Chapter Three
AIRPORT FACILITY REQUIREMENTS/ALTERNATIVES

In this chapter, existing components of the Airport are evaluated so that the capacities of the overall system are identified. Once identified, the existing capacity is compared to the forecasted activity levels prepared in Chapter Two to determine where deficiencies currently exist or may be expected to materialize in the future. Once deficiencies in a component are identified, a more specific determination of the approximate sizing and timing of the new facilities can be made.

The objective of this effort is to identify, in general terms, the adequacy of the existing airport facilities and outline what new facilities may be needed and when they may be needed to accommodate forecasted demand. Having established these facility requirements, alternatives for providing these facilities will be developed and evaluated to determine the most cost-effective and efficient means for implementation.

It is important to note that all past Airport improvements have been funded through the Port of Camas/Washougal and WSDOT Aviation Division. Grove Field has never received federal funding for improvement projects and therefore has not been obligated to meet FAA airport design standards. Because of this, many of the current airport facilities *are not* standard by the FAA's definition. If the Airport decides to accept federal funding, it will be obligated to improve the existing facilities to meet federal standards. With this situation in mind, development alternatives have been created based on the two options the Airport faces – 1) maintain the existing facilities and continue to meet demand for hangar buildings and tie-down positions as it is warranted, or 2) make facility improvements that meet FAA standards, while also considering

long-term demand and planning for it now. Two different development alternatives have been created for the latter option; both will achieve the same end result of meeting FAA standards and planning for long-term demand now. Though three distinct development alternatives have been created, it is worth mentioning that certain facilities may have only one or two options for development/improvement, therefore, some alternatives might be the same for a particular facility. The three development alternatives will be "constructed" throughout the text based on the recommendations and/or assumptions which are underlined and italicized for each facility. The development alternatives will be presented in graphic form at the end of the chapter.

Airport facilities include both airfield and landside components. Airfield facilities include those facilities that are related to the arrival, departure, and ground movement of aircraft. These components include:

- Runways
- Taxiways
- Navigational Approach Aids
- Lighting, Markings, and Signage

Landside facilities are needed for the interface between air and ground transportation modes. This includes components for general aviation needs such as:

- Aircraft Hangars
- Aircraft Parking Aprons
- Auto Parking and Access
- Airport Support Facilities

PLANNING HORIZONS

The cost-effective, efficient, and orderly development of an airport should rely more upon actual demand at an airport than a time-based forecast figure. In order to develop an airport layout plan that is demand-based rather than time-based, a series of planning horizon milestones have been established for Grove Field that take into consideration the reasonable range of aviation demand projections.

It is important to consider that the actual activity at the Airport may be higher or lower than projected activity levels. By planning according to activity milestones, the resultant plan can accommodate unexpected shifts, or changes in the area's aviation demand. It is necessary for a plan to be created that can accommodate these changes so that the Airport can respond to unexpected events in a timely fashion. These milestones provide flexibility, while potentially extending this plan's useful life if aviation trends slow over the period.

The most important reason for utilizing milestones is that they allow the airport to develop facilities according to need generated by actual demand levels. The demand-based schedule provides flexibility in development, as development schedules can be slowed or expedited according to actual demand at any given time over the planning period. The resultant plan

provides airport officials with a financially responsible and need-based program. **Table 3A** presents the planning horizon milestones for each activity demand category.

TABLE 3A: Aviation Demand Planning Horizons

Demand Category	Current	Short Term (2010)	Intermediate Term (2015)	Long Term (2025)
Operations				
Local	1,875	2,192	2,447	2,924
Itinerant	5,625	6,574	7,343	8,772
Total	7,500	8,766	9,790	11,696
Based Aircraft	83	94	104	128

Source: Chapter 2, Forecasts

AIRFIELD FACILITIES

The adequacy of existing airfield facilities at Grove Field has been analyzed from a number of perspectives, including airfield capacity, runway length, runway pavement strength, airfield lighting, navigational aids, and pavement markings.

AIRFIELD DESIGN STANDARDS

To determine facility requirements, the Airport Reference Code (ARC) must be referred to in order for the appropriate airport design criteria to be applied. As discussed in Chapter Two, the existing ARC for Grove Field is A-I (small) and the critical aircraft is a Cessna 172. The forecasts anticipate that the future ARC will be B-I (small). This change in ARC does not create a new set of design standards, it does, however, change the approach category of the aircraft using the Airport. In other words, it assumes that throughout the planning period, faster aircraft will begin to use the Airport, while the size of the aircraft will remain similar to the current operational fleet. Facility requirements will be developed based on these assumptions.

The FAA has established several airport design standards to protect aircraft operational areas and keep them free from obstructions that could affect the safe operation of aircraft. These include the runway safety area (RSA), object free area (OFA), obstacle free zone (OFZ), and runway protection zone (RPZ). Each is defined below. If the Airport decides to accept federal funding, these design standards will need to be complied with.

The RSA is “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 an excursion from the runway.”

An OFA is an area on the ground centered on the runway or taxiway centerline provided to enhance the safety of aircraft operations. No above ground objects are permitted in the OFA, except for objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes.

An OFZ is a volume of airspace that is required to be clear of objects, except for frangible items required for navigation of aircraft. It is centered along the runway and extended runway centerline.

The RPZ is defined as an area off the runway end to enhance the protection of people and property on the ground. The RPZ is trapezoidal in shape and centered about the extended runway centerline. The dimensions of an RPZ are a function of the runway ARC and approach visibility minimums.

Table 1A in the Inventory Chapter identified the dimensions of these areas by the existing ARC A-I (small) standards and the actual dimensions. Several of the actual dimensions do not meet the FAA's standards, specifically the RSA width which falls 40 feet short of the required 120-feet needed to meet A-I (small) standards, and the OFA width which is 130 feet less than the 250-foot A-I (small) standards. The existing RSA is graded and mowed to 80 feet. There does not appear to be any particular reason that the RSA could not be graded and mowed to the full 120 feet. The OFA is non-standard due to trees located within its boundary. The following are possible options the Airport may implement regarding airfield design standards:

- Alternative 1 – Leave RSA and OFA as is, do not improve to meet FAA design standards
- Alternatives 2 & 3 – Bring to standard - Grade and mow additional 20 feet on each side of the runway to achieve standard RSA dimension and remove trees on south edge of runway and grade area to meet standard OFA dimension.

RUNWAY

The adequacy of the existing runway system at Grove Field was analyzed and is presented in the following subsections. Based on this information, requirements for runway improvements were determined.

Airfield Capacity

A demand/capacity analysis measures the capacity of the airfield configuration. Planning standards indicate that when demand reaches 60% of capacity, new facilities should be planned. When demand reaches 80% of capacity, new facilities should be in place. To determine the airfield capacity at Grove Field, Advisory Circular 150/5060-5, Airport Capacity and Delay was referenced. A typical airport with a single runway configuration and a full length parallel taxiway, similar to Grove Field, has an annual capacity of 230,000 operations. Since the forecasts are projecting 11,696 annual operations by 2025, the Airport will remain well below this threshold. *The capacity of the existing runway will not be reached; therefore the airfield will be able to meet operational demands in its current configuration.*

Runway Orientation

For the operational safety and efficiency of an airport, it is desirable for the primary runway of an airport's runway system to be oriented as close as possible to the direction of the prevailing wind. This reduces the impact of wind components perpendicular to the direction of travel of an

aircraft that is landing or taking off (defined as a crosswind).

FAA design standards specify that additional runway configurations are needed when the primary runway configuration provides less than 95 percent wind coverage at specific crosswind components. The 95 percent wind coverage is computed on the basis of crosswinds not exceeding 10.5 knots for small aircraft weighing less than 12,500 pounds and from 13 to 16 knots for aircraft weighing over 12,500 pounds.

The National Climatic Data Center (NCDC) does not have any wind data available for Grove Field; therefore a review of wind data at nearby airports with similar runway configurations was conducted. Pearson Field in Vancouver has a runway heading of 8-26 and is reporting 92.25% wind coverage with a 10.5 knot crosswind component. It is important to note that this data is based on conditions at Portland International Airport (PDX). The executive summary of the Portland International Airport Master Plan Update was also consulted. PDX currently has two parallel runways on a heading of 10-28 and a crosswind runway on a heading of 3-21. The summary discusses a potential third parallel runway which would require removal of the crosswind. The summary states that after reviewing weather data it was determined that the crosswind runway could be eliminated.

Due to the distance between Grove Field and Portland and because of the interference of shifting wind patterns near the Columbia River, this data may not accurately correlate to conditions at Grove Field. *It is assumed, however, for purposes of this study, that wind coverage at Grove Field is 95%.*

Runway Length

The determination of runway length requirements should consider both takeoff and landing requirements. Takeoff requirements are a factor of airport elevation, mean maximum temperature of the hottest month, critical aircraft type (or family of aircraft types) expected to use the airport, and stage length of the longest nonstop trip destinations. Aircraft performance declines as temperature and stage length increase. Landing requirements are a factor of airport elevation, aircraft landing weight and the runway condition (i.e. dry conditions or wet conditions).

The local elevation at Grove Field is 429 feet and the mean maximum temperature of the hottest month is 79.8 degrees Fahrenheit (F) in August. There is a 17-foot elevation difference between runway ends.

Using the site-specific data described above, runway length requirements for the various classifications of aircraft that may operate at the airport were examined using the FAA Airport Design computer program, Version 4.2D. The program groups general aviation aircraft into several categories, reflecting the percentage of the fleet within each category and useful load (passengers and fuel) of the aircraft. **Table 3B** summarizes FAA's generalized recommended runway lengths for Grove Field.

TABLE 3B, Runway Length Requirements

AIRPORT AND RUNWAY DATA	
Airport elevation	429 feet
Mean daily maximum temperature of the hottest month	78.8 F
Maximum difference in runway centerline elevation	17 feet
Wet and slippery runways	
RUNWAY LENGTHS RECOMMENDED FOR AIRPORT DESIGN	
Small airplanes with less than 10 passenger seats	
75 percent of these small airplanes	2,540 feet
95 percent of these small airplanes	3,070 feet
100 percent of these small airplanes	3,670 feet
Small airplanes with 10 or more passenger seats	4,170 feet

Source: FAA's Airport Design Computer Program, Version 4.2D utilizing Chapter Two of AC 150/5325-4A, Runway Length Requirements for Airport Design

As shown in the table, *the current runway length of 2,620 feet can accommodate slightly more than 75% of small airplanes with less than 10 passenger seats.* It is more ideal for a runway to be able to accommodate 95% to 100% of these small airplanes. It is worth noting that night operations at the Airport are reduced to 1,804 feet of runway length due to the lack of lighting along the portions of the runway which are displaced. The following options exist in regard to runway length at Grove Field:

- Alternative 1 – Maintain current runway length of 2,620 feet. Install edge lighting on portions of runway that are displaced (in accordance to AC 150/5340-24) so that full runway length is available for night time operations
- Alternative 2 – Extend Runway - extend runway 450 feet to the west to achieve a runway length of 3,070 feet. This length will accommodate 95% of small aircraft with less than 10 passenger seats.
- Alternative 3 – Shift & Extend Runway – shift runway 75 feet to the south to achieve recommended runway to taxiway separation distance of 150 feet and extend runway 450 feet to the west to achieve a runway length of 3,070 feet.

If Alternative 2 or 3 is implemented Delp Road will need to be relocated. Due to a runway extension to the west, a portion of the future RPZ would be located outside of Airport property. The Airport will need to acquire or obtain an avigation easement over this portion of the land.

RUNWAY WIDTH

The width of the existing runway was also examined to determine the need for facility improvements. Runway 7-25 currently has a width of 40 feet. Airport Design Group (ADG) I standards recommend a runway width of 60 feet. Alternatives regarding runway width include:

- Alternative 1 – Maintain current width of 40 feet until runway pavement has reached the end of its useful life. When a pavement overlay is necessary, widen runway to 60 feet.
- Alternative 2 – Widen runway to 60 feet at same time as runway extension
- Alternative 3 – Widen runway to 60 feet at same time as runway shift and extension

RUNWAY PAVEMENT STRENGTH

The most important feature of airfield pavement is its ability to withstand repeated use by aircraft of a particular weight. At Grove Field, this includes a wide range of general aviation, primarily single-engine, aircraft. Runway 7-25 has an existing strength-rating of 4,000 pounds single wheel gear (SWG) load, which can support operations by the current critical aircraft. However, the majority of the aircraft that fit into the projected ARC of B-I (small) have a Maximum Take-Off Weight (MTOW) of between 5,000 and 12,500 pounds. The Aero Commander (currently based at the Airport, with an ARC of B-I (small)), has a MTOW of approximately 10,300 pounds. *If the Airport chooses to maintain its existing pavement strength, operations by aircraft that fall into the B-I (small) category will need to be limited in order to prolong the life of the pavement.* The FAA recommends a minimum pavement strength of 12,500 pounds. Alternatives for pavement strength include:

- Alternative 1 – Maintain existing pavement strength throughout the planning period.
- Alternatives 2 & 3 – Complete a pavement overlay to strengthen runway to 12,500 pound SWG. This strength will accommodate all small aircraft.

TAXIWAYS & TAXILANES

Taxiways are constructed primarily to facilitate aircraft movements to and from the runway system. Some taxiways are necessary simply to provide access between the aprons and the runways, whereas other taxiways become necessary as activity increases to provide safe and efficient use of the airfield.

Taxiway width is determined by the ADG of the most demanding aircraft to use the taxiway. As previously mentioned, the most demanding aircraft to use Grove Field fall within ADG I. According to FAA design standards, the minimum taxiway width for ADG I is 25 feet. Grove Field has one parallel taxiway (Taxiway G) at a width of 20 feet, and a midfield connector taxiway, also at a width of 20 feet.

The FAA recommends a runway centerline to taxiway centerline separation distance of 150 feet for ADG I (small). *The current runway centerline to parallel taxiway centerline separation does not meet this standard and actually decreases along the length of the runway.* Alternatives for improving taxiway width and separation are:

- Alternative 1 - When taxiway pavement reaches useful life and a pavement overlay is necessary, widen all taxiways to 25 feet.
- Alternative 2 – Shift parallel taxiway to the north to gain 150-foot runway centerline to taxiway centerline separation distance, widen taxiway to 25 feet at the time of the shift.

- Alternative 3 – Leave taxiway in current configuration, widen to 25 feet, shift runway to the south to achieve 150-foot runway centerline to taxiway centerline separation distance (see Runway Length Alternative 3).

Because Taxiway G is located on private property and is maintained by the Port through an easement, future improvements to this taxiway would not be eligible for AIP funds. In regard to taxilanes, many of the Airport's taxilanes range between 12 and 14 feet wide. Although the taxilanes to the hangar areas do not meet the 25-foot width that the FAA recommends, the aircraft using these taxilanes are small aircraft that have undercarriage widths of between 6 and 10 feet. *These taxilanes are adequate for their needs.* It is not practical for the Airport to widen these taxilanes because it would require relocation of several hangar buildings and it would not be a cost-effective project since the aircraft using the taxilanes are small and do not require additional pavement to maneuver.

NAVIGATIONAL AND APPROACH AIDS

As discussed in Chapter One, Grove Field does not currently have any instrument approach aids. However, pilots flying into or out of Grove Field can utilize signals from NAVAIDS at nearby airports. A Very High Frequency Omni-Directional Range with Distance Measuring Equipment (VOR/DME) is available at Portland International Airport, located about 9 miles southwest of Grove Field. Battle Ground Airport, located west northwest of Grove Field also has a VOR.

The advent of GPS technology can ultimately provide the airport with the capability of establishing new instrument approaches at minimal cost since there is not a requirement for the installation and maintenance of costly ground-based transmission equipment at the airport. The FAA is proceeding with a program to transition from existing ground-based navigational aids to a satellite-based navigation system utilizing GPS technology.

The FAA commissioned the Wide Area Augmentation System (WAAS) in July 2003. The WAAS refines the GPS guidance for enroute navigation and approaches. General aviation, corporate, air taxi, and regional airline operators are expected to benefit from this augmentation to GPS signals. The FAA is certifying new approaches at the current rate of about 300 per year, nationally.

GPS approaches fit into three categories, each based upon the desired visibility minimum of the approach. The three categories of GPS approaches are: precision, non-precision with vertical guidance, and non-precision. To be eligible for a GPS approach, the airport landing surface must meet specific standards as outlined in *FAA AC 150/5300-13*, Airport Design, Change 9. The FAA requires that airports having a non-precision GPS approach must have a minimum runway length of 3,200 feet and depending on the visibility minimums, may be required to have an approach lighting system. However the Design AC does state that airports having runways as short as 2,400 feet could support an instrument approach if the lowest Height Above Touchdown (HAT) is based on clearing a 200-foot obstacle within the final approach segment. Chapter Two: Forecasts, notes that the Washington Aviation System Plan forecasts assumed that all public-use airports in the State would have a minimum of one non-precision GPS approach and that Grove Field will have a GPS approach procedure in place by 2010.

The FAA Flight Procedures Office has determined that a straight-in approach to both runway ends would be feasible. Implementing a straight-in approach would require the Airport to have a 500-foot primary surface width, an increase from the existing 250-foot width. This increase in width would have many adverse impacts on the surrounding area. Houses and hangar buildings would become obstructions. It is recommended that the Airport maintain the existing 250-foot width and implement a circling GPS approach with visibility minimums greater than or equal to one mile.

AIRFIELD LIGHTING, SIGNAGE AND MARKING

Airports commonly include a variety of lighting and pavement markings to assist pilots utilizing the airport. These lighting systems and marking aids are used to assist pilots in locating the airport during the day, at night, during poor weather conditions, and assisting in the ground movement of aircraft.

Identification Lighting

Grove Field is equipped with a rotating beacon to assist pilots in locating the airport at night or in low visibility conditions. *The existing rotating beacon, located south of the runway, on the east side of the hangar area is sufficient and should be maintained in the future.*

Runway and Taxiway Lighting

Airport lighting systems provide critical guidance to pilots during nighttime and low visibility operations. *Runway 7-25 is currently equipped with a medium intensity runway lighting (MIRL) system on the pavement located between the displaced thresholds markings. This system should be maintained through the planning period.* Grove Field is equipped with pilot-controlled lighting (PCL). PCL allows pilots to activate the runway lights and the rotating beacon at the Airport using the radio transmitter in the aircraft. This system should continue to be maintained.

Effective ground movement of aircraft at night is enhanced by the availability of taxiway lighting. Currently, there are not taxiway lights on any of the taxiways at the Airport. Taxiways A and F are equipped with edge reflectors; *it is recommended that edge reflectors be added to all taxiways at the Airport.*

Visual Approach Lighting

In most instances, the landing phase of any flight must be conducted in visual conditions. To provide pilots with visual guidance information during landings to the runway, visual glideslope indicators are commonly provided at airports. The Airport currently has a precision approach path indicator (PAPI) on both runway ends. *This system will be adequate through the planning period.*

Runway identification lighting provides the pilot with a rapid and positive identification of the runway end. The most basic system involves runway end identifier lights (REILs). There are no

REILs available at the Airport at this time. *If a night time instrument approach is implemented at the Airport, it is recommended that REILs be installed on both runway ends.*

Airfield Signage

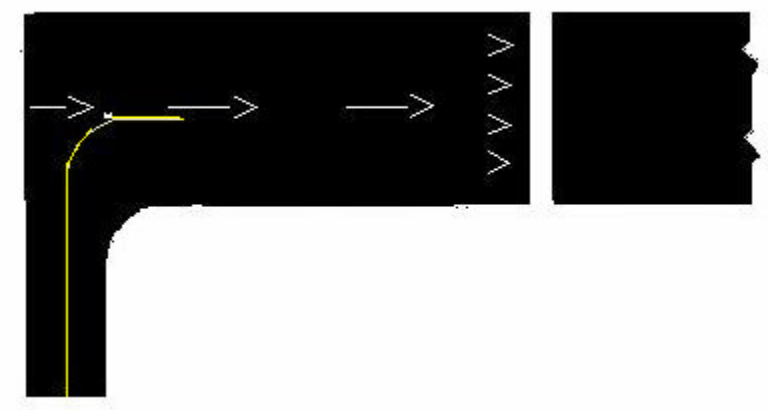
Airfield signage identifies runways, taxiways, and apron areas. These aid pilots in determining their position on the airport and provide directions to their desired location on the airport. Signage at Grove Field consists of runway direction signs, distance remaining signs, and noise abatement procedure signs. *If Alternative 2 or 3 is implemented, then it is recommended that hold signs be installed on all taxiways that adjoin the runway. (If Alternative 1 is implemented, the runway to taxiway separation distance will be too narrow to install hold signs by FAA standards).*

Pavement Markings

Runway markings are designed according to the type of instrument approach available on the runway. FAA Advisory Circular 150/5340-1H, *Standards for Airport Markings,* provides the guidance necessary to design airport markings. Runway 7-25 is currently marked for visual approaches to the Airport. Since the proposed approach to be implemented is a circling GPS non-precision approach, the visual markings are adequate.

Other runway pavement markings at Grove Field include the displaced threshold markings. Both runway ends have displaced thresholds; however the pavement markings indicating the displaced thresholds are non-standard markings. *If alternatives 1 or 2 is implemented, it is recommended that the pavement be remarked to indicate a standard displaced threshold.* The diagram below shows the appropriate markings.

Diagram 1 - Displaced Threshold Markings



Taxiway, taxilanes, and apron areas also require pavement marking. Yellow centerline stripes are currently painted on Taxiway G and all taxiways and taxilanes have white edge striping. There are no pavement markings on the fueling apron. *Besides routine maintenance of the taxiway striping, yellow centerline striping should be painted on the fueling apron as well as the taxilanes between the hangar buildings.*

All taxiways leading to the runway have hold markings painted on them; however, they are all non-standard as they do not meet the recommended location criteria. For a runway used exclusively by small aircraft with a visual, non-precision, or non-precision GPS approach, the FAA recommends that the hold lines be placed 125 feet perpendicularly from runway centerline to intersecting taxiway centerline. The current hold markings at the airport are less than this distance and range between 44 and 85 feet. *It is important to note that standard hold lines are not attainable with the runway and taxiway in its current configuration. In order to implement standard hold lines, the runway and/or taxiway would need to shift as previously discussed in Alternatives 2 and 3.*

WEATHER REPORTING

Grove Field is equipped with a lighted wind cone and a segmented circle, which provides pilots with information about wind conditions and local traffic patterns. These facilities are required when an airport is not served by a 24-hour Airport Traffic Control Tower (ATCT) and should be maintained through the planning period.

The FAA requires that establishment of an instrument approach procedure requires the ability to obtain the local altimeter setting. *If a GPS approach is developed for Grove Field, an approved altimeter source, such as an Automated Weather Observation System (AWOS) or a SuperUnicom, will be needed.* The FAA recommends that for airports with only visual and/or non-precision runways, an AWOS sensor be placed adjacent to the primary runway 1,000 to 3,000 feet down runway from the threshold. The sensor should be located at least 500 feet from the runway centerline, but no more than 1,000 feet from the runway centerline and should have a 500-foot critical area radius surrounding it. It is desired that all obstructions (i.e., vegetation, buildings) be at least 15 feet lower than the height of the sensor within the 500-foot radius and no greater than 10 feet above the sensor from 500 feet to 1,000 feet. Alternative 1 shows a potential AWOS location. A SuperUnicom will also provide the required altimeter data and does not have the height restrictions that an AWOS requires. A SuperUnicom is typically collocated with the airport's windcone.

LANDSIDE REQUIREMENTS

Landside facilities include hangars, aircraft apron/tie-downs, automobile parking, and support facilities. These facilities provide the essential interface between the air and ground transportation modes. The capacities of the various components of each area were examined in relation to projected demand to identify future landside facility needs. Table 3C provides a summary of aircraft storage needs through 2025. The subsequent text describes the methodologies used to determine aircraft storage needs and discusses other landside facility needs.

TABLE 3C: Landside Facility Needs

	Current	2010	2015	2025
Based Aircraft	83	94	104	128
T-Hangar Units	65	88	97	119
T-Hangar Space (SF)	73,504	105,600	116,400	142,800
Conventional Hangar Buildings	1	4	5	6
Conventional Hangar Space (SF)	2,000	6,400	8,000	9,600
Tie-Downs	14			
Based A/C Positions		2	2	3
Based A/C Space (SY)		600	600	900
Transient A/C Positions		5	5	6
Transient A/C Space (SY)		1,800	1,800	2,160
Total Tie-Downs Needed		7	7	9

Source: Current – Airport Management Records, Projected - W&H Pacific, 2005
Note: Space requirement projections do not include taxilanes located between hangar buildings or tie-down positions.

HANGARS

Utilization of hangar space varies as a function of local climate, security, and owner preferences. The trend in general aviation aircraft, whether single or multi-engine, is toward higher performance aircraft. Therefore, many aircraft owners prefer enclosed hangar space to outside tie-downs.

The demand for aircraft storage hangars is dependent upon the number and type of aircraft expected to be based at the airport in the future. For planning purposes, it is necessary to estimate hangar requirements based upon forecast operational activity. However, hangar development should be based upon actual demand trends and financial investment conditions. While a majority of aircraft owners prefer enclosed aircraft storage, a number of based aircraft will still tie-down outside due to the lack of hangar availability, hangar rental rates, and/or operational needs. Therefore, enclosed hangar facilities are not planned for each based aircraft. *At Grove Field, approximately 98 percent of the based aircraft are currently stored in enclosed hangar facilities, while the remaining two percent are stored in tie-downs. In the future, it is estimated that the percentage of based aircraft stored in hangars versus tie-downs will remain about the same.*

Hangar facilities at an airport typically consist of some combination of T-hangars and conventional/private hangars. T-hangars typically store one aircraft in one unit, while conventional hangars can store more than one aircraft in one large enclosed structure. At Grove Field, all hangars at the Airport are T-hangars with the exception of one 40'x50' FBO hangar. *It*

is assumed that in the future, demand for hangar storage will include both conventional hangars and T-hangars. It is estimated that as the fleet mix grows to include larger single-engine aircraft and additional multi-engine aircraft, the desire for conventional hangars will increase. Based on that assumption, a 95/5 split is used to project additional T-hangar versus conventional hangar needs. In other words, *95% of all based aircraft, not stored in tie-downs, are estimated to be stored in T-hangars, while the remaining 5% are expected to be stored in conventional hangars.* Using these assumptions, the following subsections will discuss the space needs for both types of hangars. Note that the space needs listed do not include the space required for hangar taxilanes.

T-Hangars

Based on the assumptions mentioned above, an additional 54 T-hangar units will be needed by 2025. The existing T-hangars at the Airport range in size from approximately 930 square feet per aircraft to 1,380 square feet per aircraft. A typical planning standard of 1,200 square feet per based aircraft has been used to determine future T-hangar requirements. *Using this ratio, an increase of approximately 100,000 square feet of T-hangar space will be needed by 2025 to accommodate 54 additional aircraft (see Table 3C).*

Conventional/Private Hangars

As previously mentioned existing conventional hangar space includes one 40'x50' hangar building which is currently vacant and is being reserved for a future aircraft maintenance facility. Using the 95/5 ratio discussed prior, a total of six conventional-type hangars will be needed by 2025. Planning standards indicate a typical dimension of 1,400 to 1,600 square feet per aircraft for larger single-engine aircraft and multi-engine aircraft. To be conservative and for space planning purposes, 1,600 square feet was used to calculate long-term space needs. As shown in Table 3C, *approximately 9,600 square feet of space should be reserved for this type of hangar.*

In regard to aircraft hangar buildings, Alternative 1 will identify general areas that can be reserved for future hangar development, while Alternatives 2 and 3 will show potential building layouts based on the runway/taxiway configuration they are associated with.

Through-the-Fence Operations

As discussed in Chapter 1, there are several through-the-fence operations located on the north side of the field. These users are not paying a fee to the Port for providing direct access to the runway. This practice is discouraged by the FAA and State and both agencies expect that airport treat all users fairly with regard to fees. An easement is currently in place between the Port and these land owners. The existing parallel taxiway is located on their property, via easement, in exchange for direct runway access.

AIRCRAFT PARKING APRON

A parking apron should provide for the number of locally-based aircraft that are not stored in hangars as well as for itinerant aircraft that use the Airport. There are currently a total of 14 tie-downs available at the Airport (six of which were constructed in December of 2004). At this

time, there are not designated tie-down areas for based aircraft and transient aircraft. The following subsections will discuss the requirements for both types of tie-downs. Similar to space requirements for hangar buildings, the space requirements listed in the next two sections do not include the space needed for taxilanes between tie-down positions.

Based Aircraft Tie-Downs

Currently, there is one tie-down at the Airport that is being used by a based aircraft. This represents approximately 2% of the total based aircraft at the Airport (the other 98% are stored in hangars). It is assumed that this ratio will remain the same throughout the planning period, resulting in a need for three based aircraft tie-down positions by 2025. To determine the amount of space needed for based aircraft tie-downs, the FAA Airport Design Advisory Circular was consulted. The FAA recommends using a ratio of 300 square yards per aircraft. *Based on this assumption, 900 square yards of space should be reserved for three based aircraft tie-downs.*

Transient Aircraft Tie-Downs

In regard to transient aircraft tie-downs, the FAA has developed an approach for determining the number of tie-downs needed for itinerant aircraft operating at an airport. The following steps were taken from FAA Advisory Circular (AC 150/5300-13, Appendix 5, Change 8):

- Number of annual itinerant operations (from Chapter Two), multiplied by 50 percent (50 percent of annual itinerant operations are departures, divided by 12 (12 months per year), divided by 30 (30 days per month), and then reduced by 50 percent to account for aircraft that do not remain at the Airport. Written as: {[(8,772 x 0.5) ÷ 12] ÷30} x .5 = 6

Using this methodology, the Airport will need to have transient tie-down space for six aircraft by 2025. The FAA allocates 360 square yards of space per transient aircraft tie-down. *Based on this allocation, 2,160 square yards is needed to accommodate six transient aircraft tie-down spaces by 2025.*

Conclusion

There are currently a total of 14 tie-downs at the Airport. Using the recommendations above, a total of nine tie-downs are recommended by 2025 (three for based aircraft, six for transient aircraft). *Therefore, no additional tie-down spaces are needed in the long-term; however, consideration should be given to reallocating existing tie-down spaces to accommodate both transient and based aircraft (see Table 3C).*

VEHICLE PARKING

The existing auto parking lot at Grove Field is approximately 3,800 square yards and can accommodate about 85 vehicles. It is typical at general aviation airports, such as Grove Field, for pilots to park their vehicles in their hangars while flying. Because of this, the need for additional designated automobile parking space is somewhat reduced. *It is assumed that the*

existing parking lot size will be adequate throughout the planning period. Future improvements to the lot could include paving and marking.

SUPPORT FACILITIES

Various facilities that do not logically fall within classifications of airfield, landside, or general aviation areas have also been identified. These other areas provide certain functions related to the overall operation of the airport, and include: pilot lounge area, aircraft rescue and fire fighting, fuel storage, and airport maintenance facilities.

PILOT LOUNGE

The pilot lounge at Grove Field has been recently closed due to the poor condition of the building. The Port is planning to remove this building and install a portable building. *There is a separate building for restrooms and showers which has been well maintained and should continue to be maintained through the planning period.*

AIRCRAFT RESCUE AND FIRE FIGHTING

Aircraft rescue and fire fighting (ARFF) is available through the local fire department. *This service will be adequate through the planning period.*

AIRPORT MAINTENANCE/STORAGE FACILITIES

The Port of Camas/Washougal provides airport maintenance such as snow removal, mowing, and weed control to Grove Field. *It is recommended that the Port continue to provide these services.*

AVIATION FUEL STORAGE

Grove Field has one 12,000 gallon above ground 100LL fuel storage tank with a 24-hour self service, credit card fueling system. *This system should be maintained through the planning period.*

SECURITY/FENCING

Grove Field is secured on the south, east, and west sides of the Airport with chain link fencing. There is no fencing on the north side of the field as many private hangar-owners are located in this area. Access to the on-airfield hangar area is controlled by a card operated rolling gate. *Though fencing is not required at Grove Field, it is recommended that fencing be installed on the North side of the field to restrict access by any unauthorized persons.*

UTILITIES

The existing utilities at the Airport include, water, sewer, power and phone services. *These utilities are adequate for the Airport's needs through the planning period.*

LAND USE & ZONING RECOMMENDATIONS

There are several items Clark County should complete with regard to land use in the County's comprehensive plan goals, policies and development regulations to protect and enhance Grove Field Airport. Recommendations are provided below. The recommended actions should be included in the Capital Facilities Plan (CIP).

- The final Airport Layout Plan should be adopted by reference into the Comprehensive Plan for Clark County.
- Identify Grove Field Airport as an Essential Public Facility in the Comprehensive Plan Public Facilities or Transportation element.
- Add a summary of planned improvements identified in the Airport Layout Plan to the transportation inventory.
- The specific uses defined in the Airport Commercial Zone are generally compatible with airports; however, it is recommended that the County and the Airport review the land uses at the Airport to ensure that Airport property is being used solely for aviation-related purposes as described in Clark County's zoning ordinance.
- Adopt a title notice or similar requirement to inform purchasers of property within 1 mile of the airport that their property is located adjacent to or in close proximity to Grove Field and that their property may be impacted by a variety of aviation activates. Note that such activities may include by are not limited to noise, vibration, chemical odors, hours of operation, low overhead flights, and other associated activities

SUMMARY

The intent of this chapter has been to outline the facilities required to meet potential aviation demands projected for Grove Field through the long term planning horizon. The next step is to develop alternatives to best meet these projected needs. Three alternatives have been created and each is depicted in the subsequent pages.

Based on the facility requirements previously identified, three development alternatives were created. The alternatives are shown in **Exhibit 3A** (Alternative 1), **Exhibit 3B** (Alternative 2), and **Exhibit 3C** (Alternative 3). The recommended improvements for each alternative are listed below. In addition to these alternatives there is a no build option in which the Airport would not make any significant changes to the existing facilities at the Airport. Though this option is desirable is the sense that cost is not a factor, a no-build alternative is likely to lead to reduced quality of services provided by the Airport (i.e., additional hangar buildings, tie-downs, and other airport patron services would not be constructed and existing facilities would not be improved). A no-build alternative may also affect the Airport's ability to obtain funding to maintain the viability of the facility. Implementing a no-build alternative would leave the Airport with several non-standard configurations. Funding for significant improvements may not be available until these non-standard issues are corrected. It is important to mention that the final decision with regard to pursuing a particular development plan rests with the Airport sponsor.

ALTERNATIVE 1

- Install edge lighting on portion of runway that is displaced
- Ultimately widen runway pavement to 60'
- Ultimately widen taxiway pavement to 25'
- Install edge reflectors on all taxiways
- Re-mark runway pavement to show standard displaced threshold markings
- Reserve general areas for hangar development
- Install fencing on north side of airfield

ALTERNATIVE 2

- Remove trees on south side of runway
- Grade area around runway to achieve standard RSA and OFA widths
- Extend runway 450' to the west
- Widen runway to 60'
- Complete pavement overlay to strengthen runway to 12,500 pounds SWG
- Shift parallel taxiway to north to achieve runway to taxiway separation standards
- Widen taxiway to 25'
- Install edge reflectors on all taxiways
- Install hold signs on all taxiways adjoining runway
- Re-mark runway pavement to show standard displaced threshold markings
- Re-stripe apron area and taxilanes to show yellow centerline
- Construct additional T-hangars and conventional/private hangars
- Install fencing on north side of airfield
- Acquire land or obtain easement over land within future Runway 7 RPZ
- Relocate Delp Road outside of RSA and runway OFA
  (Note: A waiver would need to be requested from the FAA in order to construct a road through the RPZ)
- Purchase mobile home park
- Implement circling, non-precision GPS approach to both runway ends

ALTERNATIVE 3

- Remove trees on south side of runway
- Grade area around runway to achieve standard RSA and OFA widths
- Shift runway 75' south to achieve runway to taxiway separation standards
- Extend runway 450' west
- Widen runway to 60'
- Complete pavement overlay to strengthen runway to 12,500 pounds SWG
- Widen taxiway to 25'
- Install edge reflectors on all taxiways
- Install hold signs on all taxiways adjoining runway
- Re-mark runway pavement to show standard displaced threshold markings
- Re-stripe apron area and taxilanes to show yellow centerline
- Construct additional T-hangars and conventional/private hangars
- Relocate tie-downs that are penetrations of the runway OFA

- Install fencing on north side of airfield
- Acquire land or obtain easement over land within future Runway 7 RPZ
- Relocate Delp Road
- Purchase mobile home park
- Implement circling, non-precision GPS approach to both runway ends

The Port Commission received numerous comments from local residents and user groups regarding the future development of Grove Field. The Commission believed it was best to hear from the public prior to making a decision regarding the preferred alternative. Several small workshops and two public meetings took place between late May 2005 and early November 2005. Throughout this time, several additional alternatives were created. After reviewing all alternatives and incorporating public input, the Port Commission selected an alternative that most closely represents Alternative 3 to improve facilities at Grove Field. The variations include a 740-foot runway extension (versus 450 feet) to the Runway 7 end and a 390-foot relocated threshold (versus a displaced threshold) on the Runway 25 end for a total runway length of 2,970 feet; increased from 2,620 feet. Another variation included locating Delp Road outside of the RSA and OFA (versus outside of the RPZ).

The selected alternative provides the following improvements: a runway extension that will accommodate nearly 95% of small aircraft with less than 10 passenger seats, a south side parallel taxiway, hangar development areas, and the installation of a SuperUnicom along with a circling, non-precision GPS approach (visibility minimums greater than or equal to one mile) to both runway ends. This alternative also meets all FAA design standards for runway to parallel taxiway separation, runway safety and object free areas, runway and taxiway widths, and maintains a clear approach. The preferred alternative is depicted in **Exhibit 3D** and will be used as the basis for completing the ALP set.