aircraft is the Cessna Citation business jet that belongs to the C-II AAC and ADG categories. The previous master plan identified the Airport’s ARC (AAC and ADG) as D-II. Aircraft that belong to an AAC of D and/or an ADG of III do use the airport although their operations are not “regular” and are not expected to cross the 500 operations threshold within the 20-year planning period. It is important to note that if the operations by D-II aircraft continue to grow, a return to an AAC and ADG of D-II is possible beyond the planning period.

Runway 17 has a published instrument approach procedure (ILS) with a visibility minimum of ½ mile. Additionally, both runways have published RNAV (GPS) procedures which have visibility minimums as low as one mile. The Washington Aviation System Plan (WASP) recommends a minimum visibility lower than ¾ mile for Regional Service Airports; the ILS on Runway 17 does meet this recommendation.

Based on the results of the forecast Chapter and the above explanation of the RDC classification, Tacoma Narrows current RDC is C-II/2400. Further, Tacoma Narrows is expected to maintain the same RDC through the 20-year planning period.

Also, as previously mentioned, Tacoma Narrows Taxiway Design Group is 2. This classification affects various taxiway design standards that will be discussed later in the chapter.

**AIRSIDE REQUIREMENTS**

This section of the report will address the requirements of the airside facilities. Airside facilities include all aircraft movement areas such as the runways, taxiways, and aprons.

**AIRSIDE CAPACITY/DEMAND ANALYSIS**

Before the need for improvements and new facilities can be identified, the capacity of the existing facilities must be analyzed and determined. This capacity is then compared to the forecast demand throughout the planning period and deficiencies are determined.

The capacity analysis is based on FAA AC 150/5060-5, Airport Capacity and Delay. Additionally, ACRP Report 79 published by the Transportation Research Board (TRB) in 2012 provides a Prototype Airfield Capacity Spreadsheet Model that is “built on base calculations following the theory in the FAA Airfield Capacity Model (ACM) and applies variable separation, spacing and
clearance standards following the guidelines included in FAA JO 7110.65, Air Traffic Control, and FAA EM-78-8A, Parameters of Future ATC Systems Relating to Airport Capacity/Delay.” The spreadsheet model provided by the TRB was used to calculate the airfield capacity at Tacoma Narrows Airport.

Two measures of airfield capacity are commonly used in airport planning, they are:

- **Hourly capacity**: considers the throughput during a typical busy hour. Factors such as percentage of arrivals, runway crossings, and taxiway exit locations are considered to arrive at an hourly number of aircraft that can use the airfield without undue delays.

- **Annual Service Volume (ASV)**: is an estimate of the number of aircraft operations that can be accommodated in one year. This measure is used to program additional runways, and/or modified taxiway exits.

Generally, planning of capacity improvements starts when an airport reaches 60 percent of its capacity and capacity improvements construction starts at or before the airfield reaching 80 percent of its calculated capacity. It must be mentioned that airfield capacity deficiencies are more common at large commercial service airports. General aviation airports similar to Tacoma Narrows may not even reach 30% of their capacity during the 20-year planning period.

Washington Aviation State Plan (WASP) indicates that the Puget Sound Region, where Tacoma Narrows is located, shows the highest utilization at 36% of the ASV. WASP also lists the airports that are forecast to exceed at least 60% of their capacity by 2030; Tacoma Narrows is not listed as one of these airports.

In calculating the Airport’s ASV, the projections of annual operations by the fleet mix specified in Chapter 2 were used. The analysis considered various factors including airfield layout, meteorological conditions, runway conditions, runway use, aircraft mix, percent arrivals, percent touch-and-go’s, and exit taxiway locations. The demand characteristics that are relevant to calculating airfield capacity are the mix of aircraft types that utilize the airport in the design hour along with the percentage of arrivals and the percentage of touch-and-go operations as well as the percentage of IFR operations. Aircraft types are classified according to size as shown below.

- **Class A**: Small single engine aircraft weighing less than 12,500 pounds
- **Class B**: Small twin-engine aircraft weighing less than 12,500 pounds.
- **Class C**: Aircraft weighing between 12,500 pounds and 300,000 pounds
- **Class D**: Aircraft weighing more than 300,000 pounds

The Annual Service Volume for Tacoma Narrows Airport was calculated at 230,000 operations which is considerably higher than the 65,306 operations expected by 2032.
RUNWAY REQUIREMENTS

Number and Orientation of Runways

The number of runways on an airfield is typically driven by the activity levels and/or the wind coverage. Busy airports often require parallel runways to accommodate their high activity levels while minimizing delays. Tacoma Narrows activity levels, current and forecast, are easily accommodated by a single runway.

The most desirable runway orientation based on wind is one that has the largest wind coverage and the minimum crosswind components. Wind coverage is defined as the percent of time crosswind velocities are below an acceptable velocity. That velocity is determined by the type of aircraft that uses the runway. The crosswind component is the resultant vector of the runway direction and existing wind that acts at a right angle to the runway. FAA Advisory Circular (AC) 150/5300-13A recommends that at least 95 percent crosswind coverage be provided by the runway system (one or more runways) of the airport.

As previously mentioned, the appropriate crosswind component is based on the Airplane Design Group (ADG) component of the RDC. The RDC for Tacoma Narrows was determined to be C-II/2400 and is forecast to stay as such for the remainder of the 20-year planning period. Smaller aircraft (ADG I) do use the airport on a regular basis. Wind speeds were evaluated for Airplane Design Group (ADG) I and ADG II. Aircraft in ADG I have the smallest wingspans and are more susceptible to crosswind conditions. The 95 percent wind coverage is computed on the basis of the crosswind component not exceeding 10.5 knots (12 mph) for AAC and ADG of A-I and B-I; 13 knots (15 mph) for AAC and ADG of A-II and B-II; 16 knots (18 mph) for AAC and ADG of C-I through D-II; and 20 knots for AAC and ADG of A-IV through D-VI.

Wind data obtained from the National Climatic Data Center (NCDC) was extracted from the onsite Automated Surface Observing System (ASOS) at Tacoma Narrows Airport. The FAA requires a minimum of 10 years of wind data to assess whether an airport has at least 95% coverage on the primary runway. Tacoma Narrows’ wind data covers the period from 2000 to 2009.

Based on this all-weather wind analysis for Tacoma Narrows Airport, utilizing the FAA Airport Design Software supplied with AC 150/5300-13A, the existing single runway configuration provides excellent wind coverage (i.e., in excess of 99.59%) for each of the crosswind components (10.5 knots, 13 knots and 16 knots). Therefore, the single-runway airfield is sufficient for wind coverage. Table 3E illustrates the results of the wind analysis. Additionally, Exhibit 3A illustrates the All-weather wind rose for Tacoma Narrows Airport.
Table 3E. Wind Coverage Analysis

<table>
<thead>
<tr>
<th>Crosswind Component (knots)</th>
<th>10.5</th>
<th>13</th>
<th>16</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Weather Wind Coverage (%)</td>
<td>99.59</td>
<td>99.87</td>
<td>99.99</td>
</tr>
</tbody>
</table>

Source: National Oceanic and Atmospheric Administration, National Climatic Data Center, 72793 Tacoma Narrows, WA. Period of Record: 2000-2009

Exhibit 3A. All-Weather Wind Rose Tacoma Narrows Airport

Source: National Oceanic and Atmospheric Administration, National Climate Data Center 72793 Tacoma Narrows, WA. Period of Record: 2000-2009

Runway Length

The runway length requirements for Tacoma Narrows Airport, and for all airports, are influenced by several factors that include the Airport’s elevation, mean maximum daily temperature of the hottest month, runway gradient, critical aircraft and the stage length of the longest nonstop trip destination.

Runway length requirements are determined based on the guidance provided by AC 150/5325-4B, Runway Length Requirements for Airport Design, which specifies the use of the 5-Step procedure for determining runway length requirements for purposes of airport design.
It must be noted that, for small aircraft with a maximum takeoff weights (MTOW) of 12,500 pounds or less and larger aircraft with an MTOW of more than 12,500 pounds (up to and including 60,000 pounds), the use of the runway length curves specified by AC 150/5325-4B generates runway lengths equivalent to those generated using the FAA Airport Design Computer Program.

The airport’s 294 feet elevation above mean sea level (MSL), its 75.4 degrees Fahrenheit (F) mean maximum temperature of the hottest month and its runway ends elevation difference of 6.4 feet were among the variables that were inputted into the FAA’s Airport Design Computer Program. The results of the analysis are illustrated in Table 3F.

The current runway length of 5,002 feet is adequate for small airplanes. The first category of large aircraft runway length requirements listed in Table 3F identifies a length of 4,660 feet for dry conditions and 5,290 feet for wet and slippery conditions, which is adequate for 75% of large aircraft of 60,000 pounds or less, at 60% useful load. At 90% useful load, the required runway length requirement would increase to 5,890 feet for dry conditions and 6,710 feet for wet and slippery conditions.

### Table 3F. Runway Length Requirements

<table>
<thead>
<tr>
<th>Aircraft Category</th>
<th>Required Length (feet)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dry</td>
<td>Wet</td>
</tr>
<tr>
<td>Small airplanes with less than 10 passenger seats</td>
<td></td>
<td></td>
</tr>
<tr>
<td>75 percent of these small airplanes</td>
<td>2450</td>
<td>2450</td>
</tr>
<tr>
<td>95 percent of these small airplanes</td>
<td>2980</td>
<td>2980</td>
</tr>
<tr>
<td>100 percent of these small airplanes</td>
<td>3550</td>
<td>3550</td>
</tr>
<tr>
<td>Small airplanes with 10 or more passenger seats</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4070</td>
<td>4070</td>
<td></td>
</tr>
<tr>
<td>Large airplanes of 60,000 pounds or less</td>
<td></td>
<td></td>
</tr>
<tr>
<td>75 percent of these large airplanes at 60 percent useful load</td>
<td>4660</td>
<td>5290</td>
</tr>
<tr>
<td>75 percent of these large airplanes at 90 percent useful load</td>
<td>5890</td>
<td>6710</td>
</tr>
<tr>
<td>100 percent of these large airplanes at 60 percent useful load</td>
<td>5070</td>
<td>5500</td>
</tr>
<tr>
<td>100 percent of these large airplanes at 90 percent useful load</td>
<td>7320</td>
<td>7320</td>
</tr>
</tbody>
</table>

Source: FAA Airport Design Software

Additionally, since the Airport is currently serving business jet traffic and the forecasts project increases in this activity, a sample of business jets and their associated runway length requirements for the Airport is presented in Table 3G.

### Table 3G lists the aircraft from shortest to longest runway required at maximum takeoff weight and 75.4 degrees (mean maximum temperature of the hottest month). Runway 17-35’s 5,002 foot length can accommodate many of the listed aircraft, up through the Mitsubishi MU-300 Diamond at the Airport’s design temperature, but weight restrictions would apply on hotter days when the aircraft’s calculated runway length requirement is above 5,002 feet. Likewise, more aircraft listed in Table 3G can use the Airport at cooler temperatures, less than maximum fuel loads or less than maximum payloads. Longer runway lengths than shown in the table may be
required by company policy or federal regulations covering fractional jet ownership or charter operations.

**Runway Width**

The required runway width is a function of the Runway Design Code (RDC). As previously mentioned, Tacoma Narrows’ RDC is C-II/2400 and is forecast to remain the same through the 20-year planning period.

The required runway width for an RDC of C-II/2400 is 100 feet. Additionally, this runway width requirement is the same for runways where the first two components of the RDC (AAC and ADG) are C-II regardless of the third component (visibility minimum).

The existing runway width is 100 feet. The runway width of 100 feet would be sufficient for aircraft in the D-II category as well. Aircraft with an ADG component of III require a runway width of 150 feet.
Table 3G. Business Jet Runway Length Requirements at Tacoma Narrows (TIW)

<table>
<thead>
<tr>
<th>Business Jets</th>
<th>AAC and ADG</th>
<th>Approach Speed (knots)</th>
<th>Wing Span (ft)</th>
<th>Max. Takeoff Wt (MTOW) (lbs)</th>
<th>Runway Length TIW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cessna 551 Citation II/SP</td>
<td>B-II</td>
<td>108</td>
<td>51.8</td>
<td>12,500</td>
<td>2,997</td>
</tr>
<tr>
<td>Cessna 501 Citation I/SP</td>
<td>B-I</td>
<td>112</td>
<td>46.8</td>
<td>10,600</td>
<td>3,198</td>
</tr>
<tr>
<td>Cessna 500 Citation</td>
<td>B-I</td>
<td>108</td>
<td>47.1</td>
<td>11,850</td>
<td>3,309</td>
</tr>
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Source: Runway lengths derived from Airport NEWS, October 2001, FAA Central Region, which includes business jets modeled for standard conditions. Standard conditions were corrected for TIW conditions.
Other Runway Design Standards

Several additional design standards outlined by the FAA should be considered in the planning and design of airports. These include:

Runway to Parallel Taxiway Separation: The purpose of the runway to taxiway separation standard is to provide adequate wingtip clearance. Tacoma Narrows does have a full-length parallel taxiway, designated as Taxiway A, at a 350-foot runway to taxiway centerline separation. For an RDC of C-II/2400, the recommended runway to taxiway separation is 400 feet. The existing 350 feet separation does not meet the requirement. This means that some new approaches associated with the NextGen technology, such as the Required Navigation Performance (RNP) approach cannot be written unless the standard 400-foot separation standard is met.

Runway Safety Area: The identification of the existing and future RSA at an airport is important to ensure the RSA is located on airport property and is properly cleared and graded to comply with FAA standards. RSA’s are of particular importance to the FAA and receive high priority funding since they enhance the safety of aircraft that overshoot, undershoot or veer off the runway. The RSA also helps firefighting and rescue equipment to reach aircraft accidents. The RSA is a cleared and graded area centered about the runway centerline. The dimensions of the RSA are determined by the aircraft type and approach visibility minimums; The RSA runs the full length of the runway plus an extended distance beyond each runway end. Based on the RDC of C-II/2400, a RSA that is 500 feet wide and extends 1,000 feet beyond runway ends is required. The RSA for Runway 17 does meet this requirement, as a result of the Runway 17 Safety Area project completed in 2011. This project included the construction of a tunnel for Stone Drive. There is an access road within the Runway 17 Safety Area, but it is restricted access tower clearance required.

The RSA for Runway 35 does not meet the RSA requirement, due to a steep terrain drop-off, an access road within the safety area boundary, and a localizer shack, Antenna, and utility transformer located within the RSA. To bring the RSA into compliance, the County started a project in 2010, but the FAA cancelled the project due to the high cost to low benefit ratio. The RSA project may be reconsidered in the future depending on funding and the future cost/benefit of the improvement as activity at the Airport grows. Despite the project cancellation, only a small portion of the RSA is not in compliance. A modification to standards request should be submitted.

Runway Object Free Area (OFA): Like the RSA, the OFA is centered on the runway centerline, extends beyond the runway ends, and is determined by the design aircraft type and approach visibility minimums. The OFA is wider than the RSA (800 feet wide required for Tacoma Narrows) but it is the same length. The ROFA must remain clear of objects at the RSA elevation, but does not have a grading requirement. There are trees located within the OFA on the southwest side of the airport. Some of the trees are above the RSA elevation, so the OFA does not meet standards The OFA surface off the north end meets the design standard.
Runway Protection Zone (RPZ): The purpose of the RPZ is enhancing the protection of people and property on the ground. The RPZ is a trapezoidal area centered about the extended runway centerline and beginning 200 feet from the runway end. Pierce County should have full control of the RPZ through fee simple ownership and/or easements, but there are small portions outside of the County’s control—these should be acquired. Three parcels to be acquired within the RPZ for Runway 17 are located to the northwest across Point Fosdick Drive. All objects should be clear of the RPZ but limited uses are permitted.

Obstacle Free Zone (OFZ): The runway OFZ is airspace centered on the runway centerline and extending 200 feet beyond each runway end. It is a three dimensional volume of airspace which protects for the transition of aircraft to and from the runway. The OFZ clearing standard precludes taxiing and parked airplanes and object penetrations, except for frangible NAVAID locations that are fixed by function. Additionally, vehicles, equipment, and personnel may be authorized by air traffic control to enter the area using the provisions of FAAO JO 7110.65, Para 3-1-5, VEHICLES/EQUIPMENT/PERSONNEL ON RUNWAYS. The runway OFZ and the inner-approach OFZ, and, when applicable, the inner-transitional OFZ, comprise the OFZ. The OFZ for Tacoma Narrows Runway is 400 feet wide.

Inner Approach OFZ: For runways with an approach lighting system, an Inner-approach OFZ is required. The Inner-approach OFZ is airspace centered on the approach area at the same width as the Runway OFZ, beginning at 200 feet from the runway end, and extending at a 50:1 slope out 200 feet past the light unit in the approach lighting system, as outlined in FAA AC 150/5300-13A. An Inner-transitional Approach OFZ is only required for precision instrument approach runways with less than ¾-mile visibility and is located along the sides of the Runway OFZ and Inner-approach OFZ.

Threshold Siting Surface: The Threshold Siting Surface (TSS) is utilized to locate runway threshold in order to meet approach obstacle clearance requirements. The dimensions of TSS vary with the type of aircraft operations, the approach visibility minimums, and the types of navigational instrumentation. For Runway 17-35, the starting point and the clearance slope are different for each runway. The following describes the TSS for each runway in accordance with FAA AC 150/5300-13A (Para. 303).

- For Runway 17, the threshold siting surface starts 200 feet from the approach end of the runway at 800 feet wide, and extends out at a 34:1 obstacle clearance scope for 10,000 feet where its ultimate width is 3,800 feet wide.

- For Runway 35, the threshold siting surface starts at the approach end of the runway at 400 feet wide and extends out at a 20:1 obstacle clearance scope for 10,000 feet where its ultimate width is 1,000 feet wide.
**Surface Gradient:** The maximum allowable longitudinal grade on the existing runways is 1.5%, which is associated with Aircraft Approach Category C and D. Based on the recently completed runway rehabilitation project, maximum longitudinal grade on the runway is 0.5%, well below the grading threshold.

**GRASS STRIP**

In the early stages of the planning process, airport users identified several issues to address in the Master Plan including a possible grass strip on the west side of the airfield to better serve the broad range of aviation activity in the community. These grass strips are often used by gliders, ultralights, or taildraggers. The subsequent development alternatives element will look at a possible location. The grass strip/turf runway location must satisfy FAA design standards, as outlined in this chapter, to ensure airfield operations are conducted in a safe and effective manner.

**HELICOPTER FACILITIES**

Helicopter operations currently represent an estimated 4% of total airport operations, which is nearly 1,938 annual operations. Helicopter operations are forecast to represent 5% of the total operations (3,266 operations) by 2032. There is no officially designated helipad or heliport on the airfield so helicopters may arrive on a runway approach and hover-taxi to the apron for parking. There is an unofficial training helipad on the west side of the runway. Although rotor wash damage has not affected fixed wing aircraft in the past and due to the high current and forecast levels of helicopter activity, providing a separate helicopter area should be considered to minimize interaction with fixed-wing aircraft.

**TAXIWAYS**

The primary function of taxiways is to facilitate aircraft movements to and from the runway system. While some taxiways are simply necessary to provide access between the aprons and runways, others are necessary, as activity increases, to provide for the safe and efficient use of the airfield.

As detailed in Chapter One, Draft Inventory, Tacoma Narrows’ taxiway system consists of a full-length parallel taxiway, designated as Taxiway A, at a 350-foot runway to taxiway centerline separation. The parallel taxiway is 75 feet wide and provides four connecting taxiways to the runway, designated as Taxiways A1, A2, A3 and A4. The four connecting taxiways are 50 feet wide. However, Taxiway A4 includes a hold apron, which widens up to 155 feet wide.

The western portion of the apron is designated as Taxiway B, between the north end of the apron and extending to the south. There are also four connecting taxiways between the apron areas.
and parallel Taxiway A. The apron to Taxiway A connectors are designated as B1, B2, B3, and C, from north to south; Taxiway C is 50 feet wide while others are 75 feet wide.

FAA guidance recommends that connecting taxiways be offset rather than provide a direct line access from the apron to the runway. Taxiway C and A3 are aligned so this configuration should be modified.

Taxiway width is a function of the newly established Taxiway Design Group. As previously mentioned, all taxiways at Tacoma Narrows belong to TDG 2. The required width for TDG 2 is 35 feet. TDG 3 and 4 require a taxiway width of 50 feet.

All taxiways at TIW meet or exceed the width requirements for TDG 2. As part of the recent pavement rehabilitation project, Pierce County reviewed taxiway width needs. The County elected to keep the connector taxiways at 50 feet wide in lieu of reducing them to the minimum standard of 35 feet. Since the additional 15 feet of pavement was not eligible for federal funding, the County paid for the additional pavement width.

As previously mentioned, the 350-foot separation between the runway and Taxiway A centerline is short of the 400-foot separation required for RDC C-II/2400. The relocation of Taxiway A to comply with the 400 feet separation requirement is needed.

Taxiway and taxilane object free area (TOFA) are a function of the design aircraft ADG. Taxiways accommodating ADG II aircraft require 131 feet (65.5 feet on either side of the centerline) while taxilanes serving ADG II aircraft require 115 feet (57.5 feet on either side of centerline) for object free area clearance. All taxiways and taxilanes at the Airport meet the TOFA standards as described above.

APRONS AND AIRCRAFT PARKING

The parking apron should provide enough space for locally-based aircraft that are not housed in hangars, transient aircrafts and for maintenance activity. Since the calculation of apron space is dependent on the availability or lack of hangar space, the calculation will be provided in the landside requirements section following the hangar space narrative and calculations.

AIRPORT PAVEMENT STRENGTH AND CONDITION

The most important feature of an airfield pavement is its ability to withstand repeated use by aircraft of significant weight. Pavement strength requirements are based on three primary factors:

- The weight of aircraft anticipated to use the airport;
• The landing gear type; and,
• The number of aircraft operations.

As detailed in Chapter One of this Master Plan, Runway 17-35 has a pavement strength rating of 50,000 lbs. single wheel loading (SWL) and 80,000 lbs. dual wheel loading (DWL). The taxiway and apron pavement strength ratings are estimated at 50,000 lbs. SWL. The pavement strength ratings are considered adequate for the type of aircraft that is expected to use the airport on a regular basis.

The FAA requires the airport sponsor receiving and/or requesting federal funds for pavement improvement projects to implement a pavement maintenance management program. The pavement maintenance management program must, among other things, develop Pavement Condition Index (PCI) rating. The rating is based on the guidelines contained in FAA Advisory Circular 150/5380-6, Guidelines and Procedures for Maintenance of Airport Pavements. WASP recommends a minimum PCI of 75 for runways and 70 for taxiways and aprons, where a PCI of 100 represents brand new pavement in perfect condition and a PCI of 0 represents completely failed pavement.

Runway 17-35 and the connecting taxiways (A1, A2, A3) between the runway and Taxiway A are in good condition, and were rehabilitated as part of the 2013 runway rehabilitation project. The pavement inspection conducted in August 2012 found that Taxiway A has a PCI rating between 74 and 75. Based on the above recommendation for relocating Taxiway A in order to provide the required 400 feet runway to taxiway centerline separation, this master plan recommends that the next pavement rehabilitation project for Taxiway A include the relocation of the Taxiway to 400 feet away from the runway.

**NAVIGATIONAL AIDS**

Airport and runway navigational aids are based on FAA recommendations, as defined in DOT/FAA Handbook 7031.2B, Airway Planning Standard Number One, and FAA Advisory Circular 150/5300-2D, Airport Design Standards-Site Requirements for Terminal Navigation Facilities.

Navigational aids provide two primary services to airport operations: precision guidance to a specific runway and/or non-precision guidance to a runway or the airport itself. The basic difference between a precision and non-precision navigational aid is that the former provides electronic descent (vertical guidance) alignment (course) and position guidance, while the non-precision navigational aid provides only alignment and position location information. The necessity of such equipment is usually determined by design standards predicated on safety considerations and operational needs. The type, purpose and volume of aviation activity expected at the airport are factors in determination of the airport's need for and eligibility for navigational aids.
The Washington Aviation System Plan (WASP) establishes the instrument approach objective for Commercial Service and Regional Service Airports as:

- At least one runway end has instrument approach with approach visibility minimums lower than ¼ mile.

Runway 17-35 is equipped with medium intensity runway lights and precision approach path indicators (PAPI) on both ends, which provide pilots with vertical guidance to the runway. Both PAPI systems are pilot-activated when the ATCT is closed (8PM to 8AM) and are in good operating condition. The FAA owns and maintains the PAPI systems. Runway 17 is equipped with a medium intensity approach lighting system (MALSR) with runway alignment indicator lights, which, in conjunction with a localizer, a glide slope (GS) and an instrument landing system (ILS), provide this runway end with a CAT I precision approach. The visibility minimums for the approach procedure are at ½ mile, which meets the performance objective of WASP. Runway 17 also has a RNAV (GPS) approach.

Runway 35 is equipped with runway end indicator lights. This runway end has a published NDB and RNAV (GPS) non-precision approach. The beacon is located east of the building area and generally aligned with midfield, is in good operating condition and will meet the airport’s needs through the planning period.

Additionally, a lighted wind indicator, contained in a segmented circle near mid-field on the east side of Taxiway A, and supplemental wind indicators are providing pilots with visual guidance on wind conditions. The County is in the process of installing two new supplemental wind cones. All such equipment should be periodically checked and replaced, as needed.

WEATHER REPORTING

The airport is equipped with an Automated Surface Observing System (ASOS), which provides automated aviation weather observations 24 hours a-day. The system updates weather observations every hour, or when significant changes in weather conditions occur. The ASOS is operated and controlled by the National Weather Service, in cooperation with the FAA and Department of Defense (DOD).

The ASOS system reports cloud ceiling, visibility, temperature, dew point, wind direction, wind speed, altimeter setting (barometric pressure), and density altitude (airfield elevation corrected for temperature).

The ASOS is located on the east side of parallel Taxiway A near the Taxiway A connector. Airport users obtain weather data from the ATCT during its operational hours (8AM to 8PM), but obtain weather data from the ASOS when the ATCT is closed. The ASOS is capable of providing weather information to airport users on a 24/7 basis.
AIRFIELD LIGHTING

The runway is equipped with a medium intensity runway lighting (MIRL) system, which was installed in 2013.

A Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR) is on Runway 17 and is found in good operating condition. The system can be controlled by pilots of properly equipped aircraft by using a series of clicks on their radio transmitter. Aircraft on approach at night, after the ATCT has closed, can activate the system through the approach procedure.

A Runway End Identifier Lighting (REIL) system is on the Runway 35 end. The REIL system is recommended by the NBAA for airports serving business aviation.

Airports with greater than 100 based aircraft are generally required to provide taxiway lighting. All taxiway pavements are equipped with medium intensity taxiway lighting (MITL).

AIRFIELD MARKING AND SIGNING

Runway markings are designed according to the type of instrument approach available on the runway. FAA AC 150/5340-1F, Marking of Paved Areas on Airports, provides guidance necessary to design an airport’s markings.

As part of the ongoing airport 2013 runway rehabilitation project, all runway signs and markings were replaced. Markings on Taxiways A, A1, A2, A3, and A4 were also restriped. The new airfield signage provides directional guidance that follows FAA standards. All taxiways are marked with taxiway centerlines and proper hold bars adjacent to runways.

LANDSIDE REQUIREMENTS

Landside facilities are those located beyond the aircraft movement areas and are necessary for the handling of aircraft and passengers while on the ground. These facilities provide the interface between the air and ground transportation modes. Landside facilities include the terminal building(s), air traffic control tower (ATCT), hangars, and other aviation facilities, services and support.

GENERAL AVIATION TERMINAL(S)
The general aviation terminal space requirements include the space required for a pilot lounge, flight planning room, management, storage, vending machines and various other needs. The estimation of the terminal facilities needs is based on the number of airport users that are expected to use these facilities during the design hour. Industry practices are to provide 120 square feet per design hour itinerant passenger. The number of passengers is determined by multiplying design hour itinerant operations by the number of passengers per aircraft (occupancy factor). An increasing occupancy factor was used (1.8 in 2013 to 2.2 in 2032) to account for the industry trend moving towards larger, more sophisticated aircraft using the airport.

Table 3I illustrates the terminal area facilities requirements.

Table 3I. General Aviation Terminal Space Requirements

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Source: WHPacific

The general aviation terminal facilities space at Tacoma Narrows Airport is generally provided by the two FBOs operating at the airport, Tacoma Narrows Flight Center and PAVCO. However, FBO input suggests that airport users need a designated GA terminal to meet the long-term needs of pilots, passengers, and airport visitors. Table 3I space requirements could be served by a combination of FBO facilities and a small terminal with expansion potential in the future.

**AIR TRAFFIC CONTROL TOWER**

The ATCT at Tacoma Narrows has been in operation since 1973 and is a federal contract tower that operates daily for 12 hours (8AM to 8PM). The ATCT has a top elevation of 339 feet. The ATCT is in good condition and its location at midfield along the aircraft apron edge provides adequate line of sight to all aircraft movement areas.

Although Tacoma Narrows ATCT’s was on the list of 149 towers across the nation identified to close due to budget restrictions resulting from the government sequestration, recent legislation to end air traffic controller furloughs has afforded the FAA enough flexibility to keep funding air traffic control towers that were on the closure list.
HANGARS

The space required for hangar facilities is dependent upon the number and type of aircraft expected to be based at the airport. Other factors that can influence hangar use include the intensity of weather conditions, security concern, hangar lease rates and hangar space availability.

Aircraft hangars at the Airport provide storage for many of the based aircraft at the Airport as well as for some limited transient aircraft. There are County-owned hangars as well as tenant-built hangars on ground leases.

Hangar space at the Airport is occupied by private aircraft owners as well as businesses. According to the County, there are approximately 150 agreements with tenants on the airport, most of which are for hangars. Two new hangars, one conventional and one T-hangar building, are proposed for construction this year on ground leases with the County.

Currently, 109 (83%) based aircraft at the Airport are stored in hangars with the remaining 23 (17%) using tiedown space. The forecast chapter estimated that the number of based aircraft will increase by 29 aircraft by 2032. This increase includes 21 single engine aircraft, 1 multi-engine aircraft, 5 jets and two helicopters.

The analysis assumes that all newly based aircraft will require hangar space, which is the preferred method of storage, particularly with the newer and more expensive aircraft. Additionally, it is assumed that 90 percent of single engine aircraft will require T-hangar space with the remaining 10 percent of single engine aircraft and 100 percent of multi-engine aircraft, jets and helicopters requiring conventional hangar space.

A planning standard of 1,200 square feet per single engine aircraft has been used along with a planning standard of 3,000 square feet per multi-engine aircraft, jet or helicopter. Since portions of conventional hangars are also used for aircraft maintenance and servicing, requirements for maintenance/service hangar area were estimated using a planning standard of approximately 15 percent of the total hangar space needs.

Table 3J outlines the additional hangar space needed throughout the 20 year planning period.
Table 3j. Additional Hangar Space Needed (square feet)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Additional Aircraft:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Additional Single Engine</td>
<td>6</td>
<td>4</td>
<td>11</td>
<td>21</td>
</tr>
<tr>
<td>Additional Multi-engine</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Additional Jets</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Additional Helicopters</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>7</td>
<td>7</td>
<td>15</td>
<td>29</td>
</tr>
<tr>
<td><strong>Hangar Positions:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T-hangar</td>
<td>5</td>
<td>4</td>
<td>10</td>
<td>19</td>
</tr>
<tr>
<td>Conventional</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>7</td>
<td>7</td>
<td>15</td>
<td>29</td>
</tr>
<tr>
<td><strong>Hangar Area Requirements (s.f.):</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T-hangar Area</td>
<td>6,000</td>
<td>4,800</td>
<td>12,000</td>
<td>22,800</td>
</tr>
<tr>
<td>Conventional Hangar Area</td>
<td>4,200</td>
<td>9,000</td>
<td>16,200</td>
<td>29,400</td>
</tr>
<tr>
<td>Maintenance Area</td>
<td>630</td>
<td>1,350</td>
<td>2,430</td>
<td>4,410</td>
</tr>
<tr>
<td><strong>Total Area Required for New Based Aircraft</strong></td>
<td>10,830</td>
<td>15,150</td>
<td>30,630</td>
<td>56,610</td>
</tr>
<tr>
<td><strong>Existing Hangar Area Available</strong></td>
<td>&gt; 60,000</td>
<td>&gt; 60,000</td>
<td>&gt; 60,000</td>
<td>&gt; 60,000</td>
</tr>
<tr>
<td><strong>Total Additional Area Needed</strong></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: WHPacific

As provided in Table 3j, a total of 56,610 square feet of hangar space would accommodate the 29 additional based aircraft during the planning period. With excess hangar capacity today, no additional hangar construction is needed during the planning period. However, future hangar development areas should be designated for long-term planning purposes.

County-owned hangars are in fair to good condition with some facilities needing improvements in the near-term, and several County-owned hangar doors need repair/replacement. As all facilities age, more improvements will be needed in the mid- to long-term, too.

**OTHER BUILDINGS**

A building adjacent to the ATCT has historically served as a restaurant. The previous restaurant closed its doors in January 2013 after 16 months, but a new tenant is moving in with plans to open their restaurant in mid-September. No specific facility requirements are identified for the building as improvements will be made by the new tenant, which are presently under way.

Runway and taxiway regulators are installed in an electrical vault, which were constructed as part of the runway rehabilitation project. There is also a generator which provides backup power to the runway and taxiway lighting. The newly constructed structure is in good condition and will serve the needs of the Airport through the planning period.
AIRCRAFT PARKING APRON

An aircraft parking apron should be designed to accommodate transient aircraft as well as locally based aircraft that are not stored in hangars. The number of tiedowns required is based on the number of potential based aircraft as well as an estimated percentage of transient aircraft requiring tiedown space.

As noted in the analysis of hangar space requirements above, it is expected that all future based aircraft will prefer enclosed hangar storage facilities. If hangars are not provided, additional apron space may be required. However, the Airport has an estimated 20 vacant tiedown spaces for aircraft parking on the apron.

Transient apron space is determined by estimating the percentage of busy-day operations that will require tiedown space at a given time.

A planning criterion of 360 square yards per based aircraft and 500 square yards per transient aircraft was used to determine the apron requirements. These dimensions take into the account the space needed for circulation, taxilane Object Free Areas (OFA) and wingtip clearances.

Table 3K illustrates the analysis of apron space need for the planning period.

<table>
<thead>
<tr>
<th>Operations</th>
<th>Existing</th>
<th>2017</th>
<th>2022</th>
<th>2032</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual operations</td>
<td>48,463</td>
<td>52,203</td>
<td>56,241</td>
<td>65,306</td>
</tr>
<tr>
<td>Peak Month</td>
<td>5,331</td>
<td>5,742</td>
<td>6,187</td>
<td>7,184</td>
</tr>
<tr>
<td>Design Day (Average Day of Peak Month)</td>
<td>172</td>
<td>185</td>
<td>200</td>
<td>232</td>
</tr>
<tr>
<td>Itinerant Operations (60% of Design Day)</td>
<td>104</td>
<td>111</td>
<td>120</td>
<td>140</td>
</tr>
</tbody>
</table>

**Table 3K. Apron Space Requirements**

<table>
<thead>
<tr>
<th>Itinerant Aircraft</th>
<th>Itinerant Aircraft Landing</th>
<th>52</th>
<th>56</th>
<th>60</th>
<th>70</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Aircraft Simultaneously Parked (50%)</td>
<td>26</td>
<td>28</td>
<td>30</td>
<td>35</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Based Aircraft</th>
<th>Existing Based Aircraft Using Apron</th>
<th>23</th>
<th>23</th>
<th>23</th>
<th>23</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Apron Tiedowns - Required Positions</th>
<th>Total Aircraft Parked</th>
<th>49</th>
<th>51</th>
<th>53</th>
<th>58</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Existing Aircraft Tiedowns (Capacity)</td>
<td>108</td>
<td>108</td>
<td>108</td>
<td>108</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Demand/Capacity Ratio</th>
<th>45%</th>
<th>47%</th>
<th>49%</th>
<th>54%</th>
</tr>
</thead>
</table>

Source: WHPacific
As illustrated in Table 3J, the existing apron area, which includes 108 tiedowns (and 58,400 square yards), is sufficient for the planning period to serve tiedown needs. Despite the calculated demand/capacity results, FBO input specifically outlined the need for more apron area, particularly for circulation during day-to-day operations. Since apron area circulation improvements may be a combination of configuration and expansion, the development alternatives should look at future apron needs.

**AVIATION BUSINESSES AND SERVICES**

*Fixed Base Operators*

An FBO provides various aeronautical services such as fueling, parking transient aircraft, hangars, flight training, and aircraft maintenance. The FAA defines Fixed Base Operator (FBO) as “an individual or firm operating at an airport and providing general aircraft services such as maintenance, storage, and ground and flight instruction.” FBO services at Tacoma Narrows Airport are provided by two private companies, Tacoma Narrows Flight Center and PAVCO Flight Center. As noted in the Inventory Chapter, the FBOs offer numerous services. According to discussion with each FBO as part of the planning study, there are no expansion plans at this time since demand for their facilities and services is adequately served, primarily due to the substantial drop in operations and slow return to historical levels.

*Fuel Storage and Provision*

Both Airport FBOs provide and sell 100LL and Jet A fuel. There are two separate fuel storage locations and each has a 10,000-gallon storage tank of 100LL and 10,000-gallon tank of Jet A, totaling 20,000 gallons of fuel storage capacity for each type of fuel. One FBO uses fuel trucks to provide aircraft fueling; the second FBO is able to directly fuel aircraft parked in front of its facility. A self-serve fuel facility is also available at the north end of the parking apron with 20,000 gallons storage. In total, the Airport has a fuel storage capacity of 60,000 gallons.

Fuel sales records collected from the FBOs show that a total of 186,784 gallons of fuel were sold in 2012. This represents, on average, 4.24 gallons per operation. It is expected, due to the trend of increasing size of based aircraft and distances they travel, that the average of gallons per operation will increase.

The forecasts estimated that total annual operations will reach 65,306 annual operations by 2032 with the peak month operations reaching 7,184 operations. Expecting that the fuel usage per operation will increase by 25% to 5.3 gallons per operation by 2032, the peak month operations will require a total of 37,885 gallons.

It is generally required that an airport have enough fuel storage capacity for two weeks of operations. The fuel storage capacity at Tacoma Narrows exceed, currently and for the remainder of the planning period, the fuel required for the peak month operations.
**Aircraft Maintenance**

The Washington Aviation System Plan recommends that Regional Service airports provide full-service FBO and major maintenance services. The system plan defines major maintenance services as “repairs that may affect weight, balance, structural length, power plant operations, flight characteristics, or other qualities affecting air worthiness.”

The maintenance services offered by the FBOs at Tacoma Narrows qualify as major maintenance services based on the above definition and do meet the WASP objectives for a Regional Service Airport.

**Road Access and Vehicle Parking**

A single roadway provides access into the Airport via 26th Avenue NW, which runs north-south along the Airport property boundary adjacent to the landside facilities where auto parking is provided. Air traffic and, consequently, auto traffic has decreased in recent years so access roadway capacity is not an issue. However, a secondary roadway into the Airport would enhance access to facilities and better serve future airport development. Development alternatives presented in the next master planning element will assess the potential need for additional access to the Airport and specific development areas.

The existing number of auto parking spaces is expected to be adequate for the planning period. However, space should be reserved for expansion of the vehicle parking area should parking needs outpace anticipated demand. Presently, the main public auto parking area provides 70 auto parking spaces to serve nearby Tacoma Narrows Flight Center (FBO), the Airport staff office, ATCT, restaurant, office tenants, and Customs. Additional parking, which consists of 19 spaces is south of the main parking area and serves PAVCO (FBO) and Tosch Aircraft. Other auto parking is adjacent to many of the hangars with the majority serving the private aircraft owners/tenants and their visitors.

The existing number of parking spaces is expected to be adequate for the planning period. However, space should be reserved for expansion of the vehicle parking area should parking needs outpace anticipated demand.

**Special Land Uses for Businesses**

Tacoma Narrows Airport’s proximity to Seattle, convenient access to major surface transportation roadways, and more efficient air transportation access for corporate aviation than SeaTac Airport make the Airport more attractive to future business tenants. These business tenants might include a manufacturer of aircraft or aircraft parts, or other aviation-related businesses. The County recognizes the revenue-generating possibilities at the Airport and should consider identifying one or more parcels of property for aviation-related tenants. While non-aeronautical development on the Airport could help diversify revenue sources, all such
development must be compatible with existing and planned aviation development and all revenues generated must go back into the Airport. The development alternatives should consider the opportunities to better serve the community’s economic growth in an aviation-compatible manner.

**EMERGENCY SERVICES AND SECURITY**

*Firefighting and Law Enforcement*

Emergency services include firefighting and law enforcement for the Airport. Fire and Medic One (Pierce County Fire District # 5) provides aircraft rescue and firefighting from an off airport station with a response time to an airfield incident of less than five minutes. There are 12 fire hydrants located on the Airport to serve the buildings area. The Pierce County Sheriff’s Department provides law enforcement support for the Airport.

Tacoma Narrows is not required to provide Aircraft Rescue and Fire Fighting (ARFF) since the Airport does not have the commercial passenger service that would require a Part 139 certificate.

It is important to note that as part of the WASP, electronic town hall meetings were conducted in which more than half of the respondents (58%) placed a high funding priority on supporting emergency services such as fire control.

*Security*

General aviation airports have very different security needs and limited resources in comparison to airports with airline service. The TSA, recognizing these differences, created an office focused specifically on security issues affecting general aviation. In order to guide airport sponsors like Tacoma Narrows in determining what security enhancements they should consider, the TSA published Security Guidelines for General Aviation Airports (IP A-001) in May 2004. The document contains an “Airport Characteristics Measurement Tool” that uses points to assess security risks for different airport characteristics.

**Table 3L** summarizes the results of the security assessment for Tacoma Narrows Airport.
Table 3L. GA Airport Security Assessment for Tacoma Narrows Airport

<table>
<thead>
<tr>
<th>Security Characteristics</th>
<th>Public Use Airport (Existing Conditions)</th>
<th>Public Use Airport (Ultimate Conditions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within 30 nm of mass population areas</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Within 30 nm of a sensitive site</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Greater than 101 Based Aircraft</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Based Aircraft over 12,500 lbs.</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Runway 5,000 feet or greater</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Asphalt or Concrete Runway</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Over 50,000 annual aircraft operations</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Part 135 Operations</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Flight Training</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Rental Aircraft</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>31</strong></td>
<td><strong>35</strong></td>
</tr>
</tbody>
</table>

*Source: Security Guidelines for General Aviation Airports (IP A-001), May 2004, and Tacoma Narrows Airport Conditions*

Based on the current and future score of Tacoma Narrows on the GA Airport Security Assessment, the TSA recommends the following:

- Perimeter Control
- Protective Lighting Systems
- Personnel and vehicle Identification Systems
- Airport Community Watch program

It must be noted that Tacoma Narrows is presently fenced with restricted access gates to enhance security, but there are gaps in the fencing allowing unauthorized entry that should be addressed with fencing improvements in the near-term. According to FBO input, aircraft in County-owned hangars to the north have been broken into on multiple occasions. The County stated that there have been thefts at the south end of the Airport as well. The Airport used to have night security, which was later discontinued. However, the presence of staff at the ATCT, FBOs, and other businesses enhances the day-to-day security at the Airport.
DRAINAGE AND UTILITIES

Drainage

The airport is located within the Gig Harbor Basin. The basin is located on a peninsula extending southward into Puget Sound. It is bound on the west by the Carr Inlet and Henderson Passage, on the east by the Tacoma Narrows, and on the south by Hale Passage. As defined in the Gig Harbor Basin Plan, the airport lies within four subbasins: Point Evans, Sullivan Gulch, Magnolia, and Doc Weathers Drainage Basins.

The eastern portion of the airport, including the apron area, lies within subbasin 25: Doc Weathers. Runoff is collected by a system of catch basins and pipes, and flows to the east.

East of the Runway 17-35 centerline, the airport lies within subbasin 15: Point Evans. Runoff is collected by a system of catch basins and pipes. The main storm drainage trunk line runs between Runway 17-35 and Parallel Taxiway A. This conveyance system flows to the south, to an outfall at the south end of the airport.

West of the Runway 17-35 centerline, the airport lies within subbasin 16: Magnolia. Stormwater sheet flows off of the pavement and grassed areas, and is collected in a ditch. The ditch begins at the northern end of Subbasin 16, and extends approximately 2,400’ to the south, where it outfalls at the base of a slope. Stormwater then appears to sheet flow west, down a hillside, where it is collected in a gulch and conveyed in an unnamed stream to Wollochet Bay.

The northwest portion of the airport lies within subbasin 14: Sullivan Gulch. Surface water flows northwest, and is discharged into the Stone Drive NW conveyance system. The system flows under Pt. Fosdick Drive and continues in a northwest direction to a creek located in Sullivan Gulch, which flows into Wollochet Bay.

There is an existing stormwater facility located east of Taxiway A, between Taxiway B3 and C. Based on conversations with County staff, this stormwater facility does not appear to be used, even during significant storm events. The facility should be evaluated to determine if it is oversized, or if it can accommodate stormwater runoff from future airport development.

Water

The Tacoma Narrows Airport water system includes a single groundwater well with a submersible pumping system, two concrete water storage tanks, two domestic supply booster pumps, liquid chlorination system, two diesel engine-driven pumps for fire protection flow, and distribution mains and hydrants. These elements are generally located at or near the south end of the airport, along the east side. Components of the system vary in age from approximately 11 to 50 years.
An analysis of the water system was completed by Kennedy/Jenks Consultants in 2010. The final report included recommendations for immediate, short-term, and long-term improvements to the water system.

A peer review of the Kennedy/Jenks Report was completed in 2011 by Northwest Water Systems. This review included modified recommendations for immediate, short-term, and long-term improvements to the water system. In general, the scope of the improvements recommended was less than the improvements recommended in 2010.

In March of 2013, Kennedy/Jenks Consultants completed a seismic evaluation of the existing water tanks, and concluded that the existing tanks do not have the strength to withstand the loads prescribed by the current building code. The report included proposed system retrofits to permit continued use of the water tanks after a seismic event.

All future development at the Airport should consider water improvement needs.

**Sanitary Sewer**

There is currently no sanitary sewer service at the airport; sanitary sewer drains to a system of septic tanks and drain fields. The Gig Harbor Sanitary Sewer Treatment Plant does not serve the Airport, as the Airport is not within City limits. The Chambers Creek Regional Wastewater Treatment Plant does not serve the Airport either. At this time, additional development at the Airport will require additional septic tanks/drain fields or other on-site treatment and disposal system.
Chapter Four
ALTERNATIVES

Tacoma Narrows Airport
Master Plan Update

This chapter walks through the process of identifying and evaluating development alternatives to serve the Tacoma Narrows Airport (Airport) in the near-term to the distant future. Proposed improvements will meet the 20-year projected aviation demand identified in Chapter 2, Forecasts, by incorporating facility needs and recommendations outlined in Chapter 3, Requirements. However, as evident in Chapter 3, the Tacoma Narrows Airport is presently providing the majority of airport facility needs identified for the 20-year planning period—a credit to ongoing proactive support in maintaining facilities and the simple fact that the decline in aviation activity in recent years created excess capacity and a retreat of the timeline for improvements as the aviation industry gradually recovers.

Nevertheless, the development alternatives consider aviation demand and facility improvement needs beyond the 20-year planning period in order to protect the long-term viability of the Airport. Further, this prudent planning approach today allows Pierce County to respond to unforeseen needs in the future.

While there are numerous possibilities for airport development, this chapter presents three development alternatives that accommodate airside and landside improvements. Since all
development components are evaluated individually and as one overall concept, it is likely that Pierce County will define an additional development alternative that is a composite of those presented in this chapter. This is often the case in similar planning studies as it allows the airport sponsor and community to choose an alternative that represents the most favorable components to meet their needs while still complying with FAA design standards and serving the local, regional, state, and national air transportation system.

The development alternatives identified in this chapter were presented to the Planning Advisory Committee (PAC) for review and discussion during a January 29, 2014 meeting; the meeting concluded with the PAC’s preliminary selection of a preferred alternative to be recommended to Pierce County. A public open house followed the January 29th PAC meeting so the public could review the alternatives, ask questions, provide comments, and be presented with the PAC’s preliminary recommendations for a preferred development alternative.

Following the PAC meeting and open house, the PAC’s preferred alternative was refined in coordination with key County staff prior to its submission to Pierce County for review and official selection of a preferred alternative. The County’s selection will take into consideration the PAC’s recommendation, the public’s input, and Pierce County’s goals for the future of the Airport. The selected alternative, referred to as the preferred alternative, is the basis for updating the Airport Layout Plan drawing set and the Airport’s Capital Improvement Plan to be addressed in subsequent chapters.

The sections that follow outline four key steps in the alternatives process:

1. Site analysis to include the identification of opportunities and challenges for development.
2. Identification of specific development alternatives.
3. Comparative evaluation of the development alternatives.
4. Selection of a preferred alternative.

**SITE ANALYSIS**

Before alternatives are identified, it is important to understand the various opportunities for development as well as the potential challenges or constraints associated with improvements at the Airport. A site analysis provides the understanding of these opportunities and challenges. Development opportunities are those site features that offer flexibility and possibility in development; an example would be vacant/undeveloped land. Development challenges are limitations or constraints at or around the Airport that may restrict or prohibit development and/or would require substantial cost, mitigation, and/or complex engineering solutions to overcome.

A list of the physical development opportunities and challenges that influence the Airport’s development potential is outlined here:
Opportunities

• Existing airport property on west side is vacant/undeveloped.
• Possible acquisition of additional vacant/undeveloped parcel adjacent to airport property on west side.
• Two existing undeveloped airport property parcels on the east side located on the far north and far south end of building area – one near Stone Drive and 26th Avenue NW intersection and the other near 4th Street NW.
• Exiting utility infrastructure.
• Undeveloped airport property aligned with Runway 17 and 35 extended centerline (beyond runway ends) allows for long-term approach/departure airspace protection and possible runway extension in the distant future, when such an extension is justified.
• Limited to no known documented environmental issues on the Airport.
• Possible second airport access to west side available off Stone Drive.

Challenges

• Steep grades and open water south of Runway 35 end.
• Close proximity of Stone Drive and Point Fosdick Drive -- both roadways are in Runway 17 Runway Protection Zone.
• Undeveloped west side includes steep grades located along the southern 1,500 feet of Runway 17-35.
• Existing stormwater ditch located east of Taxiway A, between Taxiways B3 and B4. This will have to be filled and relocated to allow the parallel taxiway to be reconstructed at the FAA-standard runway to taxiway centerline separation.
• Lack of sanitary sewer service; additional septic tanks/drain fields or other on-site treatment and disposal system needed for any future development.
• Nearby trees with existing and potential obstruction in protected airspace.
• Residential/noise-sensitive development near Airport (east of airport boundary, south half of airport).
• Existing landside on east side is near capacity, limited development potential.
• Steep grade east of 26th Avenue NW near Stone Drive.
COMMON FEATURES

While various development alternatives are presented in the next section to offer options for accommodating aviation demand, there are some basic improvements included in all of the alternatives with the exception of the No Action. These basic improvements are identified as common features since they are inherent in all development alternatives.

Common features include:

- Relocate/Remove existing stormwater facility. The existing stormwater ditch located east of Taxiway A, between Taxiways B3 and B4, will have to be filled and relocated to allow the parallel taxiway to be reconstructed at the FAA-standard runway-to-taxiway centerline separation.

- Relocate Parallel Taxiway A to meet the 400-foot runway-to-taxiway centerline separation for C-II. As noted in the previous Requirements Chapter, the current runway-to-taxiway centerline separation is insufficient and is not in compliance with FAA design standards. Further, compliance with the FAA-required 400-foot separation is a prerequisite for implementing NextGen technology.

- Relocate Taxiway B4 to eliminate direct access from apron to runway. FAA guidance requires airports to offset taxiways that presently provide direct access from the apron to runway so pilots are required to make 90-degree turns to access the runway. These turns are intended to enhance the pilot’s awareness of their location on the airfield to reduce runway incursions.

- Redevelop three building areas where structures are in poor condition.

IDENTIFICATION OF ALTERNATIVES

To kick-off the task of identifying long-term development alternatives, a work session was held with Pierce County to review the development opportunities and challenges, recap the Airport’s airside and landside facility needs, and discuss the FAA design standards associated with those future needs.

Airside discussion recognized that while the current runway length is adequate for the existing aircraft fleet mix, long-term growth in corporate GA operations (described in Chapter 2, Forecasts) may ultimately result in justification for a runway extension. However, this is not anticipated in the near-term and it is acknowledged that any future runway extension design and construction will be preceded by a comprehensive runway length analysis effort to show justification. This justification will include updates to aviation activity and demand forecasting, and collection of airport user surveys and written letters detailing needs and resulting impacts to operations as a direct result of insufficient length – all elements important to the FAA before such a project would proceed with federal funding. However, the master planning study
provides the opportunity to identify and evaluate alternative concepts for addressing a possible need for a runway extension in the long-term, thus allowing the County and FAA to protect for such an extension.

Regarding landside development, the Airport presently has sufficient capacity to serve existing and projected aircraft apron parking and hangar storage needs. This excess capacity is a result of the economic downturn and related drop in operations and based aircraft in the past few years before the economy and aviation activity started its recovery. Therefore, landside development concepts focused primarily on more distant future improvements to serve GA and acknowledge the County’s interest and ongoing efforts in attracting more corporate/business tenants to support economic growth in the community.

Since the identification of airside development alternatives did not limit development on the landside, the components are combined and complementary. Further, consideration of airport improvements beyond the projected aviation demand in the master planning timeframe allows Pierce County and other stakeholders to look at what would be needed to protect the Airport for its ultimate buildout, which is often referred to as the 50-year outlook. This protection could include proposed area land acquisition and/or land use controls. If unprotected, development around the Airport could occur that would prohibit, limit, or make financially unattainable the ultimate buildout. The ultimate buildout considers improvements that would best meet the future needs of its local operators as well as the state and regional air transportation system serving all users. It is important to note that future changes in the economy, general aviation industry, region—just to name a few—could alter the facility needs of the Airport, but protecting for future potential builds in flexibility. Fundamental review processes must trail the early planning so FAA review, environmental evaluations, and local planning and public processes can fulfill their crucial role in achieving or modifying any portion of the plan.

Airport development alternatives prepared for Tacoma Narrows include three build alternatives and a no-action/no-build alternative for comparison. Although these alternatives do not necessarily exhaust all the variations in development concepts that may be applied to the Airport, they do provide the appropriate base to produce the “preferred alternative” for the development of the Airport. The selection of a “preferred alternative” most often represents a composite alternative of the most favorable elements from each alternative included. The “No Action” is presented for the purpose of comparison. While no new development is proposed in the No Action alternative, existing facilities are maintained so costs are limited to maintenance costs.

Facility improvements and associated surfaces shown in the development alternatives follow applicable FAA design standards and FAR Part 77 airspace planning standards. The Airport Reference Code (ARC) is presently C-II and is forecast to remain the same for the planning period. For apron and hangar areas, facilities may serve variations in aircraft size (wingspan).
Therefore, facilities serving small aircraft exclusively can be developed using design standards for Airplane Design Group (ADG) I.

The alternatives presented here were reviewed and discussed with the PAC and public so Pierce County could consider comments and recommendations prior to the official selection of the “preferred alternative”.

All alternatives are presented on an aerial photo and split into multiple parts to illustrate the north and south ends of the Airport at a suitable scale.

**ALTERNATIVE 1 – NO ACTION**

This alternative is identified as the No-Action Alternative, also referred to as the No-Build Alternative. Under this alternative, Pierce County has the option of maintaining the existing facilities and capabilities of the Airport and not investing in the upgrade of existing or development of new facilities. The No Action Alternative is presented as a baseline from which the build alternatives are developed and compared.

**Exhibit 4A** illustrates the No-Action Alternative. The exhibit depicts the existing conditions such as the existing property line, Runway Safety Areas (RSA), Object Free Areas (OFA), Runway Protection Zones (RPZ), and shows the existing airside and landside facilities.

**ALTERNATIVE 2**

This alternative is one of the three build alternatives prepared to address future aviation demand, but with minimal airside and landside improvements. Highlights of Alternative 2 include the following:

**Airside**
- No extension of Runway 17-35
- Construct new Grass Strip 3,000 x 75 feet
- Common features – remove/relocate stormwater facility; relocate parallel Taxiway A and connector Taxiway B4; remove old airfield pavement

**Landside**
- Common feature – redevelop three hangar areas on east side

**Exhibit 4B** illustrates Alternative 2. As shown, Runway 17-35 remains at its current length of 5,002 feet. According to the WA Aviation System Plan, 5,000 feet is the minimum length recommended for airports serving the Regional Service Airport role like Tacoma Narrows. This length serves most Citation jets using the Airport today, and is more than adequate to
serve the multitude of small GA single and multi-engine (piston) conducting operations at the Airport.

Exhibit 4B, like the other build alternatives subsequently presented, illustrates the parallel Taxiway A and connector Taxiway B4 relocation (common features). The parallel taxiway would be relocated to increase the runway-to-taxiway separation to 400 feet in compliance with FAA design standards to serve the Airport’s design aircraft family. Connector Taxiway B4 is also relocated to comply with FAA guidelines in eliminating direct taxi access from the apron to the runway. The red hatch represents the removal of the old taxiway pavements.

A grass strip is proposed in this alternative to identify the most suitable location for this runway—a need identified by some users in the early stages of the planning process. The grass strip location and actual length would require further review by and coordination with FAA since it is located adjacent to the primary runway where hold lines, object clearance, Navaids, and aircraft movement areas need to be evaluated. The grass strip’s proximity to the primary paved Runway 17-35 is less than the FAA-required 700-foot centerline-to-centerline separation for simultaneous VFR operations. Consequently, the runways would be operated as a single landing facility. In other words, the use of the paved primary runway prohibits the use of the grass strip until the paved Runway 17-35 is clear, and vice versa.

For landside facilities, the proposed development is limited to a common feature among all build alternatives—east side redevelopment areas. This includes the highlighted areas on the east side where facilities are in outdated/poor condition; these areas are proposed for redevelopment with new/modern hangars in an efficient configuration to better serve users.

ALTERNATIVE 3

This alternative considers extending the runway to serve future increases in business jet traffic. While aviation activity projections do not support the need for a runway extension in the near-term, this alternative provides a demand-driven option for increasing length. Further, landside development on the west side is proposed to accommodate demand-driven improvement needs.

Highlights of Alternative 3 include the following:

**Airside**
- Extend Runway 35 by 300 feet
- Extend Runway 17 by 500 feet
- Construct west side partial parallel taxiway
- Common features – remove/relocate stormwater facility; relocate parallel Taxiway A and connector Taxiway B4; remove old airfield pavement

**Landside**
• West side development area for Airplane Design Group I and II hangars, additional Fixed Base Operator (FBO)
• West side airport access road to serve new development area
• West side property acquisition
• East side aircraft washdown area (aircraft wash rack) at far north end of aircraft apron
• East side aviation compatible development area across 26th Avenue NW
• Common feature – redevelop three hangar areas on east side

Exhibit 4C illustrates these proposed airside and landside improvements for Alternative 3. The purple represents all of the new pavement for the runway, taxiways, aircraft apron and second airport access road. The 300-foot extension to the south on Runway 35 is the estimated maximum extension feasible to accommodate the extended runway safety area with a retaining wall. Limiting the Runway 17 extension to the north to 500 feet avoids a required extension of the Stone Drive tunnel to accommodate a parallel taxiway extension – necessary to comply with FAA design standards and NextGen requirements. This alternative also proposed a new partial parallel taxiway on the west side to serve the proposed landside development at the northern half of the airfield.

Facilities proposed on the west side include hangars to serve both Group I and II aircraft types which are presently based and forecast to be based at the Airport in the future. Group II aircraft wingspans are wider than Group I wingspans so the proposed development considers the increased parallel taxiway-to-taxiway separation on the west side as well as the taxiway OFA clearance where more circulation area is needed. Vehicle access to the west side is served by an airport entrance road off Stone Drive. The access road runs along the back side of the hangar area and assumes most based aircraft owners would park their vehicles in their hangar space. The FBO Reserve area shown is identified for an additional FBO to locate there and serve the fueling and service needs of the west side aircraft. Auto parking would be available on the FBO site. Land acquisition for aviation compatible development is identified just west of the existing property line to accommodate a portion of the proposed hangar development shown as well as long-term aviation compatible facilities. A gravel access road is shown to the south just beyond the west side hangar development area. This gravel road begins where the paved access road ends. The gravel road would serve primarily as a service road with restricted access, namely for Navaid service and tree trimming/removal as part of the Airport’s obstruction management for airspace protection.

New development east of the airfield is limited to a proposed aircraft washdown area at the far north end of the apron; some airport users identified an aircraft wash rack as a desirable addition to the Airport’s facilities and services. A large airport property parcel east of 26th Avenue NW is designated as aviation compatible development area. Since it lacks airfield access, its use would exclude aircraft hangars, but other revenue-producing opportunities compatible with airport operations could be sought.
**ALTERNATIVE 4**

This alternative includes the longest proposed runway extension to address long-term aviation demand with growing corporate jet activity. Alternative 4 is illustrated in Exhibit 4D, with key features listed here:

**Airside**
- Extend Runway 17 by 1,000 feet including parallel taxiway; no extension for Runway 35
- Construct new grass strip 3,000 feet x 75 feet
- Construct west side partial parallel taxiway
- Expand Apron to the north of relocated connector Taxiway B4
- Common features – remove/relocate stormwater facility; relocate parallel Taxiway A and connector Taxiway B4; remove old airfield pavement

**Landside**
- West side development area limited to Airplane Design Group I hangars
- West side airport access road to serve new development area
- West side property acquisition
- East side realignment of 26th Avenue NW to straighten out northern leg—shifts intersection with Stone Drive an estimated 450 feet east
- East side aviation development (hangar and apron area expansion) following 26th NW realignment
- East side aviation compatible development area between eastern airport property boundary and newly aligned 26th Avenue NW
- North airport property parcel aviation compatible development area along 36th Street NW for revenue producing opportunities
- Common feature – redevelop three hangar areas on east side

As shown on Exhibit 4D and earlier exhibits, the future improvements are color coded and/or hatched. The purple, which represents new pavement, depicts the proposed 1,000-foot runway extension to the north on Runway 17 end and its associated parallel taxiway extension. While the runway extension can overlay the existing Stone Drive tunnel, the parallel taxiway extension on the east side would require the tunnel be extended east to maintain the required 400-foot separation from the runway in accordance with FAA design standards and NextGen requirements. Similar to Alternative 3, this alternative proposes a new partial parallel taxiway on the west side to serve new landside development. In contrast to Alternative 3, Alternative 4 proposes hangar development serve up to Group I aircraft types (smaller wingspans). This translates to less taxiway-to-taxiway separation and taxiway OFA requirements. Dedicating the west side to Group I aircraft increases aircraft storage capacity potential to serve future and some existing based aircraft, and assumes that future Group II aircraft will be accommodated on the east side. Further, the grass strip proposed in Alternative 2 is also shown in Alternative 4 to illustrate its proximity to a proposed west side Group I hangar development area.
Other west side development similarities between this concept (Alternative 4) and the previous one (Alternative 3) is the vehicle access off Stone Drive to the hangar area, the proposed land acquisition along the western airport property boundary, and the gravel service road to the south from the future hangar area.

East side development includes the proposed realignment of 26th Avenue NW, which would include substantial fill to maintain the necessary grade for the road and subsequent flight line development consisting of hangars and apron. The airport property east of 26th Avenue NW is designated as aviation compatible development area similar to Alternative 3.

OTHER DEVELOPMENT CONSIDERATIONS

In a September 2012 Memorandum, the FAA published “Interim Guidance on Land Uses within a Runway Protections Zone.” Generally, the guidance requires that FAA Regional Office (RO) and Airports District Office (ADO) staff coordinate with the National Airport Planning and Environmental Division regarding certain land uses, including public roadways, within the limits of the RPZ as a result of specific actions. The FAA identifies these actions to include:

1. An airfield project (e.g., runway extension, runway shift)
2. A change in the critical design aircraft that increases the RPZ dimensions
3. A new or revised instrument approach procedure that increases the RPZ dimensions
4. A local development proposal in the RPZ (either new or reconfigured)

While the aviation demand forecasts do not support a runway extension or an upgrade in the critical aircraft in the near-term, an unanticipated change in demand could trigger a mandatory consultation with the FAA. The required FAA coordination is to focus on finding a solution that addresses the incompatible use within the RPZ. The guidance also states that “This interim policy only addresses the introduction of new or modified land uses to an RPZ and proposed changes to the RPZ size or location. Therefore, at this time, the RO and ADO staff shall continue to work with sponsors to remove or mitigate the risk of any existing incompatible land uses in the RPZ as practical.”

There are public roadways (Stone Drive and Point Fosdick Drive) in the Runway 17 RPZ that are considered an incompatible land use. Any major runway improvement project such as an extension or shift and/or roadway improvement project would trigger mandatory FAA involvement to address the incompatible land use – roadway presence – in the RPZ.

Recent communication with the FAA about the interim guidance and how it should influence an airport sponsor’s evaluation of various development alternatives suggests that the airport consider the various implications of the guidance. However, the FAA is responding to current triggering events and not potential future triggering events. Further, official RPZ guidance is anticipated in the next year.
COMPARATIVE EVALUATION

A brief comparative evaluation of the development alternatives is presented here, which represents a summary of the details provided to the PAC members and the public on January 29, 2014. While the No Action alternative is the low cost alternative, this plan disregards FAA design standards as well as the County’s goals for planning and development and would lead to the Airport’s future inability to accommodate growing demand.

Alternative 2 proposes minimal development by focusing on compliance with FAA design standards and accommodating aviation demand within the planning period. Removal/relocation of the stormwater facility/drainage ditch and subsequent parallel Taxiway A and connector Taxiway B relocation would comply with the FAA design standards on the airside. Redevelopment of three building areas on the east side would address the near-term issue with deteriorating facilities. However, this alternative lacks a comprehensive consideration for flexibility in long-term development, possible long-term aviation demand and economic growth, and the Airport’s important regional role in the air transportation system.

In contrast, Alternatives 3 and 4 consider a runway extension should long-term growth in aviation activity, particularly in corporate activity, justify such an improvement. Further, these alternatives propose development on the west side to enhance hangar/aircraft storage capacity, but infrastructure improvements would be required such as secondary vehicle access and utility extensions.

The two main differences in Runway 17-35 improvements between Alternatives 3 and 4 include the length and location of the extensions. The Alternative 3 scenario extends the runway to the south as much as feasible considering the terrain and water constraints; the north end is extended as far as possible without requiring an extension of the Stone Drive tunnel. These parameters limit the total lengthening to 800 feet – 300 feet south and 500 feet north. However, Alternative 3’s additional 800 feet represents beneficial progress in serving the runway length needs of the corporate jet fleet as outlined previously in Table 3G, Business Jet Runway Length Requirements at Tacoma Narrows (TIW), of Chapter 3, Requirements. To provide an option for additional runway length, Alternative 4 proposes a 1,000-foot extension. With Alternative 3’s substantial retaining wall requirement at the south end to support a limited 300-foot extension, Alternative 4 proposes a full 1000-foot extension to the north. Any extension to the north over 500 feet requires a tunnel extension for the parallel taxiway so keeping the full extension to the north eliminates the need for a retaining wall on the south end.

As noted in the identification of development alternatives, Alternative 4 proposes a grass strip west of Runway 17-35. Runway 17-35 and the grass strip would operate as a single landing facility due to their close proximity so proper clearance of one runway would be required before use of either runway. Alternative 4 included the proposed grass strip as the west side hangar area is dedicated to the smaller Group I aircraft while the larger Group II aircraft remain on the east side. Alternative 4 also proposes aviation development expansion on the east side to increase
the landside capacity for Group II aircraft. This proposed expansion is located at the north end, which would require the relocation/realignment of 26th Avenue NW. The road realignment would provide an expanded flight line area. However, this road realignment would require substantial fill as the terrain drops an estimated 20-30 feet in the area. The realignment opens up a parcel in a prime location to provide airfield access as landside development is nearing capacity on the east side. The main planning drawback is that the proposed 26th Avenue NW project in Alternative 4 does not align with the County’s current roadway plans.

**MAGNITUDE OF COST COMPARISON**

Detailed cost estimates were not prepared for the development alternatives, but the order of magnitude cost is reviewed. It is also important to reiterate that the Tacoma Narrows Airport is presently providing adequate apron and hangar capacity to accommodate aviation demand in the planning period. Further, the existing runway is also serving the existing and projected near-term future runway length requirements of its local and transient aircraft operators. However, as business aviation grows and the operations by corporate jets requiring more length surpass the 500 annual operations threshold, a runway extension would be justified.

For Alternative 2, no runway extension is proposed so it represents the least cost for airside improvements among the three build alternatives. While it still proposes the construction of a new parallel grass strip, this cost is inconsequential in comparison to any Runway 17-35 extension. Alternatives 3 and 4 both propose a Runway 17-35 extension, but Alternative 3 increases length by 800 feet with an extension on each end while Alternative 4 proposes a 1,000-foot extension on Runway 17 end only. In Alternative 3, the 500-foot extension on Runway 17 stops short of requiring a roadway tunnel extension and Runway 35’s 300-foot extension is the optimum length before more costly cut and fill is required. In Alternative 4, the 1,000-foot extension is proposed to accommodate a larger family of business jet traffic in the future. While no extension is justified in the near-term, the proposed extensions on these alternatives is to facilitate a closer review and consideration for what the future may hold as business jet activity is anticipated to grow at a faster pace than small GA. The runway lengthening project in Alternative 4 would likely be substantially more costly than Alternative 3. Further, the proposed realignment of 26th Avenue NW in Alternative 4—not included in the other alternatives—would also incur substantial cost.

**PREFERRED ALTERNATIVE**

On January 29, 2014, the PAC met to review and evaluate the individual development alternatives as well as the various components of each. As explained to the PAC members, the preferred alternative could represent a composite of two or more alternatives by identifying the most favorable features of each. It should be noted that most PAC recommendations received unanimous support from PAC members with the exception of the recommendation to protect for a runway extension. The homeowners associations’ representative opposed this
This section presents the details of the preferred alternative for the Tacoma Narrows Airport Master Plan Update. This alternative was developed in collaboration with County staff and in light of the Planning Advisory Committee (PAC) recommendations and public comments gathered at the meetings held on January 29, 2014, and received via email following these meetings. The preferred alternative includes elements from the various build alternatives presented earlier.

AIRSIDE DEVELOPMENT

Runway Extension: As discussed in the Requirements, a runway extension is not needed nor justified in the short and medium terms. However, the PAC recommended that the preferred alternative show runway extensions of 1,000 feet to the north and 300 feet to the south. This was intended to allow the County and the FAA to protect the airspace from obstructions and maintain the possibility of extending the runway in the long-term. As a PAC member explained, the PAC was not deciding to extend the runway but to preserve the right of another PAC, ten to twenty years from now, to have a viable choice of extending the runway were such an extension to prove needed.

The County noted, throughout the process, that a future runway extension is dependent upon a number of requirements outlined below:

1. The level of traffic requiring a longer runway must be proven to have at least 500 or more annual itinerant operations (take-offs, landings) per the FAA.

2. The Gig Harbor Peninsula Community Plan, County Code Title 19B, would have to be amended to state the community’s support of any runway extension.
   a. This plan carries the force of law and cannot be overridden without legislative action by the Pierce County Council.
   b. Such an amendment would require a full public process.

3. Should any runway extension use the Stone Drive Northwest tunnel built to accommodate the airport’s FAA-required Runway Safety Area, the Conditional Use Permit issued for that tunnel by the Pierce County Hearing Examiner will have to be amended.
   a. Such action would require a future Pierce County Hearing Examiner ruling.
   b. Such amendment would require a full public process.

4. Any proposed extension would have to meet FAA design standards at that time.

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Alternatives
5. Lastly, a combination of federal, state, and local funding will be required to build the projected extension and related features (lighting, signage, etc.). Each of these funding sources is subject to additional federal, state, and local requirements.

In light of public concern and apparent opposition to depicting protection for a runway extension on the ALP, Pierce County decided to remove the runway extension from the Airport Layout Plan. Pierce County remains committed to preserving the airspace around the airport and protecting the right of the community and County to decide on extending the runway in the distant future if and when such extension becomes necessary and justified. Pierce County’s commitment stems not only from an understanding of the airport’s value to the community – the airport contributes more than $6.2 million to the regional economy, is an integral part of the community’s emergency plan, and is used by medical evacuation operators, small business and law enforcement agencies – but also from Pierce County’s obligation to the federal government in the form of Grant Assurances to protect the public investment in the airport. Pierce County will achieve its goal of protecting the surrounding airspace through its local zoning ordinance as well as through working with adjacent communities, such as Gig Harbor Peninsula, City of University Place, and the City of Tacoma, to ensure that their zoning ordinances provide the necessary airspace protection needed for the continued safe and efficient operation of the Airport.

**Alternate Grass Landing Area:** The preferred alternative provides for an alternate grass landing area to the west of Runway 17-35. The 2,750-foot long by 75-foot wide grass landing area extends from just south of taxiway Connector A3 (see [Exhibits 4E.3](#)) to the west of the existing B2 Connector Taxiway (see [Exhibit 4E.2](#)). Concurrent use of the alternate grass landing area and Runway 17-35 is not allowed since the Runway 17-35 centerline to alternate grass landing area centerline separation is below the 700 feet required for concurrent use. The grass strip was requested by various airport users early in the study process.

**Taxiway A Relocation:** The preferred alternative shows Taxiway A relocated to the FAA runway-to-taxiway centerline separation required by FAA AC 150/5300-13A. Although the FAA requirement for the taxiway width is 35 feet, based on a Taxiway Design Group (TDG) of 2, the width of the relocated Taxiway A would be determined through a user survey of pilots and businesses operating, or forecast to operate, at the airport. The last survey, conducted in association with the runway rehabilitation project, resulted in constructing the connector taxiways at a width of 50 feet. The relocation of Taxiway A would require the relocation/removal of the existing stormwater facility to its east.

**Taxiway B4 Relocation:** The preferred alternative includes the relocation of Taxiway B4 to the south, eliminating direct access from the apron to the runway. This relocation and the relocation/removal of the existing stormwater facility would allow for the expansion of the apron ([Exhibit 4E.3](#)).
NORTH SIDE DEVELOPMENT

This section describes the proposed development on the north side of the airport property.

Aviation Compatible Development Area (North): The preferred alternative designates the 7.9 acres to the north of Runway 17 (adjacent to 36th St NW) as an aviation compatible development area (Exhibit 4E.1).

Non-Aeronautical Land Use Conversion: The area shown in green (Exhibit 4E.1) along the northeast airport boundary is marked as non-aeronautical land use conversion. The area can be sold and funds from its sale can be used to purchase and/or develop other areas around the airport.

Aviation Compatible Reserve Area: The area along the northeast airport property and bounded by Stone Drive to its south is shown as an Aviation Compatible Reserve Area (Exhibits 4E.1 and 4E.2). Although not shown on any of the development alternatives, the area’s designation was recommended by the PAC.

Gravel Access Road: The gravel access road (Exhibit 4E.1) provides access to the wooded area on the north portion of the airport property. Such access is necessary for the maintenance of the airport and the trimming of trees that present obstacles to air navigation.

WEST SIDE DEVELOPMENT

This section describes the proposed development on the west side of the airport property.

Airport Entrance Road: The preferred alternative provides for an additional access road, off of Stone Drive, to the west side of the Airport. The access road extends to the south providing access to all proposed development (Exhibit 4E.2).

Group I Development Area: A Group I development area is shown along with its associated parallel taxiway (Exhibit 4E.2). This development would require the removal/relocation of the existing gravel road outside of the area of development. Possible development may include hangars, business user(s) or other aviation development.

Aviation Compatible Development Area: The preferred alternative shows an aviation compatible development area to the west of the Group I development and new access road. A large portion of the area is outside airport property and would require the acquisition of a number of properties (Exhibit 4E.2). County staff indicated that the County would only pursue land acquisition of these properties as they become available.
**Gravel Access Road:** The gravel access road (Exhibit 4E.3) provides access to the wooded area on the south portion of the airport property. Such access is necessary for the maintenance of the airport and the trimming of trees that present airspace obstructions.

**Non-Aeronautical Land Use Conversion:** The area shown in green (Exhibit 4E.3) along the southwest airport property line and south of 33rd Avenue NW is identified as non-aeronautical land use conversion. The area can be sold and funds from its sale used to purchase and/or develop other areas around the airport.

**Removal/Relocation of Existing Access Road:** Several portions of the existing access road that are within future development areas and within the RSA and runway OFA will be relocated (Exhibit 4E.3).

**EAST SIDE DEVELOPMENT**

**Redevelopment Areas:** Existing T-hangars to the east of Runway 17 threshold, the quad hangars to the south of these hangars, and additional hangars located east of and between Connectors B2 and B3 are identified as redevelopment areas.

**Aviation Compatible Reserve Area:** The area to the east of 26th Ave NW is identified as an aviation compatible reserve area (Exhibit 4E.2).

**Gateway Development:** The PAC's recommendation for the area included the realignment of 26th Ave NW. Considering numerous factors, including the steep slope of the area, the recent improvements to 26th Ave NW, and the existing plans for a gateway development in the area, County staff decided that the relocation of 26th Ave NW is not feasible. The area is identified as gateway development (Exhibit 4E.2).

**Aviation Compatible Development Area:** The area to the east of the existing Taxiway B4 connector, including the current hangar construction by Northwest Pilots and the apron area surrounding the development, is identified as an aviation compatible development area (Exhibit 4E.3).

**COUNTY APPROVAL**

Pierce County approved the final preferred alternative following the removal of the proposed long-term runway extension. The approved preferred alternative served as the basis for the development of the Airport Layout Plan (ALP) Drawings and Capital Improvement Plan (CIP) in subsequent chapters.
Chapter Five
Environmental Overview

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An important part of the master planning process is ensuring that future airport developments minimize impacts to the environment.

The Council on Environmental Quality (CEQ) 1501.2 states that “agencies shall integrate the NEPA process with other planning at the earliest possible time to insure that planning and decisions reflect environmental values, to avoid delays later in the process, and to head off potential conflicts.” Accordingly, identifying potential environmental impacts of proposed airport projects is an integral part of the master plan update process. This environmental overview has been prepared to identify potential environmental impacts associated with the proposed airport improvement projects for the Tacoma Narrows Airport and to discuss, where applicable, potential mitigation measures to minimize these impacts.

This environmental overview was conducted in accordance with FAA Order 5050.4B, National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions, FAA Order 1050.1E, Environmental Impacts: Policies and Procedures, the State of Washington State...
Environmental Policy Act (SEPA), Chapter 43.12C RCW and Checklist and the FAA’s Environmental Desk Reference for Airport Actions, which requires the analysis of the following environmental impact categories prior to project implementation:

- Air Quality
- Biotic Resources/Federally listed Endangered and Threatened species
- Coastal Barriers/Coastal Zone Resources
- Compatible Land Use
- Construction Impacts
- Section 4(f)
- Energy Supplies, Natural Resources, and Sustainable Design
- Farmlands
- Floodplains
- Hazardous Materials
- Historical and Archeological Resources
- Light Emissions and Visual Impacts
- Noise
- Social Impacts
- Environmental Justice
- Solid Waste
- Water Quality
- Wetlands
- Wild and Scenic Rivers
- Induced Socioeconomic/Cumulative Impacts

FAA Order 1050.1E, Environmental Impacts: Policies and Procedures, outlines types of impacts and thresholds that determine if an impact is considered to be significant. In general, projects fall into one of the following three categories:

Categorical Exclusions: Projects that are categorically excluded include those actions that have been found under normal circumstances to have no potential for significant environmental impact.

Actions Normally Requiring an Environmental Assessment (EA): Projects that normally require an EA are actions that have been found to sometimes have significant environmental impacts.

Actions Normally Requiring an Environmental Impact Statement (EIS): If a project is found to have significant impacts during the preparation of an Environmental Assessment, the FAA can
determine that an EIS is required to investigate in greater detail a project’s potential environmental impacts.

This chapter provides a preliminary evaluation of the recommended airport development projects for each of the environmental impact categories included in FAA Order 1050.1E. For those proposed airport projects that are not categorically excluded from further environmental review, if any, additional environmental analyses must be conducted and documented in a formal EA or EIS prior to project implementation.

MASTER PLAN KEY PROJECTS

This section provides a brief overview of the airport improvement projects identified in this master update for the 20-year planning period. Chapter 7, Implementation, will provide additional descriptions and details of these projects as well as detailed cost estimates.

PHASE I (2014 – 2017)

- Stormwater Improvements – Design/Environmental Phase (2015)
- Obstacle Removal – Survey/Environmental (2016)
- Stormwater Improvements – Construction Phase (2017-2020)

PHASE II (2018 – 2022)

- Pavement Maintenance
- Taxiway/Apron Improvements – This project encompasses the following three projects:
  - **Taxiway A Relocation**: Relocation of Taxiway A 50 feet to the east to comply with the FAA runway centerline to taxiway centerline separation of 400 feet.
  - **Taxiway B4 Relocation**: Relocation of Taxiway B4 to eliminate direct access from the apron to the runway.
  - **Apron Expansion**: Expansion of the apron located between Taxiway B3 and B4. This will provide pavement width for Taxiway Design Group (TDG) 2 access.
- Alternate Grass Landing Area
- Gravel Access Road
- Hangar Redevelopment
- Westside Access Road – Phase I
• Westside Group I Development – Phase I
• Surplus of Non-Aeronautical use Land
• Property Acquisition (RPZ Protection)

PHASE III (2023 – 2032)

• Airport Master Plan Update
• Property Acquisition (Westside)
• Westside Access Road – Phase II
• Westside Group I Development – Phase II
• Pavement Maintenance

ENVIRONMENTAL EVALUATION CATEGORIES

This section presents a review of each of the environmental impact categories listed above.

AIR QUALITY

The National Environmental Policy Act of 1969 (NEPA), the Clean Air Act (CAA), as amended, and Title 49 U.S.C. 47106 (c) (1) (B), as amended (formerly sections 509 B) (5) and (B) (7) of the Airport and Airway Improvement Act of 1982, as amended; and, PL 97-248, are the primary laws that apply to air quality. NEPA requires federal agencies to prepare an environmental document (i.e., EIS or EA) for major federal actions that have the potential to affect the quality of the environment, including air quality.

The Clean Air Act (CAA) established National Ambient Air Quality Standards (NAAQS) for six pollutants, termed “criteria pollutants.” The six pollutants are: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO2), ozone (O3), particulates (PM10 and PM2.5), and sulfur dioxide (SO2). The CAA requires each state to adopt a plan (State Implementation Plan or SIP) to achieve the National Ambient Air Quality Standards (NAAQS) for each pollutant within timeframes established under CAA. The State of Washington has adopted standards that are similar to the national standards. The Washington Department of Ecology (DOE) is responsible for protecting the quality of air in the State.

Pierce County is not an attainment area for criteria pollutants ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, or lead. In 2009, the U.S. Environmental Protection Agency designated most of Pierce County a "nonattainment area" for fine particle pollution (PM2.5). Pierce County’s website states that in the winter, most particle pollution comes from burning in fireplaces and wood stoves. During the summer, vehicle exhaust (cars, trucks, buses, among others), land-clearing burning and backyard burning of yard waste are the predominant sources of fine
particles. The projects proposed by this master plan are not expected to have a direct effect on particulate matter pollution.

According to FAA guidelines, an air quality analysis is required for general aviation airports with more than 180,000 projected annual operations. Since Tacoma Narrows Airport current and projected operations are significantly less than 180,000 annual general aviation operations, a detailed air quality analysis will not be required as part of the NEPA documentation for these projects.

**BIOTIC RESOURCES**

Proposed projects have the potential to impact plant communities and displace wildlife. A query of the 2012 Washington Natural Heritage Program database, maintained by the Washington Department of Natural Resources, did not produce any records of high quality ecosystems in the vicinity of the project. However, forested wetlands do occur within the project area. Wetland delineation will be conducted to determine wetland boundaries, prior to any projects that would affect them. Appropriate environmental permits will be obtained for wetland fill and mitigation if proposed activities result in wetland impacts.

As indicated in the Inventory Chapter, the Airport provides a range of wildlife habitat for both cosmopolitan and year-round habitat generalists as well as seasonal migrants. Vegetation and general habitat conditions are expected to be comparable to other Puget Sound locales. Extensive forest occurs to the north of the runway and presumably provides significant habitat within a generally urbanized region. The Airport as a whole provides significant habitat within a generally urbanized region. The Airport as a whole provides suitable habitat for abundance variety of small and large mammals, resident passerines, raptors, shorebirds, and seabirds. Additionally, the Airport likely provides stop-over habitat for migratory waterfowl, shorebirds, and wading birds. Vegetation clearing activities associated with airport projects will be scheduled to occur outside of the nesting season for migratory birds in compliance with the Migratory Bird Treaty Act (MBTA).

Additionally, information from the Washington National Heritage Information System maintained by the Washington State Department System indicated that there are currently no Known High-Quality or Rare Plant Communities and Wetland Ecosystems in the vicinity of the Airport.
COASTAL BARRIERS/COASTAL ZONE RESOURCES

Coastal Barriers

The Coastal Barriers Resources Act (CBRA) governs Federal activities involving or affecting coastal resources. This category involves the undeveloped coastal barriers along the Atlantic and Gulf coasts and therefore is not applicable to the Tacoma Narrows Airport.

Coastal Zone Management

Washington State was the first state to establish an approved Coastal Zone Management Program as part of the federal Coastal Zone Management Act. Washington’s Coastal Zone is comprised of the state’s fifteen coastal counties that have shoreline either along the Pacific Ocean or Puget Sound.

The coastal area is divided into two regions; the Pacific Ocean Coast and the Puget Sound Basin, of which Pierce County is part. Consequently, local jurisdictions, such as Pierce County, must obtain permits for certain actions with federal implication, such as the adoption of an Airport Layout Plan and Airport Capital Improvement Program that seeks federal funding assistance.

COMPATIBLE LAND USE

According to FAA Order 5050.4B, the compatibility of existing and planned land uses in the vicinity of an airport is usually associated with the extent of noise impacts related to that airport. Additionally, land use impacts also can occur if the proposed projects exceed the threshold of significance of other impact areas that have land use ramifications, including disruption of communities, relocation, and induced socioeconomic impacts (FAA Order 1050.1E).

Proposed projects do not present any impacts associated with the disruption of communities, relocation, and induced socioeconomic impacts. Noise contours for current and forecast airport operations are examined in a later section of this chapter.

Further, Pierce County has defined an Airport Overlay Zone to ensure that land use and zoning in the Airport’s surroundings are compatible with the Airport and its operations. Pierce County Title 18A – Development Regulations – Zoning 18A.10.100 states that “The Rural Airport Overlay (RAO) functions as a safety buffer adjacent to the Tacoma Narrows Airport in rural designated land. The overlay provides restrictions on the use of land, which are intended to protect the airport from neighboring land uses that are incompatible with aviation activities. The area also provides buffering between those more intensive uses related to aviation activities and the uses authorized in the rural-residential classifications.”
CONSTRUCTION IMPACTS

Impacts associated with construction activity include noise generated by construction equipment at the site and the increased vehicular traffic related to the delivery of construction materials through the local transportation network, disposal of soil, air pollution from construction equipment exhaust and dust, and water pollution from erosion.

These impacts will be mitigated, to the extent possible, by incorporating in the project specifications from the provisions of FAA Advisory Circular 150/5370-10, Standards for Specifying Construction of Airports, and FAA Advisory Circular 150/5370-10A, Standards for Specifying Construction of Airports, Item P-156, Temporary Air and Water Pollution, Soil Erosion, and Siltation Control. Potential construction-related water quality impacts would be minimized through the implementation of a sediment and erosion control plan.

Construction activities impact airport operations as they may require workers and machinery to be present in aircraft operation areas. Guidelines, as cited in FAA Advisory Circular 150/5370-2E, Operation Safety on Airports During Construction, would be enforced where applicable. Runway and/or taxiway closure conditions will be kept to a minimum in an effort to minimize inconvenience to Airport users.

DEPARTMENT OF TRANSPORTATION (DOT) ACT: SECTION 4(F)

In the U.S. Department of Transportation (DOT) Act of 1966, Section 4(f), specifies that no project will be approved that requires use of any publicly owned land from a Public Park, recreation area, wildlife refuge, or historic site unless there is “no prudent alternative”.

The proposed improvements and the continued operation of the Tacoma Narrows Airport will have no impacts on Section 4(f) lands.

ENERGY SUPPLIES AND NATURAL RESOURCES

FAA Order 1053.1, Policies and Procedures for Energy Planning and Conservation, provides for assessing energy demands related to airport improvement projects. The effects of the airport development on energy supply typically relate to the amount of energy required stationary facilities (such as terminal building heating and cooling and airfield lighting) and movement of air and ground materials. The effects of airport development on natural resources typically relate to basic materials, such as gravel, fill dirt, etc., that are required for construction.

The aviation activity at Tacoma Narrows Airport is expected to increase 1.5 percent compounded annually for the next 20 years. This will lead to an increase in energy consumption by aircraft and vehicles due to the proposed airport development projects. The local power company should
have no difficulty in meeting the energy demands of the proposed airport development. The anticipated increase in fuel consumption is not anticipated to be significant and the additional demand could be met by existing fuel supplies.

FARMLANDS

The Farmland Protection Policy Act (FPPA) directs federal agencies to take into account the adverse effects of federal programs on the preservation of Prime or Unique Farmland. The Act protects such farmland from being converted, directly or indirectly, to nonagricultural uses. No farmland adjoins the Tacoma Narrows Airport property.

FLOODPLAINS

Executive Order 11988 directs federal agencies to take action to reduce the risk of flood loss, minimize the impact of floods on human safety, health, and welfare, and restore and preserve the natural and beneficial values served by floodplains. Agencies are required to make a finding that there is no practicable alternative before taking action that would encroach on a base floodplain based on a 100-year flood (7 CFR Section 650.250).

A review of the Flood Insurance Rate Map (FIRM) identifies the entire airport property and the proposed projects area as being located in Zone C and outside any 100-year flood plain.

HAZARDOUS MATERIALS, POLLUTION PREVENTION, AND SOLID WASTE

The Resource Conservation and Recovery Act (RCRA), as amended by the Federal Facilities Compliance Act of 1992 governs the generation, treatment, storage, and disposal of hazardous wastes and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended (also known as Superfund) provides for the cleanup of any releases of a hazardous substance (excluding petroleum) into the environment. FAA actions to fund, approve, or conduct an activity require consideration of hazardous material and solid waste impacts.

In addition to hazardous waste sites, solid waste impacts must be evaluated in conjunction with airport development. This includes impacts on solid waste generation. No significant increases in solid waste generation are anticipated as a result of the proposed airport improvements. The only additional waste anticipated is that which will be associated with the construction of the aviation facilities. Existing waste collection and disposal facilities will be adequate to handle the waste associated with the construction of the airport facilities.

FAA Order 5200.5, FAA Guidance Concerning Sanitary Landfills On or Near Airports, states that “sanitary landfills will be considered as an incompatible use” if located within 1,500 meters (approximately 4,921 feet) of all runways planned to be used by piston type aircraft and within
3,000 meters (approximately 9,843 feet) of all runways planned to be used by turbo aircraft. Airports located closer than these distances to sanitary landfills have an increased risk of bird hazards. No landfills have been identified within 10,000 feet of the Tacoma Narrows Airport.

**HISTORICAL, ARCHITECTURAL, ARCHEOLOGICAL, AND CULTURAL RESOURCES**

The National Historic Preservation Act (NHPA) of 1966 requires that an initial review be made to determine if any properties that are in, or eligible for inclusion in, the National Register of Historic Places (NRHP) are within the area of a proposed action’s potential environmental impact. Further, Section 106 of the NHPA directs the heads of federal agencies, federal departments, or independent agencies that have direct or indirect jurisdiction over a federal or federally assisted undertaking to “take into account the effect of the undertaking on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register.”

The Archeological and Historic Preservation Act of 1974 provides for the survey, recovery, and preservation of significant scientific, prehistoric, historical, archeological, or paleontological data when such data may be destroyed or irreparably lost due to a federal, federally licensed, or federally funded project.

There are no historic or archaeological properties listed or eligible for listing on the National Register of Historic Places (NRHP) within the Area of Potential Effect (APE) of the recommended airport projects. If archaeological materials are encountered during construction, the procedures codified at 36 CFR 8090.13(b) will apply.

**LIGHT EMISSIONS AND VISUAL IMPACTS**

Light emissions caused by airport-related lighting may create an annoyance to residents in the vicinity of the Airport. However, light emissions created by general aviation airports are minimal. FAA Order 1050.1E indicates that light emissions are unlikely to have an adverse impact on human activity or the use or characteristics of the protected properties because of the relatively low levels of light intensity compared to background levels associated with most air navigation facilities (NAVAIDS) and other airport development actions.

**NOISE**

Aircraft noise impacts were assessed using noise exposure contours produced by the FAA Integrated Noise Model (INM). The INM was developed for evaluating aircraft noise impacts in the vicinity of airports and has been the FAA’s standard tool since 1978 for determining the predicted noise impact in the vicinity of airports. The distribution of the noise pattern on each
map calculated by the INM is a function of the number of aircraft operations, the types of aircraft flown, the time of day of the operation, how frequently each runway is used for arrivals and departures, and the routes of flight used to and from the runway. Substantial variations in any one of these factors may, when extended over a long period of time, cause changes to the shown annual noise pattern. The noise analysis study was developed using INM v7.D.

The noise exposure pattern at the airport is presented in terms of the average Day-Night Sound Level (DNL). The DNL measure is the annual one-second average of the total aircraft noise energy that occurs at a location. With DNL, the loudness of nighttime (10:00 p.m. to 6:59 a.m.) noise events are increased by ten decibels (db) to reflect the greater sensitivity to noise at night. The Noise Exposure Maps (NEMs) display contour lines that connect points of equal DNL exposure at 60 dBA, 65 dBA, 70 dBA, and 75 dBA.

The FAA has adopted land use compatibility guidelines for preparing noise studies. These guidelines are presented in Table 5A.

As noted in Table 5A, a DNL below 65 dB is considered to be compatible with all land uses. In comparison, noise levels between DNL 65 and 75 are considered incompatible with residential areas and schools, but compatible with other activities. Within the DNL 65 to 75 dB range, homes and schools could be insulated to achieve an outdoor to indoor Noise Level Reduction (NLR) of at least 25 dB. However, in areas with a DNL over 75, residential land use is considered incompatible and relocation of such use is recommended. DNL levels over 75 are also considered incompatible with hospitals, places of worship, and recreational activities.
### TABLE 5A. FAA LAND USE COMPATIBILITY WITH DNL GUIDELINES

<table>
<thead>
<tr>
<th>Land Use</th>
<th>DNL Levels (in dB)</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;65</td>
<td>65-70</td>
<td>70-75</td>
<td>75-80</td>
</tr>
<tr>
<td>RESIDENTIAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residential, Other than Mobile Homes</td>
<td>Y</td>
<td>N&lt;sup&gt;1&lt;/sup&gt;</td>
<td>N&lt;sup&gt;1&lt;/sup&gt;</td>
<td>N&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Mobile Home Parks</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Transient Lodgings</td>
<td>Y</td>
<td>N&lt;sup&gt;1&lt;/sup&gt;</td>
<td>N&lt;sup&gt;1&lt;/sup&gt;</td>
<td>N&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>PUBLIC USE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Schools</td>
<td>Y</td>
<td>N&lt;sup&gt;1&lt;/sup&gt;</td>
<td>N&lt;sup&gt;1&lt;/sup&gt;</td>
<td>N&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Hospitals, &amp; Nursing Homes</td>
<td>Y</td>
<td>25</td>
<td>30</td>
<td>N&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Churches, Auditoriums &amp; Concert Halls</td>
<td>Y</td>
<td>25</td>
<td>30</td>
<td>N&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Government Services</td>
<td>Y</td>
<td>Y</td>
<td>25</td>
<td>30</td>
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<td>Transportation</td>
<td>Y</td>
<td>Y</td>
<td>N&lt;sup&gt;2&lt;/sup&gt;</td>
<td>N&lt;sup&gt;3&lt;/sup&gt;</td>
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<tr>
<td>Parking</td>
<td>Y</td>
<td>Y</td>
<td>Y&lt;sup&gt;2&lt;/sup&gt;</td>
<td>Y&lt;sup&gt;3&lt;/sup&gt;</td>
</tr>
<tr>
<td>COMMERCIAL USE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offices, Business &amp; Professional</td>
<td>Y</td>
<td>Y</td>
<td>25</td>
<td>30</td>
</tr>
<tr>
<td>Wholesale &amp; Retail-Building Materials, Hardware &amp; Farm Equipment</td>
<td>Y</td>
<td>Y</td>
<td>N&lt;sup&gt;2&lt;/sup&gt;</td>
<td>N&lt;sup&gt;3&lt;/sup&gt;</td>
</tr>
<tr>
<td>Retail Trade-General</td>
<td>Y</td>
<td>Y</td>
<td>25</td>
<td>30</td>
</tr>
<tr>
<td>Utilities</td>
<td>Y</td>
<td>Y</td>
<td>Y&lt;sup&gt;2&lt;/sup&gt;</td>
<td>Y&lt;sup&gt;3&lt;/sup&gt;</td>
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<tr>
<td>Communication</td>
<td>Y</td>
<td>Y</td>
<td>25</td>
<td>30</td>
</tr>
<tr>
<td>MANUFACTURING &amp; PRODUCTION</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturing-General</td>
<td>Y</td>
<td>Y</td>
<td>Y&lt;sup&gt;2&lt;/sup&gt;</td>
<td>Y&lt;sup&gt;3&lt;/sup&gt;</td>
</tr>
<tr>
<td>Photographic &amp; Optical</td>
<td>Y</td>
<td>Y</td>
<td>25</td>
<td>30</td>
</tr>
<tr>
<td>Agriculture (Except Livestock) &amp; Forestry</td>
<td>Y</td>
<td>Y&lt;sup&gt;6&lt;/sup&gt;</td>
<td>Y&lt;sup&gt;7&lt;/sup&gt;</td>
<td>Y&lt;sup&gt;3&lt;/sup&gt;</td>
</tr>
<tr>
<td>Livestock Farming &amp; Breeding</td>
<td>Y</td>
<td>Y&lt;sup&gt;6&lt;/sup&gt;</td>
<td>Y&lt;sup&gt;7&lt;/sup&gt;</td>
<td>N&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Mining &amp; Fishing, Resource Production &amp; Extraction</td>
<td>Y</td>
<td>Y</td>
<td>Y&lt;sup&gt;2&lt;/sup&gt;</td>
<td>Y&lt;sup&gt;3&lt;/sup&gt;</td>
</tr>
<tr>
<td>RECREATIONAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outdoor Sports Arenas &amp; Spectator Sports</td>
<td>Y</td>
<td>Y&lt;sup&gt;5&lt;/sup&gt;</td>
<td>Y&lt;sup&gt;5&lt;/sup&gt;</td>
<td>N&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Outdoor Music Shells, Amphitheaters</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Nature Exhibits &amp; Zoos</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Amusement Parks, Resorts &amp; Camps</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Golf Courses, Riding Stables &amp; Water Recreation</td>
<td>Y</td>
<td>Y</td>
<td>25</td>
<td>30</td>
</tr>
</tbody>
</table>

**KEY:**

- **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 uses must be allowed, measures to achieve outdoor to indoor Noise Level Reduction (NLR) of at least 25 dB and 30 dB should be incorporated into building codes and be considered in individual approvals. Normal construction can be expected to provide and 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 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 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. Land use compatible provided special sound reinforcement systems are installed.

5. Residential buildings require NLR of 25.

Although a DNL below 65 is considered compatible with all land uses, this threshold does not imply public acceptance. The number of people who are annoyed by aircraft noise in a specific area varies. The level of annoyance depends on the time of day, the time of year, the activities of the people, the type and age of the dwellings occupied by those people, and in some cases, the actual visual sighting of aircraft. Some people are more perceptive and sensitive to sound. Thus, there is no “universally acceptable” minimum DNL.

Furthermore, as DNL is an average noise level, it does not account for the peak noise level experienced at any given location. A location within a DNL of 65 dB may have a peak noise level of LAMAX 90-100 dB during a flyover by the noisiest aircraft types, and 70-80 dB from common small aircraft. FAA requires the use of average noise levels in noise studies, as only average noise levels can be directly compared at all locations; peak noise is highly variable.

Exhibits 5.1, 5.2, 5.3 and 5.4 depict the noise contours generated by the Airport operations for actual 2012 activity and forecast operations in 2017, 2022 and 2032 respectively. As shown, the 65 DNL noise contours are within the airport property for current as well as forecast airport operations. These contours are centered on the runway and the helicopter operations area on the west side.

The 65 DNL has been established by the FAA, Under 14 CFR Part 150, as the threshold above which aircraft noise is considered to be incompatible with residential areas. Since the 65 dB contours are contained within the Airport property, no land use compatibility issues relating to noise level are identified within the 20-year planning period.

SOCIAL IMPACTS

The FAA requires specific analysis of social impacts associated with relocations of residential properties or commercial properties, or other community disruption that may be caused by any airport action. The categories of disruptions to be considered are:

- Alteration of surface transportation patterns
- Division or disruption of neighborhoods
- Disruption of orderly planned development
- Appreciable change in employment patterns

The Implementation plan proposed by this Master Plan Update will not necessitate or cause shifts in patterns of population movement and growth, place significant demands on public services, or cause changes in business and economic activity on the surrounding communities. Supporting evidence of this determination is reflected in the moderate forecast of growth for the airport (through 2032), and the associated capital development program. Airport improvement projects
will not require an expansion of utilities or public safety services, including fire and police service that are available to the Airport. However, utility extensions will be needed.

The proposed Airport development will generate construction-related employment that will have minor short-term economic benefits to Pierce County. The Airport projects may encourage the location of businesses in Pierce County. However, these economic impacts, while beneficial to the local economy, are not anticipated to be significant enough to result in shifts in population or changes in local land use.

ENVIRONMENTAL JUSTICE

Order 5680.1 released by the Department of Transportation (DOT) provides for complying with the Executive Order (EO) 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations. This Order requires DOT to identify and address disproportionately high and adverse human health or environmental effects of their policies or programs on minorities or low-income populations. Environmental Justice must be considered in all phases of planning. It is essential that any potential impacts to minority and low-income populations be identified early in the planning process so that they can be considered during the evaluation of project alternatives.

Based on demographic information, proposed development is not anticipated to adversely affect low-income or minority populations. No discrimination based on minority status or low income will result with implementation of proposed development.

WATER QUALITY

The Federal Water Pollution Control Act, as amended (commonly referred to as the Clean Water Act), provides the authority to establish water quality standards, control discharges, develop waste treatment management plans and practices, prevent or minimize the loss of wetlands, establish location with regard to an aquifer or sensitive ecological area such as a wetlands area, and regulate other issues concerning water quality.

The Airport sits above the Tacoma Narrows and other portions of the greater Puget Sound. Stormwater from the Airport ultimately drains into the Puget Sound via three distinct watersheds and four streams. The Airport is permitted to discharge stormwater into these streams under the Industrial NPDES Permit, administered by the Department of Ecology. The permit sets certain conditions including the establishment and implementation of a Stormwater Pollution Prevention Plan (SWPPP) which identifies sources of pollution and best practices to reduce or eliminate the pollution.
Stormwater treatment incorporating infiltration and heavy metal removal is also likely needed to ensure compliance with the endangered species act. Construction disturbances of more than 1 acre will require an NPDES Permit of Construction Activity, administered by the Department of Ecology.

If the proposed federal action (projects) impounds, diverts, drains, controls, or otherwise modifies the waters of any stream or other body of water, the Fish and Wildlife Coordination Act applies unless the project is for the impoundment of water covering an area of less than 10 acres.

Measures identified in FAA Advisory Circular 150/5370-10A, Standards for Specifying Construction of Airports, Item P-156, Temporary Air and Water Pollution, Soil Erosion, and Siltation Control, should be incorporated into the design and construction of the proposed Airport development projects to minimize adverse water quality effects, including control of water pollution during construction.

WETLANDS

Executive Order (E.O.) 11990, “Protection of Wetlands,” DOT Order 5660.1A, the Rivers and Harbors Act of 1899, and the Clean Water Act, Section 404, address activities in wetlands. E.O. 11990 requires federal agencies to ensure that their actions minimize the destruction, loss, or degradation of wetlands. It also ensures the protection, preservation, and enhancement of the Nation’s wetlands to the fullest extent practicable during the planning, construction, funding, and operation of transportation facilities and projects (7CFR Part 650.26, August 6, 1982). DOT Order 5660.1A sets forth DOT policy that transportation facilities should be planned, constructed, and operated to ensure protection and enhancement of wetlands.

Under the Fish and Wildlife Coordination Act (FWCA), FAA must consult with the U.S. Fish and Wildlife Service (FWS) when the FAA is considering an airport action that would impound, divert, deepen, control, modify, pollute, dredge, or fill any watercourse, water body, or wetland. FAA also coordinates with FWS and state agencies about action impacts on potentially affected biotic resources that do not occupy those waters. If an action would affect tidally influenced waters, Essential Fish Habitat, marine and anadromous fishes, marine mammals or sea turtles, coordination with National Marine Fisheries Service (NMFS) should occur. This interagency coordination provides multidisciplinary input critical to FAA’s evaluation of action impacts. In addition, this consultation helps FAA determine the adequacy of potential mitigation measures.

Previous reviews of the Airport have identified wetlands within the controlled property. Wetlands have been identified in the southeast, western, and eastern quadrants of the property. Some of the proposed projects will warrant additional examination of wetland
resources and delineation of wetlands in proximity to and within the footprint of these projects. These examinations will indicate the need for State and/or Federal permits and/or wetland mitigation measures.

**WILD AND SCENIC RIVERS**

The Wild and Scenic Rivers Act (P.L. 90-542, as amended) protects rivers that are listed on the National Inventory of Wild and Scenic Rivers. The State of Washington has approximately 70,439 miles of river, of which 197 miles are designated as wild & scenic—less than 3/10ths of 1% of the state's river miles. The designated rivers include a 10 mile section of the Klickitat River, 158.5 miles of the Skagit River, and 27.7 miles of the White Salmon River.

There are no System Rivers on, near, or of similar drainage confluence downstream from Tacoma Narrows Airport. Therefore, there is no anticipated impact relative to this category.

**INDUCED SOCIOECONOMIC/CUMULATIVE IMPACTS**

*Induced Socioeconomic Impacts*

FAA guidance requires consideration of the potential for induced or secondary impacts on surrounding communities of any proposed major airport project. The limited scope of anticipated changes to airport operations is not expected to result in significant socioeconomic impacts to any residents or businesses in the vicinity of the airport.

*Cumulative Impacts*

The Council of Environmental Quality regulations (40 CFR § 4321 et seq.) require that secondary (or indirect) consequences be included as part of the environmental review process. The CEQ defines cumulative impacts as: “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonable foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over time.”

While Cumulative impacts may occur if the proposed projects, combined with other local development projects, such as road improvements or economic development projects, create significant socioeconomic impacts for the surrounding area, a thorough cumulative impact analysis is beyond the scope of this Environmental Review.

There are no reasonably foreseeable secondary or indirect effects from any proposed airport development. Any proposed development at the airport will take into account other planned projects in order to coordinate construction activities and minimize impacts.
CONCLUSION

Early correspondence with environmental agencies, the preliminary review of existing project area environmental-related documents, and the preliminary review of the physical project area environment have not resulted in the identification of any potentially significant impacts associated with the proposed airport improvements. Potential impacts are similar to those addressed in past environmental evaluations.

Proposed development projects within the 20-year planning period that require an environmental assessment or further environmental evaluation include proposed land acquisition, the new west side airport development, and potentially apron expansion and hangar redevelopment/expansion.
The master planning process for the Tacoma Narrows Airport (Airport) has evolved through efforts in the previous chapters to analyze future aviation demand, establish airside and landside facility needs, and evaluate options for the future development of the airside and landside facilities. The various landside/airside development options that were presented in the previous chapter provided the Public/Advisory Committee (PAC) with a variety of options for future facility expansion. Following a careful assessment of the potential impacts of each development option, and based on the PAC recommendations and public comments received throughout the process, the Pierce County staff selected components of a recommended Conceptual Development Plan, which was presented at the conclusion of the previous chapter.

The planning process has included the development of phased reports, which were distributed to the Planning Advisory Committee (PAC), published on the County’s website and discussed at the coordination meetings and public open houses/public information sessions held during the study process. The Airport Layout Plan (ALP) drawing set present a pictorial representation and summarization of the results of the planning process. In addition, the ALP set drawings reflects airport design standards in accordance with FAA Advisory Circular 150/5070-6A, Airport Master Plans, 150-5300-13A, Airport Design (Change #1), and conforms with the FAA ARP SOP No. 2.00, Airport Layout Plan Review Checklist (October, 2013).
These drawings will be submitted to the FAA for their review and inspection. The FAA will critique the drawings from a technical perspective to ensure that all applicable federal regulations are met.

As stated by the FAA, the ALP drawing set serves as a:
- Funding eligibility tool,
- Blueprint for airport development,
- Public document and reference,
- Budgetary and airspace protection tool, and
- Staff working tool

**AIRPORT LAYOUT PLAN DRAWING SET**

This airport layout plan (ALP) drawing set depicts the necessary improvements derived from Facility Requirements and Development Alternatives chapters and shows airport features including, but not limited to, existing airfield and landside configurations, future developments, airport airspace, land uses and airport property boundaries. While the single-sheet ALP drawing shows most airport-related features, other necessary depictions, such as airspace limits and off-airport land uses are shown on separate drawings.

The Tacoma Narrows Airport ALP set includes the following drawing sheets:
1. Cover Sheet
2. Airport Layout Plan
3. Airport Airspace Plan
4. Airport Airspace Extended Approach Plan
5. Runway 17 Departure Surface
6. Runway 17 Inner Approach Surface
7. Runway 35 Inner Approach Surface
8. Terminal Area Plan
9. Land Use Map
10. Airport Property Map

The following sections provide a brief description of the purpose, content and specific elements found on the individual sheets included in the ALP drawing set.

**COVER SHEET (SHEET 1)**

The cover sheet provides a sheet index to the airport layout plan drawing set, and provides pertinent information such as the airport sponsor, airport name, the FAA grant number that funded - in part - this master plan, and the required FAA disclaimer. Additionally, the sheet shows the Airport’s location and vicinity maps.

**AIRPORT LAYOUT PLAN DRAWING (SHEET 2)**

The Airport Layout Plan (ALP) drawing serves as the official drawing of record for the Tacoma Narrows Airport. The drawing consists of a scaled single-page drawing depicting existing and
planned improvements throughout the 20-year Airport Development Plan and beyond. Specifically, this drawing depicts the current and future limits of airport property, land uses and configuration of facilities in compliance with geometric design separation and clearance standards, including airspace and navigational (NAVAID) facilities. Existing or future deviations and/or modifications to standards, if applicable, are appropriately noted.

The ALP drawing serves as a development guide representing the County’s long term vision for the Airport. The actual timing of improvements shown on the ALP drawing depends upon the aviation demand and associated improvement needs as well as funding availability. Some of the major components included in the ALP and discussed in previous chapters include:

- Relocation of Taxiway A 50 feet to the east to comply with the 400 feet runway centerline to taxiway centerline separation recommended in AC 150/5300-13A.
- Relocation of Taxiway B4 to eliminate direct access from the apron to the runway.
- Expansion of the Apron to provide Group II taxilane access.
- Provision of an alternate grass landing area to the west of Runway 17-35.
- Construction of a partial parallel taxiway to the northwest of the airport property to serve planned Group I development in the area.
- Construction of a new access road to provide access to the West Side Development area.
- Developments on the north side of the Airport that include an Aviation Compatible Development Area, Surplus Property, an Aviation Compatible Reserve Area and a Gravel Access Road.
- Developments on the west side of the airport that include an Airport Entrance Road, a Group I Development Area, an Aviation Compatible Development Area, a Gravel Access Road, a Non-Aeronautical Land Use Conversion and the Removal/Relocation of the Existing Access road.
- Developments on the east side of the airport that include Redevelopment Areas, an Aviation Compatible Reserve Area, a Gateway Development Area and an Aviation Compatible Development Area.

An important issue discussed as part of this master plan relates to the protection of the feasibility of a future runway extension. As explained in previous chapters, a runway extension is not needed nor justified in the 20-year planning period. Pierce County has expressed its interest in protecting the viability of such an extension, if and when it becomes justified and needed. A review of building height restrictions in Pierce County, Gig Harbor Peninsula, City of University Place and the City of Tacoma indicated that current zoning ordinances provide sufficient height protection for such an extension. Accordingly, the County has chosen not to show the extension on the ALP drawing and will continue to work with the involved jurisdictions to ensure that zoning controls are in place and are not changed in a manner that might impact the feasibility of such an extension in the future. Pierce County, as a recipient of Federal funds, is committed to protect, preserve, and enhance investments in the airport’s infrastructure to allow maximum utility to the travelling public and support regional economic growth.
The protection of a future runway extension would also require the protection of its resultant RPZ. The FAA requires that an airport sponsor controls the RPZ through 1) fee simple acquisition, 2) avigation easement, or 3) zoning ordinances. Portions of the current RPZ located outside of the airport’s property, as well as those portions of the ultimate RPZ that would be associated with a future runway extension are identified on the ALP drawing as avigation easement areas.

Runway Protection Zones (RPZs) are not Part 77 surfaces, but mirror the inner portion of approach surfaces on the ground. The existing/ultimate RPZ for Runway 17 has an inner width of 1,000 feet, an outer width of 1,750 feet and a length of 2,500 feet. The existing/ultimate RPZ for Runway 35 has an inner width of 500 feet, an outer width of 1,010 feet and a length of 1,700 feet. Generally speaking, the Airport Sponsor, as either fee simple acquisition or as an RPZ easement, should control the RPZs, with fee simple being the preferred type of ownership. If an easement is purchased, it is a purchase of the air rights over the actual ground.

AIRPORT AIRSPACE PLAN (SHEETS 3 and 4)
The Airspace Plan for the Airport is based upon Federal Aviation Regulations (FAR) Part 77, Objects Affecting Navigable Airspace. In order to protect the Airport’s airspace and approaches from hazards that could affect its safe and efficient operation, federal criteria have been established to provide guidance in controlling the height of objects in the vicinity airports. FAR Part 77 criteria specify a set of imaginary surfaces which, when penetrated, designate an object as being an obstruction. However, some obstructions can be determined to be non-hazardous by an aeronautical study by virtue of their location and/or marking and lighting as specified in the aeronautical study determination. Airfield navigational aids, as well as lighting and visual aids, by nature of their location, may constitute obstructions, but these objects do not violate FAR Part 77 criteria, as they are essential to the operation of the Airport.

This drawing shows the Part 77 Imaginary Surfaces for the future layout of the Airport with a USGS topographic map as the background. Part 77 defines five distinct surfaces, each with a different size and shape. The dimensions of these surfaces are based on the type of runway and the type of approach ultimately planned for the Airport. Each imaginary surface and its dimension as it applies to the Airport are defined below and are depicted in Figure 6A for reference.

Primary Surface. The primary surface is rectangular, centered on the runway, extends 200 feet beyond each end of the runway, and has a width that varies according to airport-specific criteria. The elevation of the primary surface corresponds to the elevation of the nearest point of the runway centerline. The width of the primary surface of Runway 17/35 is 1,000 feet.

Approach Surface. The approach surface is centered on the extended runway centerline, starts at the end of the primary surface (200 feet beyond each end of the runway), and has a width equal to that of the primary surface. Approach surfaces slope upward and outward from the runway ends.
The ultimately planned approach surfaces at the Airport reflect a precision approach to Runway 17 with visibility minimums as low as ½ mile and a non-precision approach to Runway 35 with visibility minimums as low as 1 mile.

Runway 17 has an approach surface with an inner width of 1,000 feet extending for a horizontal distance of 50,000 feet to an outer width of 16,000 feet. The inner 10,000 feet of the approach surface have a slope of 50:1 while the additional 40,000 feet have a slope of 40:1. Runway 35 approach surface has an inner width of 1,000 feet extending for a horizontal distance of 10,000 feet to an outer width of 3,500 feet at a slope of 34:1.

**Transitional Surface.** The transitional surface is a sloping 7:1 surface that extends outward and upward at right angles to the runway centerline from the sides of the primary surface and the approach surfaces.

**Horizontal Surface.** The horizontal surface is a flat, elliptical surface at an elevation 150 feet above the established airport elevation. The extent of the horizontal surface is determined by swinging arcs of a 10,000-foot radius from the center of each end of the primary surface.

**Exhibit 6A. Graphical Depiction of FAR Part 77 Imaginary Surfaces – Precision Approach**
Conical Surface. The conical surface extends outward and upward from the horizontal surface at a slope of 20:1 for a horizontal distance of 4,000 feet.

FAR Part 77 surfaces are the basis for protecting airspace around an airport; therefore, it is ideal to keep these surfaces clear of obstructions whenever possible. FAR Part 77 allows the “FAA to identify potential aeronautical hazards in advance thus preventing or minimizing the adverse impacts to the safe and efficient use of navigable airspace “The FAA decides if any of the obstructions to Part 77 surfaces are hazardous to aviation.

RUNWAY 17 DEPARTURE OBSTACLE CLEARANCE SURFACE (SHEET 5)
The Runway Departure Surfaces Plan depicts the plan and profile view of Runway 17 departure surface, which is applicable to all instrument runways with departure procedures. The departure surface is a surface longitudinally centered on the extended runway centerline, extending outward and upward from the end of the primary surface and at the same slope as the approach/departure zone height limitation slope.

The departure surface at the Airport begins at the end of the runway at a width of 1,000 feet. It extends outward for a length of 10,200 feet to an outer width of 6,466 feet as shown in Figure 6B. The designated obstacle clearance slope is 40:1.

Based on the FAA ORS database, queried on March 2014, there are no obstructions in the departure surface of Runway 17. Trees in the Runway 17 departure surface were identified as possible obstructions. An obstruction survey is in the County’s 5-year ACIP and is expected to be completed in 2016.
INNER APPROACH SURFACE DRAWINGS (SHEETS 6 & 7)
These drawings provide a more detailed view of the inner portions of the Part 77 imaginary approach surfaces and the Runway Protection Zones (RPZs). Sheets 6 and 7 provide large-scale drawings with both plan and profile delineations. They are intended to facilitate identification of the roadways, utility lines, railroads, structures, and other possible obstructions that may lie within the confines of the inner approach surface area associated with each runway end.

Airspace surfaces are depicted for disposition of obstructions to navigable airspace. The limits of the drawing extend to a point where the FAR Part 77, Subpart C approach surface reaches 100’ height above the runway end elevation.

Based on the FAA ORS database, queried on March 2014, there are no obstructions in the approach surfaces of Runways 17 and 35. Trees in the Runway 17 approach surface were identified as possible obstructions. An obstruction survey is in the County’s 5-year ACIP and is expected to be completed in 2016.
TERMINAL AREA PLAN DRAWING (SHEET 8)
The Terminal Area Plan shows the location and configuration of existing and proposed buildings and paved areas in the terminal area of the Airport, including hangars and parking lots. The contents of the Terminal Area Plan include a large scale plan view of the area; building data table; legend table; and title and revision blocks. Additionally, the Terminal Area Drawing identifies each building’s height where available. For future buildings, the maximum height a building can have while remaining under the Part 77 Surfaces is shown.

AIRPORT LAND USE PLAN and NOISE CONTOUR DRAWING (SHEET 9)
A land use plan has been developed for the Airport and the surrounding area. This plan includes the land uses on and around the Airport per the Pierce County Zoning Ordinance. Land uses around airports should be compatible with airport operations. Land uses and their associated activities that are of greatest concern to airports include:

- Aircraft Noise
- Nearby Lighting
- Glare, Smoke and Dust Emissions
- Bird Attractions and Landfills
- Airspace Obstructions
- Electrical Interference
- Concentrations of People

Any of these activities can create safety concerns for airport users and people on the ground. They may also be affected by airport operations. Pierce County has established an Airport Overlay Zone to ensure that land use and zoning in the Airport’s surroundings are compatible with the Airport and its operations. Pierce County Title 18A – Development Regulations – Zoning 18A.10.100 states that “The Rural Airport Overlay (RAO) functions as a safety buffer adjacent to the Tacoma Narrows Airport in rural designated land. The overlay provides restrictions on the use of land, which are intended to protect the airport from neighboring land uses that are incompatible with aviation activities. The area also provides buffering between those more intensive uses related to aviation activities and the uses authorized in the rural-residential classifications. The County’s zoning ordinance is consistent with sections RCW 36.70.547, 36.70A.510, 35A.63.270 and 35.60.250 of the Washington State Growth Management Act as adopted by the State Legislature in 1996. These sections require “all cities and counties to protect public use airports from the siting of incompatible development, whether publicly owned or privately owned public use airports through its comprehensive plan and development regulations.” The County will, if needed, redefine the Airport Overlay Zone consistent with the proposed development in this Master Plan Update.

Noise contours were developed for the Airport, based on existing and forecasted aircraft operations presented in Chapter 2, in accordance with FAA regulations using the Integrated Noise Model (INM) version 7.0d. According to FAA guidance, 65 dBA is the threshold for aircraft noise
incompatibility with some land uses. Pierce County continues to work with the local community and airport operators to ensure that noise abatement procedures and measures are in place to protect the health, safety and welfare of the Airport’s neighbors. Noise contours associated with the forecasted airport development and activity in 2017 are shown. Noise contours for the current activity as well as for the 5-year, 10-year and 20-year periods are provided in the Environmental Review Chapter.

AIRPORT PROPERTY MAP (SHEET 10)
The Airport Property Map shows areas of existing airport sponsor ownership and area proposed for ownership or release. The map also shows easements, buildings, apron, fences, roads and other features of concern. Tracts are shown for depiction purposes only and this map is not to be used for survey or land acquisition. Property information includes ownership, location, purpose, book and page.

1 For more information about land use incompatibility with airport noise, see FAA Advisory Circular 150/5020-1, Noise Control and Compatibility Planning for Airports.
Chapter Seven  
Implementation Plan

This chapter presents the 20-year improvement program for the continued development of the Tacoma Narrows Airport. The objectives of this chapter are to identify projects deemed necessary to efficiently accommodate the forecast aviation demand, project the timeframe in which the projects should be accomplished, estimate the costs associated with each project, and identify potential funding sources for each.

Improvements that are required to satisfy the forecast aviation demand at Tacoma Narrows Airport are placed into three development phases: short-term (0-5 years), intermediate-term (6-10 years), and long-term (11-20 years). The proposed improvements and associated costs for each phase are provided by time period in the Tacoma Narrows Airport Capital Improvement Plan, Table 7A, with narrative descriptions to follow.
Table 7A. Capital Improvement Plan (CIP) for Tacoma Narrows Airport

<table>
<thead>
<tr>
<th>Year/ Priority</th>
<th>Project Description</th>
<th>Total Cost</th>
<th>Pierce County</th>
<th>FAA Non-Primary Entitlement</th>
<th>State Apportion/ Discretionary</th>
<th>WSDOT</th>
<th>Private</th>
<th>Other</th>
<th>Other Description</th>
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<td>2017</td>
<td>PHASE I - EA and Predesign - Obstruction removal, pavement maintenance, Taxiway A Separation, Connector B4 &amp; Pond Relocation, Taxiway Expansion</td>
<td>$110,000</td>
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Tacoma Narrows Airport
Master Plan Update
Implementation Plan
PROJECT LIST AND IMPLEMENTATION SCHEDULE

A list of capital improvement projects has been assembled from the facility requirements and selected preferred alternative previously presented. This list has been coordinated with the Airport Layout Plan (ALP) drawing set and the capital improvement program that is continuously updated by airport management, WSDOT Aviation, and the Federal Aviation Administration (FAA).

Short-term projects (first five years) are listed in a general priority order. Intermediate- and long-term projects (6-20 years) are listed in a logical phasing sequence. Projects that were included in the ALP but are anticipated to take place beyond the 20-year planning period are identified without cost estimates. Furthermore, it is anticipated that the project phasing will invariably change as local, state, and federal priorities evolve over the years.

This implementation plan is designed to serve as a guide for the Airport throughout the planning and development process. To meet realistic funding expectations, it may be necessary to weigh the items of the development plan in a thoughtful and global manner. Funding for these projects has not yet been committed and the actual costs may vary depending upon final construction costs. The date of implementation may also vary due to funding availability and actual aviation demand.

The phases identified in the implementation plan include: Short-term (2017-2021), medium-term (2022-2026), and long-term (2027-2036).

PLANNING PHASE I (2017-2021)

Phase I is the first five years of the planning period. Phase I development projects are further broken down into specific years. Projects in this phase include:

**Hangar Door Replacement and Repair (Ongoing 2015 – 2018):** Repair and replacement of hangar doors that are nearing the end of their useful life.

**Fire Protection Water System Improvements (Ongoing 2016 - 2020):** Improvement and/or replacement of existing water lines, fire hydrants and other related infrastructure around the Airport.

**PHASE I – EA and Predesign – Obstruction removal, pavement maintenance, Taxiway A Separation, Connector B4 & Pond Relocation, Taxi lane Expansion (2017):** Preliminary design and environmental review for removing obstructions. Conduct environmental review and preliminary engineering to relocate the storm water pond, relocate Taxiway A 50 feet to the east, relocate Taxiway B4 to eliminate direct runway access from apron, and expand taxilane between Taxiway B3 and B4.
PHASE II – Final Design and Construction – Obstruction Removal (2019): Remove any obstructions exceeding Part 77 airspace hazards which were identified by WSDOT sponsored AGIS as part of the PSRC NextGen Study in 2016.

Pavement Maintenance (2019): Pavement maintenance and rehabilitation items identified in the five-year pavement maintenance program.

PHASE III – Final Design – Pond Relocation, Taxiway A Separation, Taxiway Connector B4 Relocation, and Taxilane/Apron Expansion (2020): This project encompasses four projects that are:

- **Pond Relocation**: Removal of the existing retention pond located north of Taxiway B4, and re-routing of the existing 30” stormwater pipe that currently outfalls to the south of the airport.
- **Taxiway A Relocation**: Design phase for the relocation of Taxiway A 50 feet to the east to comply with the FAA runway centerline to taxiway centerline separation of 400 feet.
- **Taxiway B4 Relocation**: Design of Taxiway B4 relocation to eliminate direct access from the apron to the runway.
- **Apron Expansion**: Design of the expansion of the taxilane/apron located between Taxiway B3 and B4.

PHASE IV – Construction – Pond Relocation (2021): Removal of the existing retention pond located north of Taxiway B4, and re-routing of the existing 30” stormwater pipe that currently outfalls to the south of the airport.

PHASE II (2022-2026)
Phase II represents the second five years of the planning period, 2019-2023. Projects identified to be implemented in this phase are:

PHASE V – Construction – Taxiway A Relocation, Taxiway B4 Relocation, and Apron Expansion: This project encompasses three projects that are:

- **Taxiway A Relocation**: Design phase for the relocation of Taxiway A 50 feet to the east to comply with the FAA runway centerline to taxiway centerline separation of 400 feet.
- **Taxiway B4 Relocation**: Design of Taxiway B4 relocation to eliminate direct access from the apron to the runway.
- **Apron Expansion**: Design of the expansion of the taxilane/apron located between Taxiway B3 and B4.
**Alternate Grass Landing Area:** Design/Construction and marking of an alternate grass landing area to the west of the runway. The landing area will accommodate small A-I and B-I aircraft.

**Gravel Access Road:** Design and Construction of a new gravel access road to the wooded area on the north and south portions of the airport property. This project is needed to access and remove/clear trees that present obstructions to air navigation.

**Gravel Access Road:** Design and Construction of a new gravel access road to the wooded area on the north and south portions of the airport property. This project is needed to access and remove/clear trees that present obstructions to air navigation. The project also includes the relocation of the existing service road outside the RSA.

**Hangar Redevelopment:** Redevelopment of the existing T-hangars to the east of Runway 17 threshold, the quad hangars to the south of these hangars, and additional hangars located east of and between Connectors B2 and B3 are identified as redevelopment areas. Project includes demolishing the existing structures and construction of new structures.

**Pavement Maintenance:** Pavement maintenance and rehabilitation items to be identified as part of the pavement maintenance program.

**Westside Access Road – Phase I:** The first phase of the design and construction of an additional access road, off of Stone Drive, to the west side of the Airport. The new road will provide access to the proposed development areas on the west side of the airport.

**Westside Group I Development – Phase I:** First phase of the design and construction of a Group I partial parallel taxiway to the west of the runway. Project also includes the site preparation and necessary taxilanes for the construction of Group I hangars.

**Property Surplus of Non-Aeronautical use Land:** Disposal of 1) the area along the southwest airport property line and south of 33rd Avenue NW and 2) the area along the northeast airport boundary of the airport. These property are identified as non-aeronautical land use conversion on the ALP. Proceeds from the surplus of the property will be used to purchase and/or develop other areas around the airport.

**Property Acquisition:** Acquisition of the property to the northwest of the airport along Point Fosdick Dr. NW. An earlier project provides for the acquisition of the portion of the property that falls within the Runway 17 RPZ. This project provides for the acquisition of the remainder of the property identified on the ALP as acquisition or avigation easement. The acquisition of this property will provide added safety for airport operations.
PHASE III (2027-2036)
Phase III represents the last ten years of the planning period, 2023-2032. Projects falling within this timeframe are:

**Airport Master Plan Update:** An update to the Tacoma Narrows Airport Master Plan is an anticipated need in the 7- to 10-year timeframe. Existing and forecast aviation demand projections including based aircraft, operations, fleet mix, and critical aircraft/design aircraft should be revisited and updated to respond to changing conditions. Subsequently, facility needs, airport layout plan, and the CIP should be revised, as appropriate.

**Pavement Maintenance:** Pavement maintenance and rehabilitation items to be identified as part of the pavement maintenance program.

**Property Acquisition (Westside):** Acquisition of multiple parcel to the northwest of the existing Airport property identified as aviation compatible development area on the preferred alternative.

**Westside Access Road – Phase II:** Second phase of the design and construction of an additional access road, off of Stone Drive, to the west side of the Airport. The new road will provide access to the proposed development areas on the west side of the airport.

**Westside Group I Development – Phase II:** Second phase of the design and construction of a Group I partial parallel taxiway to the west of the runway. Project also includes the site preparation and necessary taxilanes for the construction of Group I hangars.

**Pavement Maintenance:** Pavement maintenance and rehabilitation items to be identified as part of the pavement maintenance program.

PHASE IV (BEYOND THE 20-YEAR PLANNING PERIOD)
Phase IV represents projects that were included on the ALP and are part of the County’s vision for the long term development for the Airport. These projects are not anticipated to be needed or justified within the 20-year planning period. These projects include:

**Aviation Compatible Development (Private):** Aviation Compatible development of the 7.9 acres area to the north of the airport property, adjacent to 36th Street NW.

**Aviation Compatible Development:** Development of the area to the northeast of the runway and existing development.
COST ESTIMATES

Cost estimates for individual projects, based on 2015 dollars, have been prepared for improvements that have been identified as necessary during the 20-year planning period. The estimates have been categorized by the total cost for each project, the portion to be paid by Pierce County, and the portion anticipated to be paid by the FAA under the Airport Improvement Program (AIP) or similar programs. In addition to airport sponsor funds, the local share can include sources such as Washington State Department of Transportation (WSDOT) funding, the Washington State Department of Ecology, State and/or local economic development funds, regional commissions and organizations, other units of local government, as well as funding from private individuals or businesses.

This data is then reviewed and analyzed for specific factors that may influence costs, such as operational constraints, project schedule, utility locations, and other special project requirements. These estimates are intended to be used for planning purposes only and should not be construed as detailed construction cost estimates, which can only be prepared following the preparation of detailed design documentation. It should be noted that total project costs include construction, temporary flagging and signing, construction staking, testing, engineering, administration, and contingency, as required.

CAPITAL IMPROVEMENT PLAN (CIP) AND PHASING PLAN

The projects, phasing, and costs presented in this Master Plan are the best projections that can be developed at the time of formulation. Their purpose is to provide a reasonable projection of capital needs, which can then be used in fiscal programming to test for financial feasibility. In order to assist in the preparation of the Airport’s CIP on file with the FAA and updated annually, the first planning phase of projects and their cost estimates has been organized in a format similar to that used by the FAA.

The cost estimates provided earlier in Table 7A represent the suggested phasing for projects during the short-, intermediate-, and long-term development planning periods. These are suggested schedules, and variance from them will likely occur, especially during the latter time periods. Attention has been given to the first five years as being the most critical, and the scheduled projects outlined in that time frame should be adhered to as much as possible. The demand for certain facilities, especially in the latter time frame, and the economic feasibility of their development, are the prime factors influencing the timing of individual project implementation. Care must be taken to provide for adequate lead-time for detailed planning and construction of facilities in order to meet aviation demand. It is also important to minimize the
disruptive scheduling, where a portion of the facility may become inoperative due to construction, and to prevent extra costs resulting from improper project scheduling.

**SOURCES OF CAPITAL FUNDING**

The following section provides a description of capital improvement funding sources that are listed in Table 7A.

**FEDERAL FUNDING**

There are several Federal funding programs that are available for Tacoma Narrows Airport. A description of these programs is provided below.

*Federal AIP Entitlement Grants*

The current program, known as the Airport Improvement Program (AIP), was established by the Airport and Airway Improvement Act of 1982 (Public Law 97-248). Since then, the AIP has been amended several times, most recently with the passage of the FAA Modernization and Reform Act of 2012. Funds obligated for the AIP are drawn from the Airport and Airway Trust fund, which is supported by user fees, fuel taxes, and other similar revenue sources. For small primary, reliever, and general aviation airports, the grant covers a range of 90-95 percent of eligible costs, based on statutory requirements. For Tacoma Narrows Airport, Federal grants cover 90% of eligible costs.

The Wendell H. Ford Aviation Investment and Reform Act for the 21st Century (AIR-21), enacted in April 2000, established the first-ever Non-Primary Airports Entitlement Program. AIR-21 sets aside grant funding for general aviation airports listed in the National Plan of Integrated Airport Systems (NPIAS) for pavement maintenance work. General aviation airports like Tacoma Narrows can each receive up to $150,000 per year based on the FAA’s assessment of maintenance needs over a five-year period.

This funding set-aside is available for each federal fiscal year when Congress appropriates at least $3.2 billion for the FAA’s AIP grant program. For the convenience of the Airport Sponsor, if a project is anticipated to cost in excess of $150,000, participating airports can rollover the Non-Primary Entitlement funds for up to three years, at which time the accumulated total of rolled-over funds can be used for larger projects. Any unused funds at the end of the entitlement program revert to the FAA.

*Federal AIP Discretionary Grants*

The FAA also provides discretionary grants on a 90/10% basis to airports similar to Tacoma Narrows Airport. This source of funding is over and above entitlement funding and is provided to
airports for projects that have a high federal priority for enhancing safety, security, and capacity of the Airport and would be difficult to fund otherwise. The dollar amounts of individual grants vary and can be significant in comparison to entitlement funding. Discretionary grants are awarded at the FAA’s sole prerogative. Discretionary grant applications are evaluated based on need, the FAA’s project priority ranking system, and the FAA’s assessment of a project’s significance within the national airport and airway system.

STATE FUNDING
The Washington State Department of Transportation Aviation Division (WSDOT) provides grant money for airport projects. As is the case with most states, the majority of the state funding is spent on pavement maintenance.

WSDOT’s Airport Grant Program is available for any city, county, airport authority, political subdivision, federally recognized Indian tribe, public corporation, or person(s) that owns and operates, a public-use airport included in the Washington Aviation System Plan (WASP). The maximum amount WSDOT Aviation can award to an individual sponsor in a single grant is $250,000.

On projects seeking state funds only, the airport sponsor must contribute a minimum 5% match of the entire project cost. For projects receiving federal funds, it has been a long standing practice of the Airport Aid Program to support airports in matching their Airport Improvement Program (AIP) grants. Currently AIP grants require 10% of the project total to come from the airport sponsor. WSDOT supports grants to airports for up to half of their match requirement.

The Washington State Department of Transportation’s Airport Aid Program provides an average of $1.1 million in state airport grants per year. During the 20-year study period the state grant program is forecasted to average $1.4 million per year, resulting in an average annual funding deficiency of $12 million according to a new study by WSDOT.

The Washington State Department of Ecology (DOE) provides a number of financial assistance programs to support environmental management projects throughout the State. The Statewide Stormwater Grant Program provides funding for projects that address water quality in the State of Washington and minimize the pollution of surface water and groundwater. The Program has in the past funded 75% of eligible projects. It is expected that the stormwater improvement project be eligible for DOE funding.

PRIVATE FUNDING
Many airports use private financing when the planned improvements will be primarily used by a private business or other organization. Such projects are not ordinarily eligible for federal
funding. Projects of this kind typically include hangars, fixed base operator (FBO) facilities, fuel storage, exclusive aircraft parking aprons, industrial aviation-use facilities, non-aviation office/commercial/industrial developments, and various other projects. Often, airport funds for infrastructure, preliminary site work, and site access are required to facilitate privately developed projects on airport property.

**AIRPORT GENERATED REVENUE FINANCING**

Typically, the revenues generated by airports are used to support the local match of eligible state and federal projects. However, some projects are either non-eligible for state or federal funding participation, or do not compete well for eligible funding. In these cases, the Airport Sponsor would be responsible for 100% of the project cost to implement the proposed development.

In order to determine the ability of Pierce County to support its financial needs related to future capital development, the Airport’s revenues and expenses are reviewed.

**Historical Revenues and Expenses**

Airport user fees represent the primary source of revenues typically generated for an airport. User fees refer to charges for the facilities and services provided at the Airport and are most often determined by area market conditions. For Tacoma Narrows, the greatest revenue source is the revenue generated from T-hangars, conventional hangars, hangar space, and land. Other revenue sources include tiedown fees, fuel sales, and other rents and concessions.

Airport operating revenues are offset by operating expenses and referred to as operation and maintenance (O&M) costs. These costs represent the day-to-day costs of operating the Airport. The County tracks the following O&M costs for Tacoma Narrows Airport:

- Salaries and Benefits
- Minor Equipment, Supplies, Equipment Rental and Services
- Communication, Travel, Advertising
- Insurance
- Utilities
- Repairs & Maintenance
- Miscellaneous

**Table 7B** provides a summary of the recent history of airport operating revenues and expenses derived from County financial records. It’s important to note that expenses identified exclude capital equipment expenditures to support maintenance efforts as well as major airport maintenance projects. Expenses shown also exclude any capital improvements. Revenues shown exclude any reimbursements associated with grant funding for airport improvements.
Table 7B. Historical Revenues and Expenses (TIW)

<table>
<thead>
<tr>
<th>Revenues</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rents, Leases, &amp; Concessions</td>
<td>92,248</td>
<td>98,431</td>
<td>23,429</td>
<td>14,006</td>
</tr>
<tr>
<td>Tiedowns</td>
<td>19,559</td>
<td>12,810</td>
<td>15,034</td>
<td>15,562</td>
</tr>
<tr>
<td>Hangars</td>
<td>400,555</td>
<td>396,431</td>
<td>292,984</td>
<td>262,898</td>
</tr>
<tr>
<td>Space &amp; Facilities, Other Leases,</td>
<td>316,910</td>
<td>201,717</td>
<td>309,542</td>
<td>360,746</td>
</tr>
<tr>
<td>Rents and Concessions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Misc.</td>
<td>11,227</td>
<td>18,901</td>
<td>3,276</td>
<td>5,389</td>
</tr>
<tr>
<td>Total Revenues</td>
<td>$840,499</td>
<td>$728,290</td>
<td>$644,265</td>
<td>$658,601</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Expenses</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Salaries and Benefits</td>
<td>148,864</td>
<td>287,360</td>
<td>323,213</td>
<td>254,552</td>
</tr>
<tr>
<td>Minor Equipment, Supplies,</td>
<td>291,352</td>
<td>82,428</td>
<td>69,492</td>
<td>61,807</td>
</tr>
<tr>
<td>Equipment Rental and Services</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication, Travel, Advertising</td>
<td>11,604</td>
<td>18,493</td>
<td>14,153</td>
<td>22,065</td>
</tr>
<tr>
<td>Insurance</td>
<td>20,625</td>
<td>16,561</td>
<td>17,940</td>
<td>19,450</td>
</tr>
<tr>
<td>Utilities</td>
<td>3,552</td>
<td>78,169</td>
<td>66,096</td>
<td>57,057</td>
</tr>
<tr>
<td>Repairs &amp; Maintenance</td>
<td>18,112</td>
<td>19,954</td>
<td>57,919</td>
<td>57,068</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>73,060</td>
<td>117,215</td>
<td>171,559</td>
<td>140,010</td>
</tr>
<tr>
<td>Total Expenses</td>
<td>$567,169</td>
<td>$620,180</td>
<td>$720,372</td>
<td>$612,009</td>
</tr>
<tr>
<td>Cash Flow</td>
<td>$273,330</td>
<td>$108,110</td>
<td>$(76,107)</td>
<td>$46,592</td>
</tr>
</tbody>
</table>

Source: Pierce County. Note: Figures rounded.

While Table 7B indicates the County has a positive cash flow, net operating revenues routinely support the County’s contribution toward capital improvement projects at the Airport. Consequently, the County monitors its cash flow to assess how well revenue generated is supporting expenditures. Cash flow shortages require the County to subsidize the Airport, particularly for capital improvement projects.

Projected Revenues and Expenses

As noted earlier, FAA-eligible airport improvement projects provide a substantial return on investment for the Airport as the FAA funds 90% of the project. Still, the County may encounter budgetary constraints that could limit their ability to provide matching funds on large projects, which could result in a project being postponed until it is financially feasible. For planning purposes, a summary of projected revenues and expenses is provided. Table 7C provides this summary of projected cash flow, which are based on some general assumptions about anticipated growth in revenues and increases in expenses. Based aircraft, aviation activity levels, and landside development are the primary factors affecting airport operating revenues. As additional development occurs to serve an increase in based aircraft and aviation business tenant activity, airport leases are updated and operating revenues correspondingly increase. Modest
increases in revenues are projected to align with the gradual recovery of general aviation, the economy, and the specific aviation demand projections for Tacoma Narrows.

Table 7C. Projected Revenues and Expenses (TIW)

<table>
<thead>
<tr>
<th>Revenues</th>
<th>Baseline</th>
<th>2021</th>
<th>2026</th>
<th>2036</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rents, Leases, &amp; Concessions</td>
<td>14,200</td>
<td>16,100</td>
<td>17,500</td>
<td>20,700</td>
</tr>
<tr>
<td>Tiedowns</td>
<td>13,640</td>
<td>16,000</td>
<td>18,400</td>
<td>24,800</td>
</tr>
<tr>
<td>Hangars, Space &amp; Facilities, Other Leases, Rents and Concessions</td>
<td>638,750</td>
<td>804,300</td>
<td>954,700</td>
<td>1,365,500</td>
</tr>
<tr>
<td>Other Misc.</td>
<td>4,930</td>
<td>5,400</td>
<td>5,700</td>
<td>6,500</td>
</tr>
<tr>
<td><strong>Total Revenues</strong></td>
<td><strong>671,520</strong></td>
<td><strong>841,800</strong></td>
<td><strong>996,300</strong></td>
<td><strong>1,417,500</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Expenses</th>
<th>Baseline</th>
<th>2021</th>
<th>2026</th>
<th>2036</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salaries and Benefits</td>
<td>250,000</td>
<td>292,900</td>
<td>340,400</td>
<td>468,700</td>
</tr>
<tr>
<td>Minor Equipment, Supplies, Equipment Rental and Services</td>
<td>52,000</td>
<td>56,900</td>
<td>60,500</td>
<td>68,500</td>
</tr>
<tr>
<td>Communication, Travel, Advertising</td>
<td>12,500</td>
<td>13,800</td>
<td>15,200</td>
<td>18,500</td>
</tr>
<tr>
<td>Insurance</td>
<td>21,000</td>
<td>31,000</td>
<td>39,600</td>
<td>64,500</td>
</tr>
<tr>
<td>Utilities</td>
<td>58,000</td>
<td>65,300</td>
<td>70,400</td>
<td>81,700</td>
</tr>
<tr>
<td>Repairs &amp; Maintenance</td>
<td>50,000</td>
<td>57,400</td>
<td>64,000</td>
<td>80,000</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>155,000</td>
<td>176,300</td>
<td>194,200</td>
<td>236,700</td>
</tr>
<tr>
<td><strong>Total Expenses</strong></td>
<td><strong>598,500</strong></td>
<td><strong>693,600</strong></td>
<td><strong>784,300</strong></td>
<td><strong>1,018,600</strong></td>
</tr>
<tr>
<td><strong>Cash Flow</strong></td>
<td><strong>$73,020</strong></td>
<td><strong>$148,200</strong></td>
<td><strong>$212,000</strong></td>
<td><strong>$398,900</strong></td>
</tr>
</tbody>
</table>

Source: Pierce County. Baseline operating revenues and expenses estimated using financial records for 2013 and other recent years. Note: Figures rounded.

While a variety of factors will determine the actual financial outcome—all of which are difficult to predict with any accuracy, the projections presented here take into account recent activity and tenant growth trends and projections as well as recent airport financial results. As shown, cash flow is projected to grow. These projections consider normal growth factors adapted to the unique characteristics of Tacoma Narrows, particularly with revenues associated with hangar, space and facility leases, which have shown overall growth and are projected to increase with forecast demand and the County’s development plans.

Taking the projected cash flow for the Airport over the 20-year planning period and comparing it to the CIP funding needs for the same timeframe provides a picture of the financial responsibility for capital improvements beyond the FAA and State funding resources, shown in Table 7D. The local/other share column shown in the table consists of Pierce County, any private development funding, and other possible agency grant funding sources; these are combined as Pierce County will be responsible for coordinating or securing such funds.
Phase I financial needs identified in Table 7A indicate an estimated $3,060,000 total cost. $150,000 is slated for county funding with the balance anticipated from FAA in Non-Primary Entitlement ($965,000) and State Apportionment/Discretionary ($1,795,000) funding with WSDOT picking up the remaining $150,000.

For Phase II, nearly $1.2 of the $7.8 million local funding need is the County’s obligation. Half of this county funding responsibility is the AIP-ineligible $675,000 portion of the proposed taxiway/apron improvement construction project, along with another $175,000 of ineligible development on the west side. One project in Phase II offers financial benefit as it contributes $34,000 to the Airport fund following the release of surplus land from the airport property. The total cost of the property to be released is $340,000, but 90% goes to the FAA as reimbursement for its acquisition in the past. This land release will also coincide with the County’s acquisition of additional land needed to increase the safety of airport operations.

The surplus in Phase III is evidence of the projected growth in revenues coupled with the fact that all projects proposed in Phase III are eligible for AIP funds—withstanding the exception of a $100,000 portion on the west side development—helping minimize the County’s financial obligation.

While Table 7D summarizes the financial scenario by phase to provide an overview, the Airport will incur net income shortages during specific years when major development projects are programmed. The Airport’s net income shortage is not uncommon among general aviation airports when local grant matches are needed. Shortages may also result if other anticipated funding sources do not come through or unanticipated financial obligations arise. However, as noted in Chapter 1, the Tacoma Narrows Airport is an economic engine and valuable asset for the community and region—generating jobs and visitor spending, as described in the WSDOT Economic Impact Study prepared for airports. Therefore, the FAA, State, and local airport

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Table 7D. Cash Flow vs. Local/Other CIP Funding Requirements

<table>
<thead>
<tr>
<th>Phase</th>
<th>Revenues</th>
<th>Expenses</th>
<th>Net Income</th>
<th>CIP Local/Other Share</th>
<th>Net Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase I (through 2021)</td>
<td>3,950,600</td>
<td>3,332,100</td>
<td>618,500</td>
<td>150,000</td>
<td>468,500</td>
</tr>
<tr>
<td>Phase II (2022-2026)</td>
<td>4,658,500</td>
<td>3,728,000</td>
<td>930,500</td>
<td>1,153,750</td>
<td>(223,250)</td>
</tr>
<tr>
<td>Phase III (2027-2036)</td>
<td>12,139,800</td>
<td>9,075,200</td>
<td>3,064,600</td>
<td>327,500</td>
<td>2,737,100</td>
</tr>
<tr>
<td>Total</td>
<td>20,748,900</td>
<td>16,135,300</td>
<td>4,613,600</td>
<td>1,631,250</td>
<td>2,982,350</td>
</tr>
</tbody>
</table>

Source: Table 7C Projected Revenues and Expenses and Table 7A CIP. Note: Figures rounded.
investments contribute to the economic development in the region in addition to serving the national, state, and regional air transportation systems.

OTHER FUNDING
While the AIP is the primary source for funding capital improvements at public use airports in Washington, there are other options such as private funding mentioned earlier. Many airport sponsor have also obtained funding through general obligation bonds, revenue bonds, special legislative appropriations, and loan programs that provide access and flexibility to funding. Despite the AIP eligibility of numerous proposed projects at Tacoma Narrows, priority ranking of airport projects can easily delay funding of needed improvements so consideration of various options is a favorable approach. As the County attracts more business tenants to the Airport and projected aviation activity is realized, the positive and growing cash flow will benefit the County’s access to other funding options.

SUMMARY
Pierce County remains committed to developing the Tacoma Narrows Airport into a facility that serves the community and surrounding region, needs of the air transportation system, and future economic growth. This Master Plan Update will serve as a tool to guide the County’s future development plans. Planning is a continuous process and changes in the aviation industry, economic environment, and numerous other factors may require adjustments in timing of planned improvements. The fundamental elements addressed in the Master Plan will assist the County in responding to such adjustments in the coming years.
DEFINITIONS

ABOVE GROUND LEVEL. The elevation of a point or surface above the ground.

ACCELERATE – STOP DISTANCE AVAILABLE (ASDA). See declared distances

ADVISORY CIRCULAR. External publication issued by the FAA consisting of non-regulatory material providing for the recommendations relative to a policy, guidance and information relative to a specific aviation subject.

AIR CARRIER. An operator, which: (1) performs at least five round trips per week between two or more points and publishes flight schedules which specifies the times, days of the week, and places between which such flights are performed; or (2) transport mail by air pursuant to a current contract with the U.S. Postal Service. Certified in accordance with Federal Aviation Regulation (FAR) Parts 121 and 127.

AIR ROUTE TRAFFIC CONTROL CENTER (ARTCC). A facility established to provide air traffic control service to an aircraft operating on an IFR flight plan within controlled airspace and principally during the enroute phase of flight.

AIR TAXI. An air carrier certificated in accordance with FAR Part 135 and authorized to provide, on demand, public transportation of persons and property by aircraft. Generally operates small aircraft for hire for specific trips.

AIR TRAFFIC CONTROL FACILITIES (ATC-F). Electronic equipment and buildings aiding air traffic control (ATC) for communications, surveillance of aircraft including weather detection and advisory systems.

AIRCRAFT. An aircraft is a device that is used or intended to be used for flight in the air.

AIRCRAFT APPROACH CATEGORY. A grouping of aircraft based on 1.3 times the stall speed in their maximum certificated landing weight. The categories are as follows:

- Category A: Speed less than 91 knots.
- Category B: Speed 91 knots or more, but less than 121 knots.
- Category C: Speed 121 knots or more, but less than 141 knots.
- Category D: Speed 141 knots or more, but less than 166 knots.
- Category E: Speed greater than 166 knots.

**AIRCRAFT OPERATION.** The landing, takeoff, or touch-and-go procedure by an aircraft on a runway at an airport.

**AIRCRAFT OPERATIONS AREA (AOA).** A restricted and secure area on the airport property designed to protect all aspects related to aircraft operations.

**AIRFIELD.** The portion of an airport which contains the facilities necessary for the operation of aircraft.

**AIRPLANE.** An engine-driven fixed-wing aircraft heavier than air that is supported in flight by the dynamic reaction of the air against its wings.

**AIRPLANE DESIGN GROUP (ADG).** A grouping of aircraft based upon relative wingspan or tail height (whichever is most demanding). The groups are as follows:

<table>
<thead>
<tr>
<th>Group</th>
<th>Tail Height (ft)</th>
<th>Wingspan (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>&lt;20</td>
<td>&lt;49</td>
</tr>
<tr>
<td>II</td>
<td>20 - &lt;30</td>
<td>49 - &lt;79</td>
</tr>
<tr>
<td>III</td>
<td>30 - &lt;45</td>
<td>79 - &lt;118</td>
</tr>
<tr>
<td>IV</td>
<td>45 - &lt;60</td>
<td>118 - &lt;171</td>
</tr>
<tr>
<td>V</td>
<td>60 - &lt;66</td>
<td>171 - &lt;214</td>
</tr>
<tr>
<td>VI</td>
<td>66 - &lt;80</td>
<td>214 - &lt;262</td>
</tr>
</tbody>
</table>

**AIRPORT.** An airport is an area of land or water that is used or intended to be used for the landing and takeoff of aircraft, and includes its buildings and facilities, if any.

**AIRPORT BEACON.** A navigational aid located at an airport which displays a rotating light beam to identify whether an airport is lighted.

**AIRPORT ELEVATION.** The highest point on an airport’s usable runway expressed in feet above mean sea level (MSL).

**AIRPORT IMPROVEMENT PROGRAM.** A program authorized by the Airport and Airway Improvement Act of 1982 that provides funding for airport planning and development.

**AIRPORT LAYOUT DRAWING (ALD).** The drawing of the airport showing the layout of existing and proposed airport facilities.

**AIRPORT LAYOUT PLAN (ALP).** A scaled drawing of the existing and planned land and facilities necessary for the operation and development of the airport.
AIRPORT LAYOUT PLAN DRAWING SET. A set of technical drawings depicting the current and future airport conditions. The FAA required drawings include the Airport Layout Plan, the Airport Airspace Drawing, and the Inner Portion of the Approach Surface Drawing, On-Airport Land Use Drawing, and Property Map.

AIRPORT MOVEMENT AREA SAFETY SYSTEM. A system that provides automated alerts and warnings of potential runway incursions or other hazardous aircraft movement events.

AIRPORT OBSTRUCTION CHART. A scaled drawing depicting the Federal Aviation Regulation (FAR) Part 77 surfaces, a representation of objects that penetrate these surfaces, runway, taxiway and ramp areas, navigational aids, buildings, roads and other details in the vicinity of the airport.

AIRPORT REFERENCE CODE (ARC). A coding system used to relate airport design criteria to the operational (Aircraft Approach Category) to the physical characteristics (Airplane Design Group) of the airplanes intended to operate at the airport.

AIRPORT REFERENCE POINT (ARP). The latitude and longitude of the approximate center of the airport.

AIRPORT TRAFFIC CONTROL TOWER (ATCT). A central operations facility in the terminal air traffic control system, consisting of a tower, including an associated instrument flight rule (IFR) room if radar equipped, using air/ground communications and/or radar, visual signaling, and other devices to provide safe and expeditious movement of terminal air traffic.

AIRSIDE. The portion of an airport that contains facilities necessary for the operation of aircraft.

AIRSPACE. The volume of space above the surface of the ground that is provided for the operation of aircraft.

ALERT AREA. See special-use airspace.

ALTITUDE. The vertical distance measured in feet above mean sea level.

ALIGNED TAXIWAY. A taxiway with its centerline aligned with a runway centerline. Sometimes referred to as an “inline taxiway.”

APPROACH PROCEDURE WITH VERTICAL GUIDANCE (APV). An Instrument Approach Procedure (IAP) providing both vertical and lateral electronic guidance.

ANNUAL INSTRUMENT APPROACH (AIA). An approach to an airport with the intent to land by an aircraft in accordance with an IFR flight plan when visibility is less than three miles and/or when the ceiling is at or below the minimum initial approach altitude.
**APPROACH LIGHTING SYSTEM (ALS).** An airport lighting facility, which provides visual guidance to landing aircraft by radiating light beams by which the pilot aligns the aircraft with the extended centerline of the runway on his/her final approach and landing.

**APPROACH MINIMUMS.** The altitude below which an aircraft may not descend while on an IFR approach unless the pilot has the runway in sight.

**APPROACH SURFACE.** An imaginary obstruction limiting surface defined in FAR Part 77 which is longitudinally centered on an extended runway centerline and extends outward and upward from the primary surface at each end of a runway at a designated slope and distance based upon the type of available or planned approach by aircraft to a runway.

**APPROACH SURFACE BASELINE (ASBL).** A horizontal line tangent to the surface of the earth at the runway threshold aligned with the final approach course.

**APRON.** A specified portion of the airfield used for passenger, cargo or freight loading and unloading, aircraft parking, and the refueling, maintenance and servicing of aircraft.

**AREA NAVIGATION.** The air navigation procedure that provides the capability to establish and maintain a flight path on an arbitrary course that remains within the coverage area of navigational sources being used.

**AUTOMATIC DIRECTION FINDER (ADF).** An aircraft radio navigation system, which senses and indicates the direction to a non-directional radio beacon (NDB) ground transmitter.

**AUTOMATED SURFACE OBSERVATION SYSTEM (ASOS).** A reporting system that provides frequent airport ground surface weather observation data through digitized voice broadcasts and printed reports.

**AUTOMATED WEATHER OBSERVATION STATION (AWOS).** Equipment used to automatically record weather conditions (i.e. cloud height, visibility, wind speed and direction, temperature, dew-point, etc.).

**AUTOMATED TERMINAL INFORMATION SERVICE (ATIS).** The continuous broadcast of recorded non-control information at towered airports. Information typically includes wind speed, direction and active runway.

**AVIGATION EASEMENT.** A contractual right or a property interest in land over which a right of unobstructed flight in the airspace is established.
AZIMUTH. Horizontal direction expressed as the angular distance between true north and the
direction of a fixed point (as the observer’s heading).

BASE LEG. A flight path at right angles to the landing runway off its approach end. The base leg
normally extends from the downwind leg to the intersection of the extended runway centerline.
See Traffic Pattern.

BASED AIRCRAFT. The general aviation aircraft that uses a specific airport as a home base.

BEARING. The horizontal direction to or from any point, usually measured clockwise from true
north or magnetic north.

BLAST FENCE. A barrier used to divert or dissipate jet blast or propeller wash.

BLAST PAD. A prepared surface adjacent to the end of a runway for the purpose of eliminating
the erosion of the ground surface by the wind forces produced by airplanes at the initiation of
takeoff operations.

BUILDING RESTRICTION LINE (BRL). A line that identifies suitable building area locations on the
airport.

BYPASS TAXIWAY. A taxiway used to reduce aircraft queuing demand by providing multiple
takeoff points.

CAPITAL IMPROVEMENT PLAN. The planning program used by the FAA to identify, prioritize,
and distribute funds for airport development and the needs of the National Airspace System to
meet specified national goals and objectives.

CATEGORY-I (CAT-I). An instrument approach or approach and landing with a Height Above
Threshold (HATh) or minimum descent altitude not lower than 200 ft (60 m) and with either a
visibility not less than ½ statute mile (800m), or a runway visual range not less than 1800 ft
(550m).

CATEGORY-II (CAT-II). An instrument approach or approach and landing with a Height Above
Threshold (HATh) lower than 200 ft (60 m) but not lower than 100 ft (30 m) and a runway visual
range not less than 1200 ft (350m).

CATEGORY-III (CAT-III). An instrument approach or approach and landing with a Height Above
Threshold (HATh) lower than 100 ft (30 m), or no HATh, or a runway visual range less than 1200
ft (350m).
CEILING. The height above the ground surface to the location of the lowest layer of clouds which is reported as either broken or overcast.

CIRCLING APPROACH. A maneuver initiated by the pilot to align the aircraft with the runway for landing when flying a predetermined circling instrument approach under IFR.

CLASS A AIRSPACE. See Controlled Airspace.

CLASS B AIRSPACE. See Controlled Airspace.

CLASS C AIRSPACE. See Controlled Airspace.

CLASS D AIRSPACE. See Controlled Airspace.

CLASS E AIRSPACE. See Controlled Airspace.

CLASS G AIRSPACE. See Controlled Airspace.

CLEARWAY (CYW). A defined rectangular area beyond the end of the runway cleared or suitable for use in lieu of runway to satisfy takeoff distance requirements.

COMMON TRAFFIC ADVISORY FREQUENCY. A radio frequency identified in the appropriate aeronautical chart which is designated for the purpose of transmitting airport advisory information and procedures while operating to and from an uncontrolled airport.

COMPASS LOCATOR (LOM). A low power, low/medium frequency radio-beacon installed in conjunction with the instrument landing system at one or two or the marker sites.

CONICAL SURFACE. An imaginary obstruction-limiting surface defined in FAR Part 77 that extends from the edge of the horizontal surface outward and upward at a slope of 20 to 1 for a horizontal distance of 4,000 feet.

CONTROLLED AIRPORT. An airport that has an operating airport traffic control tower.

CONTROLLED AIRSPACE. Airspace of defined dimensions within which air traffic control services are provided to instrument flight rules (IFR) and visual flight rules (VFR) flights in accordance with the airspace classification. Controlled airspace in the United States is designated as follows.

- CLASS A. The airspace from 18,000 feet mean sea level (MSL) up to but not including 60,000 MSL (flight level FL600).
• **CLASS B.** Generally, the airspace from the surface to 10,000 feet MSL surrounding the nation’s busiest airports. The configuration of Class B airspace is unique to each airport, but typically consists of two or more layers of airspace and is designed to contain all published instrument approach procedures to the airport. An air traffic control clearance is required for all aircraft to operate in the area.

• **CLASS C.** Generally, the airspace from the surface to 4,000 feet above the airport elevation (charted as MSL) surrounding those airports that have an operational control tower and radar approach and are served by a qualifying number of IFR operations or passenger enplanements. Although individually tailored for each airport, Class C airspace typically consists of a surface area with a five nautical miles (nm) radius and an outer area with a 10 nm radius that extends from 1,200 feet to 4,000 feet above the airport elevation. Two-way radio communication is required for all aircraft.

• **CLASS D.** Generally, that airspace from the surface to 2,500 feet above the airport elevation (charted as MSL) surrounding those airports that have an operational control tower. Class D airspace is individually tailored and configured to encompass published instrument approach procedures. Unless otherwise authorized, all persons must establish two-way radio communications.

• **CLASS E.** Generally, controlled airspace not classified as Class A, B, C or D. Class E airspace extends upward from either the surface or a designated altitude to the overlying or adjacent controlled airspace. When designated as a surface area, the airspace will be configured to contain all instrument procedures. Class E airspace encompasses all Victor Airways. Only aircraft following instrument flight rules are required to establish two-way radio communications with air traffic control.

• **CLASS G.** Generally, that airspace not classified as Class A, B, C, D or E. Class G airspace extends from the surface to the overlying Class E airspace

**CONTROLLED FIRING AREA.** See special-use airspace.

**CROSSWIND.** Wind flow that is not parallel to the runway of the flight of an aircraft.

**CROSSWIND COMPONENT.** The component of wind that is at a right angle to the runway centerline or the intended flight path of an aircraft.
CROSSWIND LEG. A flight path at right angles to the landing runway off its upwind end. See Traffic Pattern.

DECIBEL. A unit of noise representing a level relative to a reference of a sound pressure 20 micro newtons per square meter.

DECISION HEIGHT. The height above the end of the runway surface at which a decision must be made by a pilot during the ILS or Precision Approach Radar approach to either continue the approach or to execute a missed approach.

DECLARED DISTANCES. The distances declared available for the airplane’s takeoff run, takeoff distance, accelerate-stop distance and landing distance requirements. The distances are:

- TAKEOFF RUN AVAILABLE (TORA). The runway length declared available and suitable for the ground run of an airplane taking off.

- TAKEOFF DISTANCE AVAILABLE (TODA). The TORA plus the length of any remaining runway and/or clearway beyond the far end of the TORA.

- ACCELERATE – STOP DISTANCE AVAILABLE (ASDA). The runway plus stopway length declared available for the acceleration and deceleration of an aircraft aborting a takeoff.

- LANDING DISTANCE AVAILABLE (LDA). The runway length declared available and suitable for landing.

DESIGN AIRCRAFT. An aircraft with characteristics that determine the application of airport design standards for a specific runway, taxiway, taxilane, apron, or other facility (such as Engineered Materials Arresting System [EMAS]). This aircraft can be a specific aircraft model or a composite of several aircraft using, expected, or intended to use the airport or part of the airport. (Also called “critical aircraft” or “critical design aircraft.”)

DISPLACED THRESHOLD. A threshold that is located at a point on the runway other than the designated beginning of the runway.

DISTANCE MEASURING EQUIPMENT (DME). Equipment (airborne and ground) used to measure, in nautical miles, the slant range distance of an aircraft from the DME navigational aid.
**DNL.** The 24-hour average sound level, in A-weighed decibels, obtained after the addition of ten decibels to sound levels for the periods between 10 pm and 7 am as averaged over a span of one year. It is the FAA standard metric for determining the cumulative exposure of individuals to noise.

**DOWNWIND LEG.** A flight path parallel to the landing runway in the direction opposite to landing. The downwind leg normally extends between the crosswind leg and the base leg. Also see Traffic Pattern.

**EASEMENT.** The legal right of one party to use a portion of the total rights in real estate owned by another party. This may include the right of passage over, on or below property; certain air rights above property, including view rights; and the rights to any specified form of development or activity, as well as any other legal rights in the property that may be specified in the easement document.

**END-AROUND TAXIWAY (EAT).** A taxiway crossing the extended centerline of a runway, which does not require specific clearance from air traffic control (ATC) to cross the extended centerline of the runway.

**ENPLANED PASSENGERS.** The total number of revenue passengers boarding aircraft, including originating, stop-over, and transfer passengers, in scheduled and non-scheduled services.

**ENPLANEMENT.** The boarding of a passenger, cargo, freight or mail on an aircraft at an airport.

**ENTITLEMENT.** Federal funds for which a commercial service airport may be eligible based upon its annual passenger enplanements.

**ENTRANCE TAXIWAY.** A taxiway designed to be used by an aircraft entering a runway. Entrance taxiways may also be used to exit a runway.

**EXIT TAXIWAY.** A taxiway designed to be used by an aircraft only to exit a runway.

**ENVIRONMENTAL ASSESSMENT (EA).** An environmental analysis performed pursuant to the National Environmental Policy Act to determine whether an action would significantly affect the environment and thus require a more detailed environmental impact assessment.

**ENVIRONMENTAL AUDIT.** An assessment of the current status of a party’s compliance with applicable environmental requirements of a party’s environmental compliance policies, practices and controls.
**FEDERAL AVIATION REGULATIONS.** The general and permanent rules established by the executive departments and agencies of the Federal Government for aviation, which are published in the Federal Register. These are aviation subset of the Code of Federal Regulations.

**FINAL APPROACH.** A flight path in the direction of landing along the extended runway centerline. The final approach normally extends from the base leg to the runway. See Traffic Pattern

**FINAL APPROACH AND TAKEOFF AREA (FATO).** A defined area over which the final phase of the helicopter approach to a hover, or a landing is completed and from which takeoff is initiated.

**FINAL APPROACH FIX.** The designated point at which the final approach segment for an aircraft landing on a runway begins for a non-precision approach.

**FIXED BASE OPERATOR (FBO).** An FBO typically offers the following services (or a combination thereof): aircraft charter operation, aircraft rental, aircraft storage, flight training, aircraft sales/leasing, aircraft component maintenance, aircraft parts sales, and aircraft maintenance.

**FLIGHT SERVICE STATION.** An operations facility in the national flight advisory system which utilizes data interchange facilities for the collection and dissemination of Notices to Airmen, weather, and administrative data and which provides pre-flight and in-flight advisory services to pilots through air and ground based communication facility.

**FRANGIBLE NAVAID.** A navigational aid which retains its structural integrity and stiffness up to a designated maximum load, but on impact from a greater load, breaks, distorts, or yields in such a manner as to present the minimum hazard to aircraft.

**GENERAL AVIATION.** That portion of civil aviation that encompasses all facets of aviation except air carriers holding a certificate of convenience and necessity, and large aircraft commercial operators.

**GENERAL AVIATION AIRPORT.** An airport that provides air service to only general aviation.

**GLIDE PATH ANGLE (GPA).** The GPA is the angle of the final approach descent path relative to the approach surface baseline.

**GLIDE PATH QUALIFICATION SURFACE (GQS).** An imaginary surface extending from the runway threshold along the runway centerline extended to the Decision Altitude (DA) point.

**GLIDE SLOPE (GS).** Provides vertical guidance for aircraft during approach and landing. The glide slope consists of 1) electronic components emitting signals which provide vertical guidance by reference to airborne instruments during instrument approaches such as ILS; or 2) visual ground
aids, such as VASI, which provide vertical guidance for VFR approach or for the visual portion of an instrument approach and landing.

**GLOBAL POSITIONING SYSTEM (GPS).** A system of 24 satellites used as reference points to enable navigators equipped with GPS receivers to determine their latitude, longitude and altitude.

**HAZARD to AIR NAVIGATION.** An existing or proposed object that the FAA, as a result of an aeronautical study, determines will have a substantial adverse effect upon the safe and efficient use of navigable airspace by aircraft, operation of air navigation facilities, or existing or potential airport capacity.

**HEIGHT ABOVE THRESHOLD (HATH).** The height of the Decision Altitude (DA) above the threshold.

**HELIPAD.** A designated area for the takeoff, landing and parking of helicopters.

**HIGH INTENSITY RUNWAY LIGHTS.** The highest classification in terms of intensity or brightness for lights designated for use in delineating the sides of a runway.

**HIGH-SPEED EXIT TAXIWAY.** A long radius taxiway designed to expedite aircraft turning off the runway after land (at speeds up to 60 knots), thus reducing runway occupancy time.

**HORIZONTAL SURFACE.** An imaginary obstruction-limiting surface defined in FAR Part 77 that is specified as a portion of a horizontal plane surrounding a runway located 150 feet above the established airport elevation. The specific horizontal dimensions of this surface are a function of the types of approaches existing or planned for the runway.

**INITIAL APPROACH FIX.** The designated point at which the initial approach segment begins for an instrument approach to a runway.

**INSTRUMENT APPROACH PROCEDURE.** A series of predetermined maneuvers for the orderly transfer of an aircraft under instrument flight conditions from the beginning of the initial approach to a landing or to a point from which a landing may be made visually.

**INSTRUMENT FLIGHT RULES (IFR).** Rules governing the procedures for conducting instrument flight. Also a term used by pilots and controllers to indicate type of flight plan.

**INSTRUMENT LANDING SYSTEM (ILS).** A precision instrument approach system, which normally consists of the following electronic components and visual aids: 1) localizer, 2) glide slope, 3) outer marker, 4) middle marker and 5) approach lights.
**INSTRUMENT METEOROLOGICAL CONDITIONS.** Meteorological conditions expressed in terms of specific visibility and ceiling conditions that are less than the minimums specified for visual meteorological conditions.

**ITINERANT OPERATIONS.** All aircraft operations other than local operations.

**KNOTS.** A unit of speed length used in navigation that is equivalent to the number of nautical miles traveled in one hour.

**LANDSIDE.** The portion of an airport that provides the facilities necessary for the processing of passengers, cargo, freight and ground transportation vehicles.

**LANDING DISTANCE AVAILABLE (LDA).** See declared distances.

**LARGE AIRPLANE.** An airplane that has a maximum certified takeoff weight in excess of 12,500 pounds.

**LOCAL AREA AUGMENTATION SYSTEM.** A differential GPS system that provides localized measurement correction signals to the basic GPS signals to improve navigational accuracy, integrity, continuity and availability.

**LOCAL OPERATIONS.** Aircraft operations performed by aircraft that are based at the airport and that operate in the local traffic pattern or within sight of the airport, that are known to be departing for or arriving from flights in local practice areas within a prescribed distance from the airport, or that execute simulated instrument approaches at the airport.

**LOCAL TRAFFIC.** Aircraft operating in the traffic pattern or within site of the tower, or aircraft known to be departing or arriving from the local practice areas, or aircraft executing practice instrument approach procedures. Typically, this includes touch-and-go training operations.

**LOCALIZER.** The component of an ILS, which provides course guidance to the runway.

**LOCALIZER TYPE DIRECTIONAL AID (LDA).** A facility of comparable utility and accuracy to a localizer, but is not part of a complete ILS and is not aligned with the runway.

**LORAN.** Long range navigation, an electronic navigational aid which determines aircraft position and speed by measuring the difference in the time of reception of synchronized pulse signals from two fixed transmitters. Loran is used for enroute navigation.
LOW IMPACT RESISTANT (LIR) SUPPORT. A support designed to resist operational and environmental static loads and fail when subjected to a shock load such as that from a colliding aircraft.

LOW INTENSITY RUNWAY LIGHTS. The lowest classification in terms of intensity or brightness for lights designated for use in delineating the sides of a runway.

MAIN GEAR WIDTH (MGW). The distance from the outer edge to outer edge of the widest set of main gear tires.

MEDIUM INTENSITY RUNWAY LIGHTS. The middle classification in terms of intensity or brightness for lights designated for use in delineating the sides of a runway.

MICROWAVE LANDING SYSTEM (MLS). An instrument approach and landing system that provides precision guidance in azimuth, elevation, and distance measurement.

MILITARY OPERATIONS AREA (MOA). See special-use airspace.

MILITARY TRAINING ROUTE. An air route depicted on aeronautical charts for the conduct of military flight training at speeds above 250 knots.

MISSED APPROACH COURSE (MAC). The flight route to be followed if, after an instrument approach, a landing is not effected, and occurring normally when the aircraft has descended to the decision height and has not established visual contact or when directed by air traffic control to pull up or to go around again.

MODIFICATION to STANDARDS. Any approved nonconformance to FAA standards, other than dimensional standards for Runway Safety Areas (RSAs), applicable to an airport design, construction, or equipment procurement project that is necessary to accommodate an unusual local condition for a specific project on a case-by-case basis while maintaining an acceptable level of safety.

MOVEMENT AREA. The runways, taxiways, and other areas of an airport which are utilized for taxiing/hover taxiing, air taxiing, takeoff, and landing of aircraft, exclusive of loading ramps and parking areas. At those airports with a tower, air traffic control clearance is required for entry onto the movement area.

NATIONAL AIRSPACE SYSTEM. The network of air traffic control facilities, air traffic control areas, and navigational facilities through the US.
NATIONAL PLAN OF INTEGRATED AIRPORT SYSTEMS. The national airport system plan developed by the Secretary of Transportation on a bi-annual basis for the development of public use airports to meet national air transportation needs.

NAUTICAL MILE. A unit of length used in navigation which is equivalent to the distance spanned by one minute of arc in latitude, that is, 1,852 meters or 6,076 feet. It is equivalent to approximately 1.15 statute mile.

NAVAID. A term used to describe any electrical or visual air navigational aid, light, sign, and associated supporting equipment.

NOISE CONTOUR. A continuous line on a map of the airport vicinity connecting all points of the same noise exposure level.

NONDIRECTIONAL BEACON (NDB). A beacon transmitting non-directional signals whereby the pilot of an aircraft equipped with direction finding equipment can determine his/her bearing to and from the radio beacon and home on, or track to, the station. When the radio beacon is installed in conjunction with the Instrument Landing System marker, it is normally called a compass locator.

NONPRECISION APPROACH PROCEDURE. A standard instrument approach procedure in which no electronic glide slope is provided, such as VOR, TACAN, NDB or LOC.

OBJECT FREE AREA (OFA). An area on the ground centered on a runway, taxiway or taxilane centerline provided to enhance the safety of aircraft operations by having the area free of objects, except for objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes.

OBSTACLE FREE ZONE (OFZ). The airspace below 150 feet above the established airport elevation and along the runway and extended runway centerline that is required to be kept clear of all objects, except for frangible visual NAVAIDs that need to be located in the OFZ because of their function, in order to provide clearance for aircraft landing or taking off from the runway, and for missed approaches.

OPERATION. A takeoff or landing.

OUTER MARKER (OM). An ILS navigation facility in the terminal area navigation system located four to seven miles from the runway edge on the extended centerline indicating to the pilot that he/she is passing over the facility and can begin final approach.
PILOT CONTROLLED LIGHTING. Runway lighting systems at an airport that are controlled by activating the microphone of a pilot on a specified radio frequency.

PRECISION APPROACH. A standard instrument approach procedure, which provides runway alignment and glide slope (descent) information. It is categorized as follows:

- CATEGORY I. A precision approach which provides for approaches with a decision height of not less than 200 feet and visibility not less than ½ mile or Runway Visual Range (RVR) 2400 with operative touchdown zone and runway centerline lights.

- CATEGORY II. A precision approach, which provides for approaches with a decision height of not less than 100 feet and visibility not less than 1200 feet RVR.

- CATEGORY III. A precision approach, which provides for approaches with minima less than Category II.

PRECISION APPROACH PATH INDICATOR (PAPI). A lighting system providing visual approach slope guidance to aircraft during a landing approach. It is similar to a Visual Approach Slope Indicator (VASI) but provides a sharper transition between the colored indicator lights.

PRECISION OBJECT FREE ZONE (POFZ). An area centered on the extended runway centerline, beginning at the runway threshold and extending behind the runway threshold that is 200 feet long by 800 feet wide. The POFZ is a clearing standard, which requires the POFZ to be kept clear of above ground objects protruding above the runway safety area edge elevation (except for NAVAIDs). The POFZ applies to all new authorized instrument approach procedures with less than ¾ mile visibility.

PRIMARY AIRPORT. A commercial service airport that enplanes at least 10,000 annual passengers.

PRIMARY SURFACE. An imaginary obstruction limiting surface defined in FAR Part 77 that is specified as a rectangular surface longitudinally centered about a runway. The specific dimensions of this surface are a function of the types of approaches existing or planned for the runway.

PROHIBITED AREA. See special-use airspace.

REMOTE TRANSMITTER / RECEIVER (RTR). See remote communications outlet. RTRs serve ARTCCs.
RELIEVER AIRPORT. An airport to serve general aviation aircraft, which might otherwise use a congested air-carrier served airport.

RESTRICTED AREA. See special-use airspace.

RNAV. Area Navigation – airborne equipment, which permits flights over determined tracks within prescribed accuracy tolerances without the need to overfly ground-based navigation facilities. Used enroute and for approaches to an airport.

RUNWAY. A defined rectangular area on an airport prepared for an aircraft landing and taking off. Runways are normally numbered in relation to their magnetic direction, rounded off to the nearest 10 degrees. The runway heading on the opposite end of the runway is 180 degrees from that runway end. Aircraft can takeoff or land from either end of a runway, depending upon wind direction.

RUNWAY ALIGNEMENT INDICATOR LIGHT. A series of high intensity sequentially flashing lights installed on the extended centerline of the runway usually in conjunction with an approach lighting system.

RUNWAY BLAST PAD. A surface adjacent to the ends of runways provided to reduce the erosive effect of jet blast and propeller wash.

RUNWAY END IDENTIFIER LIGHTS (REIL). Two synchronized flashing lights, one on each side of the runway threshold, which provide rapid and positive identification of the approach end of a particular runway.

RUNWAY GRADIENT. The average slope, measured in percent, between the two ends of a runway.

RUNWAY PROTECTION ZONE (RPZ). An area off the runway end to enhance the protection of people and property on the ground. The RPZ is trapezoidal in shape. Its dimensions are determined by the aircraft approach speed and runway approach type/minima.

RUNWAY REFERENCE CODE (RRC). A code signifying the current operational capabilities of a runway and associated parallel taxiway.

RUNWAY SAFETY AREA (RSA). A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot or excursion from the runway.
RUNWAY VISUAL RANGE (RVR). An instrumentally derived value, in feet, representing the horizontal distance a pilot can see down the runway from the runway end.

RUNWAY VISIBILITY ZONE (RVZ). An area on the airport to be kept clear of permanent objects so that there is an unobstructed line-of-site from any point five feet above the runway centerline to any point five feet above an intersecting runway centerline.

SEGMENTED CIRCLE. A system of visual indicators designed to provide traffic pattern information at airports without operating control towers.

SHOULDER. An area adjacent to the edge of paved runways, taxiways or aprons providing a transition between the pavement and the adjacent surface; support for aircraft running off the pavement; enhanced drainage; and blast protection. The shoulder does not necessarily need to be paved.

SLANT-RANGE DISTANCE. The straight line distance between an aircraft and a point on the ground.

SMALL AIRPLANE. An airplane that has a maximum certified takeoff weight of up to 12,500 pounds.

SPECIAL USE AIRSPACE. Airspace of defined dimensions identified by a surface area wherein activities must be confined because of their nature and/or wherein limitations may be imposed upon aircraft operations that are not a part of those activities. Special-use airspace classifications include:

- ALERT AREA. Airspace that may contain a high volume of pilot training activities or an unusual type of aerial activity, neither of which is hazardous to aircraft.

- CONTROLLED FIRING AREA. Airspace wherein activities are conducted under conditions so controlled as to eliminate hazards to nonparticipating aircraft and to ensure the safety of persons or property on the ground.

- MILITARY OPERATIONS AREA (MOA). Designated airspace with defined vertical and lateral dimensions established outside Class A airspace to separate/segregate certain military activities from instrument flight rule (IFR) traffic and to identify for visual flight rule (VFR) traffic where these activities are conducted.
• **PROHIBITED AREA.** Designated airspace within which the flight of aircraft is prohibited.

• **RESTRICTED AREA.** Airspace designated under FAR 73, within which the flight of aircraft, while not wholly prohibited, is subject to restriction. Most restricted areas are designated joint use. When not in use by the using agency, IFR/VFR operations can be authorized by the controlling air traffic control facility.

• **WARNING AREA.** Airspace, which may contain hazards to nonparticipating aircraft.

**STANDARD INSTRUMENT DEPARTURE (SID).** A preplanned coded air traffic control IFR departure routing, preprinted for pilot use in graphic and textual form only.

**STANDARD TERMINAL ARRIVAL (STAR).** A preplanned coded air traffic control IFR arrival routing, preprinted for pilot use in graphic and textual or textual form only.

**STOP-AND-GO.** A procedure wherein an aircraft will land, make a complete stop of the runway, and then commence a takeoff from that point. A stop-and-go is recorded as two operations: one operations for the landing and one operations for the takeoff.

**STOPWAY.** An area beyond the takeoff runway, no less wide than the runway and centered on the extended centerline of the runway, able to support an airplane during an aborted takeoff, without causing structural damage to the airplane, and designated for use in decelerating the airplane during an aborted takeoff.

**STRAIGHT-IN LANDING / APPROACH.** A landing made on a runway aligned within 30 degrees of the final approach course following completion of an instrument approach.

**TACTICAL AIR NAVIGATION (TACAN).** An ultra-high frequency electronic air navigation system, which provides suitably-equipped aircraft a continuous indication of bearing and distance to the TACAN station.

**TAKEOFF DISTANCE AVAILABLE (TODA).** See declared distances.

**TAKEOFF RUN AVAILABLE (TORA).** See declared distances.
**TAXILANE.** A taxiway designed for low speed and precise taxiing. Taxilanes are usually, but not always, located outside the movement area, providing access from taxiways (usually an apron taxiway) to aircraft parking positions and other terminal areas.

**TAXIWAY.** A defined path established for the taxiing of aircraft from one part of an airport to another.

**TAXIWAY DESIGN GROUP (TDG).** A classification of airplanes based on outer to outer Main Gear Width (MGW) and Cockpit to Main Gear (CMG) distance.

**TAXIWAY SAFETY AREA (TSA).** A defined surface alongside the taxiway prepared or suitable for reducing the risk of damage to an airplane unintentionally departing the taxiway.

**TETRAHEDRON.** A device used as a landing indicator. The small end of the tetrahedron points in the direction of landing.

**THRESHOLD.** The beginning of that portion of the runway available for landing. In some instances the landing threshold may be displaced.

**TOUCH-AND-GO.** An operation by an aircraft that lands and departs on a runway without stopping or exiting the runway. A touch-and-go is recorded as two operations: one operation for the landing and one operation for the takeoff.

**TOUCHDOWN ZONE (TDZ).** The first 3,000 feet of the runway beginning at the threshold.

**TOUCHDOWN ZONE ELEVATION (TDZE).** The highest elevation in the touchdown zone.

**TOUCHDOWN ZONE (TDZ) LIGHTING.** Two rows of transverse light bars located symmetrically about the runway centerline normally at 100-foot intervals. The basic system extends 3,000 feet along the runway.

**TRAFFIC PATTERN.** The traffic flow that is prescribed for an aircraft landing or taking off from an airport. The components of a typical traffic pattern are the upwind leg, crosswind leg, downwind leg, and final approach.

**UNCONTROLLED AIRPORT.** An airport without an air traffic control tower at which the control of visual VFR traffic is not exercised.

**UNCONTROLLED AIRSPACE.** Airspace within which aircraft are not subject to air traffic control.
**UNICOM.** A nongovernmental communication facility, which may provide airport information at certain airports. Locations and frequencies of UNICOMs are shown on aeronautical charts and publications.

**UPWIND LEG.** A flight path parallel to the landing runway in the direction of landing. See traffic pattern.

**VECTOR.** A heading issued to an aircraft to provide navigational guidance by radar.

**VERY HIGH FREQUENCY / OMNIDIRECTIONAL RANGE STATION (VOR).** A ground-based electronic navigation aid transmitting very high frequency navigation signals, 360 degrees in azimuth, oriented from magnetic north. Used as the basis for navigation in the national airspace system. The VOR periodically identifies itself by Morse code and may have an additional voice identification feature.

**VERY HIGH FREQUENCY OMNIDIRECTIONAL RANGE STATION / TACTICAL AIR NAVIGATION (VORTAC).** A navigation aid providing VOR azimuth, TACAN azimuth and TACAN distance measuring equipment (DME) at one site.

**VICTOR AIRWAY.** A control area or portion thereof established in the form of a corridor, the centerline of which is defined by radio navigational aids.

**VISUAL APPROACH.** An approach wherein an aircraft on an IFR flight plan, operating in VFR conditions under the control on an air traffic control facility and having an air traffic control authorization, may proceed to the airport of destination in VFR conditions.

**VISUAL APPROACH SLOPE INDICATOR (VASI).** An airport lighting facility providing vertical visual approach slope guidance to aircraft during approach to landing by radiating a directional pattern of high-intensity red and white focused light beams, which indicate to the pilot whether or he or she is on path. Some airports serving large aircraft have three-bar VASIs that provide two visual guide paths to the same runway.

**VISUAL FLIGHT RULES (VFR).** Rules that govern the procedures for conducting flight under visual conditions. The term VFR is also used in the United States to indicate weather conditions that are equal to or greater than minimum VFR requirement. In addition, it is used by pilots and controllers to indicate type of flight plan.

**VISUAL METEOROLOGICAL CONDITIONS.** Meteorological conditions expressed in terms of specific visibility and ceiling conditions which are equal to or greater than the threshold values for instrument meteorological conditions.
WARNING AREA. See special-use airspace.

WIDE AREA AUGMENTATION SYSTEM (WAAS). The Wide Area Augmentation System (WAAS) uses a system of ground stations to provide necessary augmentations to the GPS Standard Positioning Service (SPS) navigation signal. A network of precisely surveyed ground reference stations is strategically positioned across the country to collect GPS satellite data. Using this information, a message is developed to correct any signal errors.

WINGSPAN The maximum horizontal distance from one wingtip to the other wingtip, including the horizontal component of any extensions such as winglets or raked wingtips.

ACRONYMS / ABBREVIATIONS

AC. Advisory circular

ADF. Automatic direction finder

ADG. Airplane design group

AFSS. Automated flight service station

AGL. Above ground level

AIA. Annual instrument approach

AIP. Airport improvement program

ALS. Approach lighting system

ALSF-1. Standard 2,400-foot high-intensity approach lighting system with sequenced flashers (Cat I configuration)

ALSF-2. Standard 2,400-foot high-intensity approach lighting system with sequenced flashers (Cat II configuration)

APV. Instrument approach procedure with vertical guidance

ARC. Airport reference code

ARFF. Aircraft rescue and firefighting

ARP. Airport reference point
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
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<tbody>
<tr>
<td>ARTCC.</td>
<td>Air route traffic control center</td>
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<tr>
<td>ASDA.</td>
<td>Accelerate-stop distance available</td>
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<tr>
<td>ASR.</td>
<td>Airport surveillance radar</td>
</tr>
<tr>
<td>ASOS.</td>
<td>Automated surface observation station</td>
</tr>
<tr>
<td>ATCT.</td>
<td>Air traffic control tower</td>
</tr>
<tr>
<td>ATIS.</td>
<td>Automated terminal information service</td>
</tr>
<tr>
<td>AVGAS.</td>
<td>Aviation gasoline (typically 100 low lead (LL))</td>
</tr>
<tr>
<td>AWOS.</td>
<td>Automated weather observation station</td>
</tr>
<tr>
<td>BRL.</td>
<td>Building restriction line</td>
</tr>
<tr>
<td>CFR.</td>
<td>Code of Federal Regulations</td>
</tr>
<tr>
<td>CIP.</td>
<td>Capital improvement program</td>
</tr>
<tr>
<td>CPO.</td>
<td>Community Planning Organization</td>
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<tr>
<td>DME.</td>
<td>Distance measuring equipment</td>
</tr>
<tr>
<td>DNL.</td>
<td>Day-night noise level</td>
</tr>
<tr>
<td>DWL.</td>
<td>Runway weight bearing capacity for aircraft with dual wheels per strut</td>
</tr>
<tr>
<td>DTWL.</td>
<td>Runway weight bearing capacity for aircraft with dual-tandem type landing gear</td>
</tr>
<tr>
<td>EAA.</td>
<td>Experimental Aircraft Association</td>
</tr>
<tr>
<td>FAA.</td>
<td>Federal Aviation Administration</td>
</tr>
<tr>
<td>FAM.</td>
<td>Financial Aid to Municipalities</td>
</tr>
<tr>
<td>FAR.</td>
<td>Federal Aviation Regulation</td>
</tr>
<tr>
<td>FBO.</td>
<td>Fixed base operator</td>
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<tr>
<td>FY.</td>
<td>Fiscal year</td>
</tr>
<tr>
<td>GA.</td>
<td>General Aviation</td>
</tr>
<tr>
<td>Acronym</td>
<td>Definition</td>
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<tr>
<td>---------</td>
<td>------------</td>
</tr>
<tr>
<td>GPS</td>
<td>Global positioning system</td>
</tr>
<tr>
<td>GS</td>
<td>Glide slope</td>
</tr>
<tr>
<td>HIRL</td>
<td>High-intensity runway edge lighting</td>
</tr>
<tr>
<td>IFR</td>
<td>Instrument flight rules</td>
</tr>
<tr>
<td>ILS</td>
<td>Instrument landing system</td>
</tr>
<tr>
<td>IM</td>
<td>Inner marker</td>
</tr>
<tr>
<td>LDA</td>
<td>Landing distance available</td>
</tr>
<tr>
<td>LIRL</td>
<td>Low-intensity runway edge lighting</td>
</tr>
<tr>
<td>LMM</td>
<td>Compass locator at middle marker</td>
</tr>
<tr>
<td>LOC</td>
<td>ILS localizer</td>
</tr>
<tr>
<td>LOM</td>
<td>Compass locator at ILS outer marker</td>
</tr>
<tr>
<td>LORAN</td>
<td>Long range navigation</td>
</tr>
<tr>
<td>MALS</td>
<td>Medium-intensity approach lighting system</td>
</tr>
<tr>
<td>MALSR</td>
<td>Medium-intensity approach lighting system with runway alignment indicator lights</td>
</tr>
<tr>
<td>MIRL</td>
<td>Medium-intensity runway edge lighting</td>
</tr>
<tr>
<td>MITL</td>
<td>Medium-intensity taxiway edge lighting</td>
</tr>
<tr>
<td>MLS</td>
<td>Microwave landing system</td>
</tr>
<tr>
<td>MM</td>
<td>Middle marker</td>
</tr>
<tr>
<td>MOA</td>
<td>Military operations area</td>
</tr>
<tr>
<td>MSL</td>
<td>Mean sea level</td>
</tr>
<tr>
<td>NAVAID</td>
<td>Navigational aid</td>
</tr>
<tr>
<td>NDB</td>
<td>Non-directional radio beacon</td>
</tr>
<tr>
<td>NM</td>
<td>Nautical mile (6,076.1 feet)</td>
</tr>
</tbody>
</table>
NOTAM. Notice to airmen

NPIAS. National plan of integrated airport systems

NPRM. Notice of proposed rulemaking

ODALS. Omnidirectional approach lighting system

OFA. Object free area

OFZ. Object free zone

OM. Outer marker

PAC. Project Advisory Committee

PAPI. Precision approach path indicator

PFC. Passenger facility charge

PCL. Pilot-controlled lighting

PLASI. Pulsating visual approach slope indicator

PMP. Pavement Maintenance Program

POFA. Precision object free area

PVASI. Pulsating/steady visual approach slope indicator

RCO. Remote communications outlet

RDG. Runway design group

REIL. Runway end identifier lights

RNAV. Area navigation

RPZ. Runway protection zone

RTR. Remote transmitter/receiver

RVR. Runway visibility range

RVZ. Runway visibility zone
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>SALS</td>
<td>Short approach lighting system</td>
</tr>
<tr>
<td>SASP</td>
<td>State Aviation System Plan</td>
</tr>
<tr>
<td>SEL</td>
<td>Sound exposure level</td>
</tr>
<tr>
<td>SID</td>
<td>Standard instrument departure</td>
</tr>
<tr>
<td>SM</td>
<td>Statute mile (5,280 feet)</td>
</tr>
<tr>
<td>SRE</td>
<td>Snow removal equipment</td>
</tr>
<tr>
<td>SSALF</td>
<td>Simplified short approach lighting system with sequenced flashers</td>
</tr>
<tr>
<td>SSALR</td>
<td>Simplified short approach lighting system with runway alignment indicator lights</td>
</tr>
<tr>
<td>STAR</td>
<td>Standard terminal arrival route</td>
</tr>
<tr>
<td>SWL</td>
<td>Runway weight bearing capacity for aircraft with single-wheel type landing gear</td>
</tr>
<tr>
<td>STWL</td>
<td>Runway weight bearing capacity for aircraft with single-wheel tandem type landing gear</td>
</tr>
<tr>
<td>TACAN</td>
<td>Tactical air navigation</td>
</tr>
<tr>
<td>TDG</td>
<td>Taxiway design group</td>
</tr>
<tr>
<td>TDZ</td>
<td>Touchdown zone</td>
</tr>
<tr>
<td>TDZE</td>
<td>Touchdown zone elevation</td>
</tr>
<tr>
<td>TAF</td>
<td>Terminal Area Forecast</td>
</tr>
<tr>
<td>TODA</td>
<td>Takeoff distance available</td>
</tr>
<tr>
<td>TORA</td>
<td>Takeoff run available</td>
</tr>
<tr>
<td>TRACON</td>
<td>Terminal radar approach control</td>
</tr>
<tr>
<td>VASI</td>
<td>Visual approach slope indicator</td>
</tr>
<tr>
<td>VFR</td>
<td>Visual flight rules</td>
</tr>
<tr>
<td>VHF</td>
<td>Very high frequency</td>
</tr>
<tr>
<td>VOR</td>
<td>Very high frequency omnidirectional range</td>
</tr>
<tr>
<td>VORTAC</td>
<td>VOR and TACAN collocated</td>
</tr>
</tbody>
</table>
**WAAS.** Wide Area Augmentation System

**WSDOT.** Washington State Department of Aviation
Appendix B          Tacoma Narrows Airport User Survey
Master Plan Update

A user survey was distributed at the initiation of this study to airport businesses and users. A copy of the survey is included in this appendix.
Pierce County is in the initial stages of updating the master plan for the Tacoma Narrows Airport (TIW). Please help us better understand airport use and how the airport could be improved. Your input will be documented and included in the master plan update. Fill in the blank or circle your answer, as appropriate.

What zip code do you live in?

What type aircraft do you own or fly? (List Model/Type)

Estimate your number of annual landings at all airports. (Include Touch & Go)

What percent of your annual landings are at TIW? %

What is your primary use of TIW? (Circle which applies most to you.)

Business          Emergency          Training          Other: Recreational

Is your aircraft based at TIW? YES NO

If based at TIW, do you lease/rent aircraft storage/tiedown from the County or private Pierce County Private Business business?

If not at TIW, where is your aircraft based? (List Airport ID)

Why don’t you base your aircraft at TIW? (Circle all that apply.)

Inadequate Runway Length Inconvenient Location

Lack of Suitable Hangar Other (please explain):

Cost of Hangar

What should be done to improve TIW?

OPTIONAL: If you provide your name, address, phone number, and email address, we will notify you of public meetings about the master plan and may contact you for more information related to the master plan update.

Name:

Mailing Address:
Thank you for completing this survey!
Please return the survey by mail, fax or email by April 22, 2013, to:

Wendy Renier, Senior Planner
WHPacific | 12100 NE 195th St, Ste 300 | Bothell, WA 98011
Fax 425.951.4808 | wrenier@whpacific.com
This appendix contains the forecasts and ALP approval letters from the FAA.
February 5, 2014

Ms. Deb Wallace
Environmental Services Building
9850 64th Street West
University Place, WA 98467

Dear Ms. Wallace:

Forecast Approval
Tacoma Narrows Airport, Tacoma, WA
AIP- 3-53-0076-016

I have reviewed the Forecasts Chapter 3 of the Master Plan Update submitted by WH Pacific for Tacoma Narrows Airport. The forecasts of based aircraft and aircraft operations, respectively, are hereby approved and accepted for Federal Aviation Administration (FAA) purposes. Please call me at (425)-227-1654 if I can be of further assistance.

Sincerely,

[Signature]
Deepa Parashar
Airport Planner, Washington

cc:
Wendy Renier, WH Pacific
March 24, 2016

Ms. Deb Wallace  
Airport and Ferry Administrator  
Pierce County Public Works  
9850 64th Street West  
University Place, WA 98467

Dear Ms. Wallace:

The Tacoma Narrows Airport Layout Plan (ALP), prepared by WH Pacific, and bearing your signature, is approved and the master plan is accepted. A signed copy of the approved ALP is enclosed.

An aeronautical study (no. 2015-ANM-784-NRA) was conducted on the proposed development. This determination does not constitute FAA approval or disapproval of the physical development involved in the proposal. It is a determination with respect to the safe and efficient use of navigable airspace by aircraft and with respect to the safety of persons and property on the ground.

In making this determination, the FAA has considered matters such as the effects the proposal would have on existing or planned traffic patterns of neighboring airports, the effects it would have on the existing airspace structure and projected programs of the FAA, the effects it would have on the safety of persons and property on the ground, and the effects that existing or proposed manmade objects (on file with the FAA), and known natural objects within the affected area would have on the airport proposal.

The FAA has only limited means to prevent the construction of structures near an airport. The airport sponsor has the primary responsibility to protect the airport environs through such means as local zoning ordinances, property acquisition, avigation easements, letters of agreement or other means.

This ALP approval is conditioned on acknowledgement that any development on airport property requiring Federal environmental approval must receive such written approval from FAA prior to commencement of the subject development. This ALP approval is also conditioned on acceptance of the plan under local land use laws. We encourage appropriate agencies to adopt land use and height restrictive zoning based on the plan.

Approval of the plan does not indicate that the United States will participate in the cost of any development proposed. AIP funding requires evidence of eligibility and justification at the time a funding request is ripe for consideration. When construction of any proposed structure or
development indicated on the plan is undertaken, such construction requires normal 45-day
advance notification to FAA for review in accordance with applicable Federal Aviation
Regulations (i.e., Parts 77, 157, 152, etc.). More notice is generally beneficial to ensure that all
statutory, regulatory, technical and operational issues can be addressed in a timely manner.

Please attach this letter to the Airport Layout Plan and retain it in the airport. We wish you great
success in your plans for the development of the airport.

Sincerely,

[Signature]

Joelle Briggs
Manager, FAA Seattle Airports District Office

Enclosure

cc: Chris Corich, WH Pacific, Inc
This appendix contains the newsletters distributed throughout the project. These newsletters provided updates and information on the project findings and progress.
BACKGROUND

In late 2012, Pierce County accepted a federal grant from the FAA to complete an Airport Master Plan Update—the Federal Aviation Administration (FAA) grant covers 90% of the study cost with Pierce County funding the remaining 10%.

The County recognized the need for a comprehensive Airport Master Plan Update to address the Airport’s current issues and to ensure its future development is functional, cost-effective, safe, demand driven, environmentally compatible, mindful of sustainability opportunities, and aligned with the community and regional air transportation system goals. The 2003 Master Plan used 1997 baseline data, making the former Master Plan well over a decade old. Changes in aviation industry trends, the local mix of aircraft types and aviation users, airport operation levels, and socioeconomic factors all drove the need to update the Master Plan.

STUDY SCOPE

The Master Plan will provide an updated strategy or “road map” for the development of the Airport over the next 5, 10, and 20 years, and beyond. Specific study tasks include:

- Identify key airport issues needing consideration
- Document the existing conditions at the airport and surrounding community
- Forecast based aircraft and traffic for the airport
- Determine facility needs to meet growing demand and to comply with FAA standards
- Present various development alternatives for evaluation so the County may choose a preferred development plan
- Conduct a review of compliance with federal grant assurances
- Prepare a set of airport layout plan drawings to illustrate the existing and future facilities, land use, and airspace for the Airport to meet FAA requirements and remain eligible for federal and state funding
- Present a capital improvement program (CIP) for the short-to-long-term development of the Airport with a breakdown of federal, state, and local funding needs for each CIP project

COMMUNITY OUTREACH

The community outreach program associated with this master planning effort provides several resources for communication with the public: project newsletters, public open houses, Planning Advisory Committee (PAC) meetings, and a project website. The project newsletters report on study progress and will be emailed to interested parties and posted to Pierce County’s project website: www.piercecountywa.org/tacomanarrows
Public open houses include a presentation by the County and Consultant Team with time allotted for discussion, questions and comments. The first set of five PAC meetings and open houses was held in January.

The Planning Advisory Committee (PAC) for the Master Plan Study was formed in the early stages of the Study. The role of the PAC is to serve as a liaison to the community, provide input at meetings, provide review comments on published materials, and to work together to develop a plan that will best serve the community, region, and air transportation system needs.

**STUDY PROGRESS**

The Airport Master Plan Update is under way with Inventory and Forecasts to be presented and discussed at the PAC meeting and public open house on June 5th. The forecasts will be presented to the FAA for their review and approval prior to completion of the next element of the Master Plan.

Chapter One, Inventory, includes an overview of the existing aviation activity (2012), existing runway, aircraft parking areas, hangars and other buildings, fuel services and storage, roadway access, and other facilities and services.

Chapter Two, Forecasts, presents the anticipated growth in based aircraft and operations at the Airport over the 20-year planning period. After a decline in both based aircraft and operations over the last decade—particularly after the economic recession—both are expected to show modest growth in the future, but remain slightly below 2007 levels.

The current count of aircraft based at the airport – 132 – is expected to grow to 161 by 2032. Airport operations are projected to increase to 65,300 in 20 years from nearly 48,500 in 2012.

According to air traffic control records, the current critical aircraft operating at the Airport today is the Cessna Citation and similar business jet aircraft. Based on the jet forecasts, which align with business aviation industry projections, the Airport will continue to serve this family of aircraft.

Existing and forecast airport activity primarily includes air taxi, general aviation (GA) and military. Examples of air taxi operations at the Airport include cargo courier services, medical operations (including Angel Flight), and fractional jet operators. Some air taxi flights are counted as GA operations at many uncontrolled airports, but air traffic control tower operators are able to identify them separately. GA activity refers to civil aviation other than scheduled airline service or military aviation. GA is the broadest category of aviation, encompassing activity such as business and corporate, aerial photography and surveying, scenic flights, newsgathering, law enforcement, firefighting, emergency medical flights, agricultural spraying, flight training, and various recreational activity. The majority of operations at the Airport are GA flights. An operation is defined as a take-off or landing so an aircraft that lands and then departs counts as two operations.

The next element in the Airport Master Plan Update study will be Facility Requirements where aviation demand is translated to airport needs over the next 5, 10, and 20-year timeframes.

For more information about the Airport Master Plan Update Study, please contact:
Mr. Warren Hendrickson, Aviation and Ferry Planner, Pierce County Public Works and Utilities, 2702 South 42nd Street, Suite 201, Tacoma, WA 98409-7322; office (253) 798-2428, warren.hendrickson@co.pierce.wa.us

Please watch for draft materials on the project website: www.piercecountywa.org/tacomanarrows We welcome your comments.
Welcome to the second of three project newsletters for the Tacoma Narrows Airport Master Plan Update Study. This newsletter provides a brief review of the forecasts and provides an overview of the future airport improvement needs.

ONGOING COMMUNITY OUTREACH

The community outreach program—in place since the Study kicked off eight months ago—continues to provide several resources for communication with the public: project newsletters, public open houses, Planning Advisory Committee (PAC) Meetings, and a project website. Public open houses include a presentation by the County and Consultant Team with time allotted for discussion, questions and comments. The second set of five PAC meetings and open houses was held in June. The project newsletters report on study progress and will be emailed to interested parties and posted to Pierce County’s project website: www.piercecountywa.org/tacomanarrows

FORECAST REVIEW

Today, the Tacoma Narrows Airport is home to 132 based aircraft, but is forecast to increase by 29 aircraft for a total of 161 by 2032. Annual aircraft operations are also projected to increase. An operation is a takeoff or a landing. Within 20 years, operations are projected to increase from the current 113 daily operations (nearly 48,500/year), to 179 daily operations (65,300/year). According to air traffic control records, the current critical aircraft operating at the Airport today is the Cessna Citation and similar business jet aircraft. Based on the jet forecasts, which align with business aviation industry projections, the Airport will continue to serve this family of aircraft.
FACILITY REQUIREMENTS

The Facility Requirements element of the Airport Master Plan Update translates the projected aviation activity at the Tacoma Narrows Airport (TIW) into airport improvements needed over the 20-year planning period. These airport improvements include both airside and landside improvements.

Airside refers to aircraft movement areas such as the runway and taxiways. Landside improvements refer to areas outside of the aircraft movement areas such as hangars, office buildings, the restaurant, and auto access and parking. The facility that most often drives the location of other facilities at the Airport is the runway. The runway dimensions and surrounding protective surfaces are driven by the aircraft using the runway. Generally, the existing runway meets the needs of its “regular” aircraft family users today based on FAA’s definition of “regular” as 500 or more annual operations. TIW’s current 5,002-foot runway serves the large majority of all aircraft using the airfield today. However, there are business jets operating at TIW that do require more runway length, but they conduct less than the 500 operations threshold.

In other words, the operations by those business jets requiring a runway longer than 5,002 feet are expected to continue growing to exceed 500 annual operations in the future. In fact, historical air traffic reports indicate that many of these jets operated more frequently in the past before the economic recession. While many in this jet family can operate at TIW today as well as other airports with 5,000 feet of runway, they are often weight-restricted, particularly on hot summer days when engine performance is impacted. Alternatively, some of these jets adjust their flight schedule to ensure takeoffs are conducted early morning or late evening when temperatures are cooler.

Highlights of other airside needs include taxiway improvements. As identified in the past TIW Airport Master Plan, the parallel taxiway separation does not comply with FAA design standards. Currently, the taxiway is too close to the runway and requires 50-foot relocation farther from the runway to meet standards. Runway to taxiway centerline separation is primarily driven by aircraft approach speed and wingtip clearance requirements. Other taxiway improvements recommended at the Airport are for enhanced safety and circulation.

Landside requirements for future improvements are based on the projected increase in aviation activity. However, with activity still rebounding from the recession, much of the existing landside development can adequately serve the Airport’s needs during the planning period. Hangars presently have excess capacity and aircraft parking apron has vacant aircraft tiedown space. In contrast, the apron area that needs enhanced circulation and space is near the Fixed Base Operators (FBOs) where most transient aircraft activity occurs for fueling and parking.

The facility requirements important in accommodating the forecast aviation demand and compliance with FAA design standards and regulations will be presented and discussed at the PAC meeting and public open house on September 4th.

WHAT’S NEXT

The next element in the Airport Master Plan Update Study will be the identification of various long-term airport development alternatives to meet the needs identified, to date. Subsequently, three alternatives will be presented for a comparative evaluation. The PAC may select one of the alternatives or a composite of the alternatives by selecting specific components of each. These components will be combined to establish the “preferred development alternative” to be recommended to the County for approval so the Airport Master Plan Update may progress to completion.

For more information about the Airport Master Plan Update Study, please contact:
Mr. Warren Hendrickson, Aviation and Ferry Planner, Pierce County Public Works and Utilities, 2702 South 42nd Street, Suite 201, Tacoma, WA 98409-7322; office (253) 798-2428, warren.hendrickson@co.pierce.wa.us

Please watch for draft materials on the project website: www.piercecountywa.org/tacomanarrows We welcome your comments.
Welcome to the third of four project newsletters for the Tacoma Narrows Airport Master Plan Update Study. This newsletter reports on the Study’s progress to include an overview of the long-term development alternatives to be presented to the PAC and public.

ONGOING COMMUNITY OUTREACH

Pierce County remains committed to the ongoing community outreach program established for the Airport Master Plan Update Study. Project newsletters, public open houses, Planning Advisory Committee (PAC) Meetings, and a project website all serve as resources for the community to stay up to date on the study progress and findings. Public open houses include a presentation by the County and Consultant Team with time allotted for discussion, questions and comments. A total of five PAC meetings and open houses are included in the study process with the third set of meetings completed in September 2013. The project newsletters report on study progress and are emailed to interested parties and posted to Pierce County’s project website: www.piercecountywa.org/tacomanarrows

LONG-TERM DEVELOPMENT ALTERNATIVES

Development alternatives have been prepared to address the facility needs of the Tacoma Narrows Airport through the long-term. These alternatives consider aviation demand and facility improvement needs identified in previous airport master planning chapters published in 2013. Consideration of potential needs in the more distant future is prudent planning. It helps protect the long-term viability of the Airport. This approach ensures other development at and around the Airport does not preclude the Airport from developing in a manner that best serves the community and its role in the air transportation system.
While there are numerous possibilities for airport development, three development alternatives that accommodate airside and landside improvements have been identified for the PAC. In addition, a No Action Alternative will be presented for comparison to the development alternatives. Since all development components are evaluated individually and as one overall concept, it is possible that the (PAC) will identify a preferred alternative that is a composite of the most favorable components from more than one alternative. The preferred alternative will be the PAC’s recommendation to Pierce County for their review and approval. The development alternatives will be presented to the PAC for review and discussion during the January 29, 2014 meeting. The meeting will conclude with the PAC’s preliminary selection of a preferred alternative. A public open house will follow the January 29th PAC meeting so the public may review the alternatives, ask questions, provide comments, and be presented with the PAC’s preliminary recommendations for a preferred development alternative. Following the PAC meeting and open house, the PAC’s preferred alternative will be submitted to Pierce County for review in February so the County may make an official selection of a preferred alternative. The County’s selection will take into consideration the PAC’s recommendation, the public’s input, and Pierce County’s goals for the future of the Airport. Given the aforementioned no-action/no-build alternative and three build alternatives, there are nonetheless common features among all three build alternatives to comply with FAA design standards. These common features include the relocation of parallel Taxiway A to meet the standard 400-foot runway-to-taxiway centerline separation, the relocation of a connecting taxiway, and the removal/relocation of a drainage ditch to accommodate the taxiway relocations. The redevelopment of three hangar areas is also a common feature as some existing hangars are in outdated/poor condition and require replacement. The following highlights the key features of the alternatives identified for evaluation:

**Alternative 1 – No Action**
- No airside or landside development
- Maintain existing facilities

**Alternative 2**
- Runway 17-35 runway length remains
- Parallel grass strip
- Limited landside development – hangar redevelopment areas

**Alternative 3**
- Runway 17 – extend 500 feet
- Runway 35 – extend 300 feet
- Parallel taxiway improvements
- Land acquisition, second access road, and hangar development to serve small and large aircraft on west side.
- Aircraft washdown area on the east side near Runway 17 end
- Aviation compatible development across 26th Ave NW.

**Alternative 4**
- Runway 17 - extend 1,000 feet, tunnel extension, parallel taxiway
- Grass strip
- Land acquisition, second access road, and hangar development for small aircraft exclusively on west side
- Realignment of 26th Ave NW to accommodate more aviation development

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**WHAT’S NEXT**
Once Pierce County approves the PAC’s recommendation for a long-term development plan, the remaining elements of the Airport Master Plan Update Study can be completed to include the Environmental Overview, Airport Plans, and Implementation. We look forward to your continued participation and input.

For more information about the Airport Master Plan Update Study, please contact:
Mr. Warren Hendrickson, Aviation and Ferry Planner, Pierce County Public Works and Utilities
2702 South 42nd Street, Suite 201, Tacoma, WA 98409-7322
Office: 253.798.2428 ~ Email: warren.hendrickson@co.pierce.wa.us

Please watch for draft materials on the project website: www.piercecountywa.org/tacomanarrrows
We welcome your comments.
As a recipient of Federal Airport Improvement Program (AIP) grant funds, Tacoma Narrows Airport is contractually bound to various sponsor obligations typically known as “Grant Assurances”. These Grant Assurances are included in the grant application package.

Most AIP obligations or grant assurances relating to the use, operation, and maintenance of the airport remain in effect for the useful life of the facilities developed, equipment acquired, or project items installed in the facilities, not to exceed 20 years. Some assurances have no limit on the duration of terms; they remain in effect as long as the airport remains in operation. This is true for Grant Assurance 23, Exclusive Rights; Grant Assurance 25, Airport Revenues; and Grant Assurance 30, Civil Rights. In addition, under AIP grants, the duration of the terms, conditions, and assurances do not expire with respect to real property acquired with federal funds (land and appurtenances, when applicable) as covered by Grant Assurance 4, Good Title; Grant Assurance 31, Disposal of Land; and Grant Assurance 35, Relocation and Real Property Acquisition.

This report includes a review of the most recent approved ALP, Airport Ordinance (if any), Zoning Ordinance, Rules and Regulations, Minimum Standards, airport fund/budget leases, easements, permits and any other pertinent governing document to ascertain compliance with the Assurances.

Existing and potential compliance issues are listed, described, and referenced to the specific assurance involved. For any existing violations, remedies will be recommended as well as time frames for achieving compliance. For potential compliance issues, recommended strategies that eliminate the risk of noncompliance will be presented.

The compliance review presented in this report is guided by the FAA Airport Sponsor Grant Assurances (as amended in April of 2012) and the FAA Airport Compliance Manual – Order 5190.6B.

**COMPLIANCE PROGRAM IMPLEMENTATION**

The FAA is continuously making an effort to educate airport sponsors in general of their obligations as grant recipients. This effort includes conferences, newsletters, and a dedicated webpage on the FAA’s website to provide information on compliance issues. Historically, however, much of the FAA’s efforts with individual sponsors have been in reaction to violations that came to the FAA’s attention and required correction.
When administering the AIP, the FAA has implemented a simplified noncompliance process to withhold sponsor entitlement funds. The project grant application approval process, outlined in 49 U.S.C. § 47106. Subparagraph 47106(d), discusses withholding grant application approval and specifically calls out primary apportionment funds 47114(c) and supplemental apportionment for Alaska 47114(e) as requiring the opportunity for a hearing prior to withholding grant application approval due to a violation of grant assurances. The statute does not require a hearing to withhold grant application approval for general aviation apportionment 47114(d); this includes 47114(d)(2) state apportionment and 47114(d)(3) non-primary apportionment. Non-primary apportionment are the funds commonly referred to as General Aviation Entitlements, i.e. $150,000 maximum per fiscal year per general aviation airport. Section (g)(2) of 49 U.S.C. § 47107 states that “The Secretary of Transportation may approve an application for a project grant only if the Secretary is satisfied that the requirements prescribed under paragraph (1)(A) of this subsection have been met.” Subsection 1(A) says, “To ensure compliance with this section, the Secretary of Transportation shall prescribe requirements for sponsors that the Secretary considers necessary.” The FAA can administratively determine that a sponsor is not meeting its grant assurances and withhold entitlement funds at general aviation airports.

**GRANT ASSURANCES GUIDING PRINCIPLES**

As identified in FAA Order 5190.6B, “The Airport Compliance Program is designed to protect the public interest in civil aviation. Grants and property conveyances are made in exchange for binding commitments (federal obligations) designed to ensure that the public interest in civil aviation will be served. The FAA bears the important responsibility of seeing that these commitments are met.”

When an airport is included in the National Plan of Integrated Airport System (NPIAS), such as is the case with Tacoma Narrows Airport, it becomes eligible for federal funds under the federal Airport Improvement Program (AIP). In applying for and receiving these funds, the Airport agrees to a set of grant assurances that are designed to protect the public investment and are guided by the following principles outlined in the NPIAS:

- Airports should be safe and efficient, located at optimum sites, and developed and maintained to appropriate standards.
- Airports should be efficiently operated so that they are affordable to both users and Government. They must rely primarily on user fees and place minimal burden on the general revenues of the local, State, and Federal governments.
- Airports should be flexible and expandable, able to meet increased demand and able to accommodate new aircraft types.
• Airports should be permanent, with the assurance that they remain open for use over the long term.
• Airports should be compatible with the surrounding communities. They must maintain a balance between the needs of aviation and the requirements of residents in neighboring areas.
• Airports should be developed in concert with improvements to the air traffic control system and technological advancements.
• The airport system should support national objectives for defense, emergency readiness, and postal delivery.
• The airport system should be extensive, providing as many people as possible with convenient access to air transportation, typically by having most of the population within 20 miles of a NPIAS airport.
• The airport system should help air transportation contribute to a productive national economy and international competitiveness.

GRANT ASSURANCES

In accepting a federal AIP grant, the Airport agrees to a total of 39 grant assurances. This section provides a listing and a brief description of each of these assurances. Additionally, a brief examination of the County’s compliance is provided for each of the assurances.

It should be noted that the terms, conditions and assurances usually remain in effect for a 20-year period from the receipt of the last AIP grant with the exception of land purchased with federal funds for which the terms, conditions and assurances do not expire.

1 – General Federal Requirements. The airport sponsor will comply with all applicable Federal laws, regulations, executive orders, policies, guidelines, and requirements as they relate to the application, acceptance, and use of Federal funds.

• It appears that the County has, and will continue to comply with all applicable federal guidance to the best of its ability.

2 – Responsibility and Authority of the Sponsor. The grant applicant must have the legal authority to apply for, finance, and administer the grant.

• The County, as acknowledged by the State of Washington, is the local discretionary authority for the Airport.
3 – **Sponsor Fund Availability.** The Sponsor must have sufficient funds to match their portion of the AIP grant.

- The County has historically complied with this assurance. Additionally, the Capital Improvement Plan (CIP) developed as part of this master plan identifies funding sources—including the local financial obligation for each project—to ensure the County verifies availability of the local matching funds prior to applying for federal assistance.

4 – **Good Title.** The Sponsor must hold good title to the Airport, or to the site of proposed improvements.

- Exhibit A (included in the previous Master Plan) shows that the County owns the entire Airport property. For future development and airport protection needs, the County will secure the necessary land beyond the current airport property boundary via fee acquisition or avigation easement. The Airport Property Map has been updated as part of this Master Plan to reflect the current and future airport property boundary.

5 – **Preserving Rights and Powers.** The Airport sponsor will not take or permit any action that would deprive it of the rights and powers necessary to perform any of the grant assurances, nor will it sell, lease, encumber, or transfer any part of its title or interests in the Airport property.

- The County has and will continue to maintain its rights and powers associated with the grant assurances. Parcels of airport property deemed unusable for aeronautical purposes have been identified and presented to the FAA for possible disposal/release (also noted in Grant Assurance #31). The appropriate review and approval process will be followed. Another important issue relating to this grant assurance is the granting of through-the-fence (TTF) leases. TTF activities allow access to airport facilities from off-airport users. In many instances, the airport sponsor cannot control the activities of those operating off the airport resulting in less sponsor control. This loss of control can potentially have an adverse impact to airport users. For example, TTF activities many times do not pay the same rates and charges as on-airport users, resulting in an unfair competitive advantage for business/users located off-airport versus those on-airport. All TTF agreements must preserve the rights and powers of the Airport. Tacoma Narrows Airport does not have any TTF agreements and the Master Plan Update study did not identify any such proposed agreements within the planning period. If the County chooses to enter into any TTF agreements in the future, such agreements must include the necessary guarantees that preserve the County’s title and interest in the Airport property.
6 – **Consistency with Local Plans.** The proposed project must be reasonably consistent with Local, County, and State plans, to include the area surrounding the Airport.

- It appears that past projects undertaken at the Airport were consistent with Local, County, and State plans. Additionally, this Master Plan, which will ultimately be incorporated into the County’s Comprehensive Plan, recommends that all Washington State Department of Transportation (WSDOT) Aviation land use regulations be adopted. It is anticipated that all future projects will comply with this assurance.

7 - **Consideration of Local Interests.** The sponsor will give fair consideration to the local community’s interests.

- This Master Plan has been conducted with the assistance of a Planning Advisory Committee (PAC) representative of the local community. All PAC meetings have been open to the public with a separate Public Open House held the same day following each PAC meeting to provide an opportunity for public input and a Q&A session. The County considered input from the public throughout the master planning study, particularly on proposed airport improvements. Public comments were compiled and are maintained in the Pierce County files. Future projects will undergo public involvement, consistent with the project’s scope.

8 – **Consultation with Users.** Consultation with affected parties using the Airport must be conducted prior to, and during, any proposed project.

- There are no indications that the County has not consulted with affected parties during prior projects. Further, this Master Plan included a user survey to invite feedback regarding airport issues and improvement needs. Airport users were also represented on the Planning Advisory Committee. Also represented on the PAC were the residents and land owners of property adjacent to or in close proximity to the Airport. The County routinely communicates via their website and email during airport projects, During the Master Plan Study, notices in the newspaper and postcard mailings to area neighborhoods were provided to communicate an opportunity for public involvement on the planning process. The County will continue to coordinate with affected parties, as necessary, consistent with the nature of the project.

9 – **Public Hearing.** For major projects, the Airport sponsor must give the community an opportunity for a public hearing to consider economic, social, and environmental effects of the proposed project.

- The County will coordinate with the FAA to determine what qualifies as a major project. If necessary, the County will publish in its newspaper of record the availability of public
hearing, if requested by a member of the public. This Master Plan process included five public open houses, all of which were advertised on the County’s website and in various media outlets.

10 – Air and Water Quality Standards. For major construction projects, the sponsor must comply with applicable air and water quality standards to the satisfaction of concerned agencies.

- Consistent with the recommendations in Chapter 4, Development Alternatives, the County should, as it has in the past, coordinate with applicable agencies during project design to determine permit requirements, if any.

11 - Pavement Preventative Maintenance. The sponsor must implement an effective airport pavement maintenance-management program for the useful life of any pavement construction with AIP assistance.

- In 2012, Washington State Department of Transportation (WSDOT) conducted a statewide Airport Pavement Management System Study (report published 2013) to evaluate the current condition and preservation needs of Washington’s airport pavements. Runway, apron, taxiway and taxilane pavements at the Tacoma Narrows Airport were tested as part of the study and a pavement management program was put in place. The County will continue to work with the State through their pavement management system to ensure that a pavement maintenance program is in place.

12 - Terminal Development Prerequisites. If the sponsor were to develop a public-use terminal, it must certify that all safety and access equipment required by rule or regulation is provided to all passengers.

- If a terminal were to be developed, in response to the demand, the plans and specifications prepared by the County and its engineer – and approved by the FAA – would ensure all equipment needs are met.

13 - Accounting System, Audit, and Record Keeping Requirements. The County must keep all project accounts and records relative to the project in accordance with the Single Audit Act of 1984. Additionally, the County must make all records available for the purpose of audit and examination.

- Currently, it appears the County’s recordkeeping satisfies FAA’s requirements. However, the County should periodically evaluate their accounting system to ensure future compliance. Project documentation should be readily accessible and include such items as fund transfers, income received, expenditures, and any other information pertinent to the project.
14 – Minimum Wage Rates. For all contracts in excess of $2,000 that involve labor, the sponsor shall establish minimum wage rates in accordance with the Davis-Bacon Act (40 U.S.C. 276a-276a-5).

- The County has, and will continue to, establish minimum rates of wages consistent with the Davis-Bacon Act for all federally-assisted contracts meeting this requirement.

15 – Veteran’s Preference. Contracts for work involving AIP grants must ensure that preference is given to available and qualified veterans.

- Although no prior projects were examined, the County has indicated that all AIP funded projects do provide preference for qualified veterans. It is recommended that all future project plans and specifications include a clause regarding veteran’s preference.

16 – Conformity to Plans and Specifications. The sponsor will execute the AIP projects per the plans, specifications, and schedule approved by the FAA. Any modifications to the project must obtain the FAA’s approval.

- Regular contact with the FAA should be initiated by the County and the County’s engineer to avoid any miscommunication or deviation from the approved program. Onsite construction inspection should help lessen the possibility of work being performed inconsistent with the project’s plans and specifications.

17 - Construction Inspection and Approval. Competent technical supervision must be provided by the sponsor throughout the construction project to assure the work conforms to the plans, specifications, and schedule approved by FAA.

- All future projects should be overseen by qualified construction inspection personnel. It does not appear that any past projects have violated this requirement.

18 – Planning Projects. During planning projects, the sponsor must execute the project as approved in the scope of work, while making the reports and documents available to the public.

- As part of the Master Plan process, the County developed plans in an open manner with input from the community through the PAC representatives, the airport website, public open houses held during the study, and direct communication with the County. The County remains committed to conduct a similar process for all future planning projects.

19 - Operation and Maintenance. The Airport and all facilities must be operated at all times in a safe and serviceable condition and in accordance with minimums standards set by the sponsor. Any temporary closure for non-aeronautical purposes must be approved by the FAA. The sponsor
must promptly mark and/or light hazards and notify airmen of any condition affecting aeronautical use of the Airport.

- The County meets the criteria of this grant assurance as it conducts an ongoing assessment of the conditions at the Airport to identify any possible concerns such as increasing tree heights. In addition, the County is in the process of updating the Airport’s Minimum Standards in accordance with this grant assurance.

20 – Hazard Removal and Mitigation. The sponsor must take appropriate action to assure the Airport’s airspace is adequately cleared and protected.

- The County remains committed to removing any obstructions to airspace and air navigation such as trees. The County has programmed an obstruction survey in the CIP to identify obstructions, if any, so they may take action to address them.

21 - Compatible Land Use. To the extent reasonable, the sponsor shall include the adoption of zoning laws to restrict the use of land adjacent to or in the immediate vicinity of the Airport to activities and purposes compatible with normal airport operations.

- Pierce County has defined an Airport Overlay Zone to ensure that land use and zoning in the Airport’s surroundings are compatible with the Airport and its operations. Pierce County Title 18A – Development Regulations – Zoning 18A.10.100 states that “The Rural Airport Overlay (RAO) functions as a safety buffer adjacent to the Tacoma Narrows Airport in rural designated land. The overlay provides restrictions on the use of land, which are intended to protect the airport from neighboring land uses that are incompatible with aviation activities. The area also provides buffering between those more intensive uses related to aviation activities and the uses authorized in the rural-residential classifications

22 - Economic Nondiscrimination. The sponsor will make the Airport available as an airport for public use on reasonable terms and without unjust discrimination to all types, kinds, and classes of aeronautical activities. Any agreement the sponsor enters into with a third party must outline and enforce provisions that 1) services will not be unjustly discriminatory; 2) charges will be reasonable and just; 3) each FBO shall be subject to the same rates and charges; and 4) the sponsor will not grant any right which operates to prevent any person, firm, or corporation operating aircraft from performing any services that it may choose to perform.

- The Airport does comply with the provisions provided in this grant assurance.

23 – Exclusive Rights. The sponsor must not permit exclusive right for the use of the Airport by any person providing aeronautical services to the public. Services by a single FBO are not considered an exclusive right if it would be unreasonably costly or impractical for more than one
FBO to provide the services and if allowing more than one FBO would require the reduction of the first FBO’s lease area.

- A review of the County’s lease agreements did not reveal that exclusive rights were granted to any tenants and/or operators. There is no indication that the County has in the past denied any lease requests on the basis of the request competing with an existing lease holder’s business. The County will continue to review all requests for the provision of aeronautical services at the Airport to ensure a competitive airport environment and safe and efficient operations.

24 – Fee and Rental Structure. The fee and rental structure for Airport facilities and services must be developed and maintained by the sponsor with the goal of helping the Airport become financially self-sustaining.

- The current fee and rental structure, which took effect in 2013, is comparable to that of similar airports in the state. It is recommended that the County continuously update its fee and rental structure with the goal of becoming financially self-sustaining. The fee structure should be based on a market study that looks at keeping the attractiveness of the Airport while generating the most possible revenue.

25 – Airport Revenues. All revenues generated by the Airport and any local taxes on aviation fuel will be expended by the Airport for the capital or operating costs of the Airport, the local airport system, and other facilities owned by the sponsor which are directly and substantially related to the actual air transportation of passengers or property.

- The County does comply with the provisions of this grant assurance.

26 – Reports and Inspections. The sponsor will submit annual financial and operations reports to the FAA, and make the reports available to the public. All Airport records for development projects must be available to the FAA upon request.

- The County has complied with all requests by the FAA for data and records pertaining to the Airport. These reports are also available to the public, as part of the County’s records.

27 – Use by Government Aircraft. The sponsor shall make available all of the facilities of the Airport developed with Federal financial assistance and all those usable for landing and takeoff of aircraft to the United States for use by Government aircraft at all times without charge. However, if the use by Government aircraft is substantial, charge may be made for a reasonable share, proportional to such use, for the cost of operating and maintaining the facilities used.

- The County has, and will continue to, make its facilities available for government use as appropriate and in compliance with this grant assurance.
28 – Land for Federal Facilities. The sponsor shall furnish real estate, without cost to the Federal Government, for use in connection with any air navigation, weather reporting, or communication activities.

- The Airport has never denied a request or charged any fee to the Federal Government for the furnishing of real estate for use in connection with any air navigation, weather reporting, or communication activities.

29 – Airport Layout Plan. The Airport Layout Plan will be kept up-to-date at all times.

- The previous Airport Layout Plan was updated in 2003. This Master Plan updated the Airport ALP to reflect the current conditions at the Airport, the latest FAA design standards, and the proposed future improvements. The County plans to keep the ALP updated in the future, as needed, particularly as proposed development occurs.

30 – Civil Rights. For the period the sponsor retains ownership of the Airport property it will assure that no person shall, on the grounds of race, creed, color, national origin, sex, age, or handicap be excluded from participating in any activity conducted with or benefiting from funds received from the grant.

- The County has, and continues to, comply with this assurance.

31 – Disposal of Land. When land purchased under a grant for airport development purposes is no longer needed for airport purposes, disposal of such land should be done at fair market value or the land must be made available to the US Transportation Secretary. Land is considered to be needed for airport purposes if it is needed for aeronautical purposes (such as the RPZ) or serve as a noise buffer, and the revenue from the interim uses of such land contributes to the financial self-sufficiency of the Airport. Disposition of the land must retain the rights necessary to ensure the land will only be used for airport-compatible purposes.

- This Master Plan identified Airport-owned property that is needed for airport purposes in the minimum 20-year planning period. The location of some parcels makes aeronautical development impractical so the County may consider disposal of this land for the financial benefit of the Airport.

32 – Engineering and Design Services. The sponsor will award engineering, planning, and design contracts based on qualifications, in the same manner as a contract for architectural and engineering services under Title IX.

- The County has, and will continue to, secure professional services according to the guidance of Title IX.
33 – **Foreign Market Restrictions.** The sponsor shall not allow grant funds to finance any project that uses any product or service of a foreign country listed by the US Trade Representative as denying fair and equitable market opportunities.

- The County has not knowingly financed any product or services from a restricted country of origin. Materials and labor for any proposed project are readily available in the United States, so there should be no issues concerning securing them from non-listed countries.

34 – **Policies, Standards and Specifications.** The sponsor shall carry out the project in accordance with the policies, standards, and specification approved by the Secretary of Transportation.

- The County has, and will continue to, perform all projects in accordance with U.S. Department of Transportation policies, standards, and specifications.

35 – **Relocation and Real Property Acquisition.** If real property is to be acquired, the sponsor will reimburse property owners – to the extent practicable – for necessary expenses, including relocation assistance or comparable replacement dwelling in accordance with FAA regulations.

- Prior to the acquisition of any property as recommended by this Master Plan, whether it includes runway protection zones or land for development and expansion, the County will undergo the necessary Environmental Assessment (EA) and property appraisal for the said acquisition, ensuring compliance with this grant assurance.

36 – **Access by Intercity Buses.** Intercity buses, if applicable, will have access to the Airport.

- No bus service is currently available at the Airport and there does not appear to be any plans for future bus service. This grant assurance is intended for airports with commercial passenger service.

37 – **Disadvantaged Business Enterprise (DBE).** No discrimination on the basis of race, color, national origin, or sex will be tolerated in the award and performance of any FAA-assisted contract or in the administration of the sponsor’s DBE Program.

- A review of past federally funded contracts entered into by the County indicates that all appropriate County projects include a DBE clause and are in accordance with 49 CFR Part 26.

38 – **Hangar Construction.** If a third party constructs a hangar at their own expense, the sponsor will grant the third party a long-term lease subject to such terms and condition on the hangar as the sponsor may impose.
• Hangar lease agreements entered into by the County are consistent with FAA guidance and this grant assurance. It is recommended that the County periodically review its lease agreements to ensure continuous compliance.

**39 – Competitive Access.** This assurance only applies to medium or large hub airports.

• This assurance does not apply to the Tacoma Narrows Airport.

**AIRPORT COMPLIANCE PROGRAM**

The Airport Compliance Program aims to ensure that the nation has a system of safe and properly maintained public use airports that are operated according to the airport owners’ federal obligations. The program is designed to safeguard the public’s investment in civil aviation.

The Airport Compliance Program is not designed to control or direct operations at an airport, but to protect the federal investment by monitoring airports sponsors’ compliance with the commitments they made to the federal government. More specifically, the program is designed to:

• Educate airport sponsors
• Promote dispute resolution through an informal process using CFR 14 Part 13.1 and/or an alternative dispute resolution (ADR).
• Eliminate duplication by distinguishing between the functions of local, regional, and national FAA offices.
• Speed the decision-making process.
• Enforce agreements when necessary.

The guidelines of the Airport Compliance Program are found in FAA Order 5190.6B, Airport Compliance Requirements Manual. Order 5190.6B offers more details than what is found in the AIP grant application. The Manual should be consulted to develop corrective action with regard to any grant assurance deficiencies. The topics covered in the Airport Compliance Manual include:

• Scope and Authority of the FAA
• Compliance Program
• Federal Obligations from Property Conveyances
• Federal Grant Obligations and Responsibilities
• Complaint Resolution
• Rights and Powers and Good Title
• Airport Operations
• Exclusive Rights
• Unjust Discrimination between Aeronautical Users
• Reasonable Commercial Minimum Standards
• Self-Service
• Review of Aeronautical Lease Agreements
• Airport Noise and Access Restrictions
• Restrictions Based on Safety and Efficiency Procedures and Organization
• Permitted and Prohibited Uses of Airport Revenue
• Resolution of Unlawful Revenue Diversion
• Self-sustainability
• Airport Rates and Charges
• Airport Financial Reports
• Compatible Land Use and Airspace Protection
• Land Use Compliance Inspection
• Releases from Federal Obligations
• Reversions of Airport Property
• Appendices

As previously mentioned, the Airport Compliance Requirements Manual will guide the development of remedial actions addressing the County’s compliance with the FAA grant assurances.

SUMMARY, RECOMMENDATIONS AND BEST MANAGEMENT PRACTICES

Based on the review presented above, it appears that Pierce County is in compliance with all grant assurances agreed to when accepting AIP federal funds. It is recommended that the County communicate with the FAA on a regular basis to ensure the continued compliance with the 39 assurances described above.

Additionally, a number of best management practices are presented below. These practices are aimed at providing a preemptive approach to avoid potential future issues regarding certain grant assurances. However, it’s important to reiterate that the County is presently in compliance with these assurance.

Sponsor Fund Availability. This master plan identifies a capital improvement plan (CIP) that proposes a feasible and attainable action plan for development at the Airport. Along with the estimated cost for the projects, the CIP projects the County’s share of the improvement costs. The County should use this to budget for anticipated projects. Additionally, the CIP should be updated regularly based on development demand.
Accounting System, Audit, and Record Keeping Requirements. Although there are no existing concerns regarding the County’s accounting system, it is recommended the County periodically review their accounting practices. This proactive approach will ensure that all needs of the County and FAA are met.

Hazard Removal and Mitigation. According to existing records, there are no current obstructions to the Airport’s airspace. It is recommended that County work aggressively towards removing new obstructions, if any, identified as part of the upcoming obstruction survey.

Disadvantaged Business Enterprises. A current copy of the County’s DBE Program must be on-file with the FAA Office of Civil Rights at all times. The County should continuously update their DBE Program to comply with federal and state goals, as well as develop DBE goals for all upcoming projects involving federal funding.
Pierce County
Public Works and Utilities
2702 South 42nd St., Suite 201
Tacoma, Washington 98409-7322
Tacoma Mall Plaza
PIERCE COUNTY TITLE 18A ENACTS A RURAL AIRPORT OVERLAY ZONE AND THE GIG HARBOR PENINSULA COMMUNITY PLAN DESIGNATES A RURAL AIRPORT OVERLAY THAT INCLUDES ALL PROPERTIES WITHIN 1,000 FEET OF THE AIRPORT. BOTH DOCUMENTS PROHIBIT NON-AIRPORT COMPATIBLE USES IN THESE ZONES. BOTH DOCUMENTS ALSO PROHIBIT BUILDINGS AND STRUCTURES THAT WOULD PENETRATE THE AIRPORT'S PART 77 SURFACES.
Pierce County

Public Works and Utilities

Tacoma Mall Plaza

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Tacoma, Washington  98409-7322

At APA Approved Agency

TACOMA NARROWS AIRPORT (TIW)

AIRPORT MASTER PLAN UPDATE

AIRPORT PROPERTY MAP

PROJ 9936