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Grove Field
Camas, Washington

AIRPORT LAYOUT PLAN REPORT

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Chapter One
INVENTORY

The initial step in the preparation of the Airport Layout Plan Report for Grove Field is the collection of information pertaining to the Airport and the area it serves. The information collected in this chapter will be used in subsequent analyses in this study. The inventory portion of this chapter will summarize the Airport location, history and existing facilities. By establishing a thorough and accurate inventory, an appropriate forecast and recommendations for airfield and landside facilities can be developed.

The information was obtained from several sources, including on-site inspections, airport records, reviews of other planning studies, the Federal Aviation Administration (FAA), various government agencies, a number of on-line (Internet sites) which summarize statistical information and facts about the Airport, and interviews with airport staff, planning associations, and airport tenants. As with any airport planning study, an attempt has been made to utilize existing data, or information provided in existing planning documents, to the maximum extent possible.

AIRPORT LOCATION AND ACCESS

Grove Field is located in Clark County, Washington approximately three miles north of downtown Camas along State Highway 500. Clark County is in south western Washington, bordered by the Columbia River and the State of Oregon on the south and the Cascade foothills on the north and east. The City of Camas is situated in eastern Clark County and is served by State Highways 14 and 500. Public transportation in the City of Camas is provided by C-Tran

bus service. There are also Greyhound Bus and Amtrak stations in the City of Vancouver (14 miles west of Camas).

AREA TOPOGRAPHY

The Airport has an elevation of 429 feet (NAVD 88). The surrounding terrain is hilly to mountainous. Three large mountain peaks are located near the Camas area: Mt. St. Helen's to the north, Mt. Adams to the northeast, and Mt. Hood to the southeast. The area to the west of Camas consists of less rugged, gentler peaks that gradually decrease in elevation as they approach the coast of the Pacific Ocean.

CLIMATE

Camas has a mild climate. The average high temperatures during the winter months (December through March) generally range from 44 to 55 degrees Fahrenheit with the coolest temperatures typically occurring in December and January. Average high temperatures during the summer months (June through September) generally range from 72 to 80 degrees Fahrenheit with the warmest days occurring in the month of July. Annual rainfall averages about 50 inches, while annual snowfall averages about 8.9 inches.

COMMUNITY AND AIRPORT HISTORY

Approximately 6,000 years ago, Native Americans inhabited the land now known as Camas. The name Camas is derived from the Indian word "Camass" meaning "sweet fruit" and was named so because of the bulb of the pale blue camas lily which was often eaten by the Pacific Northwest Indians as a delicacy. Lewis and Clark were the first Americans to discover the Camas area in 1805. The City of Camas history began in 1846 when a sawmill was constructed on La Camas Creek. In 1883 business men from Portland came to the area to lay out a town site and began to build the first paper mill in the Washington Territory. This mill has since grown into one of the world's largest manufacturers of specialty papers and is now a division of the nationwide Georgia Pacific Corporation.

Grove Field was originally constructed in 1945 on 15 acres of land purchased by Ward Grove. At the time, the runway was 1,650 feet long. In 1946, Ward Grove purchased an additional 10 acres of land and extended the runway to its current length. An FBO hangar was also constructed at this time and is still used as an FBO today. In 1962, the Port of Camas/Washougal acquired the Airport and has owned and operated the Airport since that time. Over the years, several hangars have been constructed, taxiways and taxilanes were built and paved, the runway was paved, and a series of other Airport improvements have been made.

AIRCRAFT ACTIVITY DATA

There are two types of aircraft activity data: based aircraft and annual operations. Based aircraft are the number of aircraft that are stored at an airport (either in hangars or in tiedowns). Annual operations are a reflection of the yearly number of aircraft that perform a takeoff or a landing at

the Airport. There are currently 73 based aircraft at Grove Field. There are 72 single-engine aircraft and 1 multi-engine aircraft. Based on the FAA's Airport Master Records (form 5010) for Grove Field, current annual aircraft operations at the Airport are estimated to be 7,000. Of the 7,000 total annual operations, 5,000 are general aviation local operations and the remaining 2,000 are general aviation itinerant operations. Projected based aircraft and annual operations data will be presented in Chapter Two, *Forecasts.*

No significant airport service area studies have been conducted, but through discussions with the Airport, it is estimated that the primary service area for Grove Field includes the Cities of Camas, Washougal, and other communities in Eastern Clark County.

CRITICAL AIRCRAFT

An airport is designed based on the characteristics of the most demanding aircraft, in terms of approach speed and wingspan, which currently use an airport or that is projected to use an airport at some point in the future. The critical aircraft for an airport must have 500 or more annual itinerant operations at that airport. The critical aircraft at Grove Field is a Cessna 172. This aircraft has a wingspan of 36.1 feet and a maximum takeoff weight of 2,450 pounds.

EXISTING FACILITIES

The airport reference code (ARC) is a criterion that defines the critical airport dimensions based on an airport's critical aircraft. The ARC is defined specifically by the approach category and the design group of the critical aircraft. The approach category is determined by 1.3 times the stall speed of the aircraft in its landing configuration at its maximum landing weight. The approach category is represented by the letters A, B, C, D and E. The design group of the aircraft is based on the length of the wingspan and is defined by roman numerals I, II, III, IV, V and VI. **Exhibit 1A** summarizes representative aircraft by ARC.

Grove Field Airport has an existing ARC of A-I (small). Approach category A includes those aircraft that have an approach speed less than 91 knots. Design group I includes those aircraft that have a wingspan of up to but not including 49 feet. The Cessna 172, identified as the critical aircraft, falls into this ARC. The existing facilities at Grove Field are discussed in the following paragraphs and are identified on **Exhibit 1B**.

Table 1A presents the existing Airport design standards and the design standards that the Airport should have in order to meet the ARC of A-I (small).

Table 1A - Airport Design Standards

Design Feature	Existing (feet)	Standard A-I (small) (feet)
Runway Safety Area (RSA)		
-Width	80	120
-Runway 7 Length beyond runway end	0	240
-Runway 25 Length beyond runway end	110	240
Runway Object Free Area (OFA)		
-Width	120	250
-Runway 7 Length beyond runway end	500	240
-Runway 25 Length beyond runway end	110	240
Runway Protection Zones	250 x 1,000 x 450	250 x 1,000 x 450

Sources: Existing – W& H Pacific, Inc.
Standard – FAA AC 150/5300-13, Change 9
Note: The Airport does not own the existing RPZ.

As can be noted in Table 1A, a few of the existing critical area dimensions do not meet A-I (small) ARC standards. These variances will be discussed later in the report.

AIRFIELD FACILITIES

All existing pavement sections and pavement conditions were obtained from Pavement Consultants Inc.'s 1999 pavement survey (see **Exhibits 1C** and **1D**). The pavement condition index (PCI) survey is an inventory of the existing pavement sections and pavement conditions at all state-funded airports. The survey is compiled by a consultant hired by the State of Washington. The consultant uses a form of pavement testing to get a rating for each pavement surface. The rating, based on a numbered scale of 0-100, with 0 being the lowest and 100 being the highest, corresponds to a pavement condition ranging from poor to excellent. The State has hired another consultant to update this data in 2004/2005. Pavement conditions discussed below are reported based on visual observations by W&H Pacific through an Airport field visit conducted on September 24, 2004.

Runway

Grove Field has one paved runway (Runway 7-25) at a length of 2,620 feet and a width of 40 feet. The runway has displaced thresholds on both ends; 404 feet on the Runway 7 end and 416 feet on the Runway 25 end. The thresholds are displaced because of trees in the approach surface of both runway ends. It is important to note that, according to the WSDOT Aviation Division's Pilot's Guide, there is only 1,804 feet of runway length available for night operations due to the fact that the displaced thresholds are not lit.

The pavement section for Runway 7-25 consists of 15 inches of aggregate sub base, four inches of crushed aggregate base and two inches of asphalt. The runway was fog sealed in 1992 and 1999. The runway pavement is in good condition. According to the US Department of Transportation's Airport Facility Directory, the runway pavement at Grove Field is rated for

single wheel gear 4,000-pound aircraft. This pavement strength is adequate in supporting the operations of the critical aircraft.

Runway orientation is determined by the direction of the prevailing winds. The FAA recommends that a runway have 95% wind coverage based on specified crosswind components. Grove Field does not currently have a wind rose; therefore current wind coverages cannot be identified. As part of the facility requirements chapter, effort will be made to obtain wind data for the Airport.

All existing data (i.e., runway end elevation data, latitudes and longitudes) have been surveyed. Elevations are accurate to between 0.041 and 0.045 meters, latitudes are accurate to between 0.006 and 0.008 meters, longitudes are accurate to between 0.014 and 0.016 meters.

Taxiways and Taxilanes

Runway 7-25 has a parallel taxiway (Taxiway G) on its north side. Taxiway G is 2,660 feet long and 20 feet wide and is in good condition. The pavement section for Taxiway G consists of an unknown thickness of aggregate base course and two inches of asphalt. Taxiway G was fog sealed in 1999. This taxiway is located on private property, but is maintained by the Port through easement. Taxiway F is the midfield connector taxiway. It is 410 feet long by 20 feet wide and is in fair condition. The Taxiway F pavement section consists of four inches of crushed aggregate base course and two inches of asphalt. Taxiway F was fog sealed in 1992 and 1999. Taxilanes B, C, D, and E are all located on the south side of the runway. The taxilanes provide access to the aircraft hangar area. The dimensions and pavement sections of each taxilane vary (see **Exhibits 1A** and **1B**). Taxilane pavement conditions are poor.

Aprons and Aircraft Parking

Grove Field has three aircraft apron areas. One is a paved 115-foot by 140- foot area dedicated to aircraft fueling. This apron is located east of the hangar area. The apron pavement is in fair condition. The other is a grass 300-foot by 350-foot area used for aircraft parking, located south of the runway near the Airport wind cone. There are eight tie-down positions located on this apron. A third grass apron area was constructed in December of 2004. It is located on the east side of the fueling facility. It is estimated that there will be an additional six to ten tie-down positions on the new apron. The Port of Camas/Washougal charges an In-District tie-down rate of $29.75 per month and an Out-of-District rate of $34.75 per month. In-District refers to people that live or own property in the Port district and therefore pay taxes to the Port.

LANDSIDE FACILITIES

Hangars and Airport Buildings

There are a total of eight Port-built and owned T-hangar buildings on the Airport, all located south of the runway. There are a total of 79 hangar bays within the eight buildings. All hangars are leased by the Port on a month-to-month basis. Hangar lease rates vary in price based on location and In-District versus Out-of-District rates but generally range from $134-$255 per

month. There is also a restroom/shower building located at the Airport. The pilot's lounge has been closed due to its poor condition, however, the Port plans to remove the pilot's lounge and install a portable building in the near future. In addition to on-airport aviation-related buildings, there are six privately owned hangars located on residential property on the north side of the Airport. These hangars are considered through-the-fence operations. This practice is highly discouraged by the FAA and WSDOT Aviation Division.

Fixed Based Operators (FBOs)

A fixed based operator is an individual or a business that offers aviation-related services to Airport users, such as flight instruction, aircraft rental, aircraft maintenance, full-service aircraft fueling, etc. The Port has negotiated a lease with an individual interested in providing aircraft maintenance services at the FBO building.

Internal Circulation, Access and Vehicle Parking

The majority of the Airport is fenced. The south side of the Airport has seven-foot chain link fence, the east and west end has a four-foot fence and the north end of the field is open. Access to the field is controlled by a card operated security gate at the airport entrance. Vehicular access to the Airport is via State Highway 500. Automobile parking is located on the east end of the Airport off of 267th Street outside of the fenced in area. The lot is approximately 3,800 square yards and has space for about 85 vehicles.

AIRFIELD SUPPORT FACILITIES

Aircraft Rescue and Firefighting

There are no Aircraft Rescue and Firefighting (ARFF) facilities available at the Airport. Local Police & Fire Departments provide emergency services to the Airport. In order to aid in these efforts, a 120,000 gallon water storage tank has been installed. It is worth noting that the Clark County Fire District has purchased a portion of land adjacent to the Airport for construction of a new fire station. This is further discussed in the facility requirements chapter.

Fueling Facilities

The Port owns and operates the Airport's fueling system. There is one above-ground 12,000 gallon tank for 100LL aircraft fuel. The fueling tank is located to the east of the hangar area. The Airport has a 24-hour self-service credit card fueling system available to pilots.

Airport Maintenance

Airport maintenance is provided by the Port of Camas/Washougal.

Utilities

Water at the Airport is provided by the City of Camas. Telephone and power services are provided by the local utility companies. Sewer service is limited to the Airport's on-site septic system.

Common Traffic Advisory Frequency (CTAF)

The Federal Communications Commission (FCC) issued Grove Field a Common Traffic Advisory Frequency (CTAF) of 122.9 MHz. This frequency is used by pilots to communicate their intentions, via radio, to other pilots who may be in the vicinity of the Airport.

AIRPORT NAVIGATIONAL AIDS

Airport Navigational Aids, or NAVAIDS, provide electronic navigational assistance to aircraft for approaches to an airport. NAVAIDS are either visual approach aids or instrument approach aids; the former providing a visual navigational tool, and the latter being an instrument-based navigational tool. The types of approaches available at an airport are based on the NAVAIDS which are provided.

Instrument Approach Aids

There is no airport traffic control tower (ATCT) or any instrument approach aids at Grove Field.

Visual Approach Aids

All approaches to the Airport are made on a visual basis. Grove Field is equipped with a rotating beacon, a lighted wind sock, and a segmented circle. The Airport also has a 2-light Precision Approach Path Indicator (PAPI) on the left side of both runway ends. PAPIs contain multiple light units that are angled to provide the pilot with information as to whether they are approaching too low or too high.

Airport Lighting and Signing

The pavement between the thresholds (1,804') of Runway 7-25 is equipped with medium intensity runway lights (MIRL). The MIRL are pilot activated by using the CTAF frequency of 122.9 MHz. There is no lighting on the Airport taxiways; however Taxiways A and F are equipped with reflectors. The Airport has runway directional signs, distance remaining signs and noise abatement procedure signs.

LAND USE PLANNING AND ZONING

There are several land use requirements that need to be considered in planning for the future of an airport. These include Federal, State, County, and City regulations. A review of the regulations pertaining to Grove Field is included in the following sections.

Federal regulations cover airspace protection through the establishment of the CFR 14 Part 77 requirements and establish a threshold of noise concern for 65 dBA DNL as an area of potential effect. Federal Aviation Regulations (FAR) Part 77, *Objects Affecting Navigable Airspace*, Establishes obstruction standards used for identifying potential adverse effects to air navigation and establishes notice standards for proposed construction. Imaginary surfaces were created and our used as the basis for protecting the airspace around the airport. It is ideal to keep these areas clear of any obstructions. FAR Part 77 consists of five surfaces, each with specific controlling measures. The surfaces include: a primary surface, an approach surface, a transitional surface, a horizontal surface and a conical surface. There are existing obstructions to the runway approach surfaces at Grove Field. The controlling obstruction for Runway 7 is a group of trees located 1,125 feet from the runway end at a height of 111 feet above the runway end. The controlling obstruction for Runway 25 is a tree located 61 feet above the runway end, 405 feet from the runway end, and 5 feet to the left of the extended runway centerline. Any additional existing obstructions to this surface and obstructions to other Part 77 surfaces will be discussed in subsequent chapters.

Under FAA guidelines, the airport sponsor must provide assurances that appropriate actions have been (or will be) taken to the extent reasonable, 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.

Washington State regulations are based on the Growth Management Act (GMA), Chapter 36.70A of the Revised Code of Washington (RCW), which requires most counties and cities to establish goals, evaluate community assets, and write comprehensive plans to discourage the siting of incompatible uses near airports that are operated for the benefit of the general public. Depending on airport characteristics, location and amount of usable open space adjacent to a general aviation airport, incompatible land uses may include public assembly/large concentrations of people, residential density, intensity of nonresidential development, structure height issues, hazardous or explosive material, wildlife hazards/wetlands, light/glare, air quality and electronic signals. The requirements to plan under GMA are based on the city or county's population or rate of population growth. Areas that do not meet specified growth rates may choose whether or not to plan under GMA requirements. Clark County is required to plan under the GMA.

From an airport protection standpoint, the principles established under the GMA are valuable for every public use airport, regardless of jurisdictional planning status. These four basic principles related to public use airports are as follows:

- Local comprehensive plans and development regulations must discourage development of incompatible land uses adjacent to public-use airports
- Formal consultation with airport owners, ports, pilots and WSDOT Aviation prior to adoption
- WSDOT Aviation to provide technical assistance program to develop such protection
- Airport to be identified as an Essential Public Facility (EPF) in the Comprehensive Plan.

Grove Field is owned and operated by the Port of Camas/Washougal. The airport is within Clark County, outside of the Camas city limits, and is therefore subject to Clark County planning, land use controls, development regulations and zoning. Existing zoning and land uses are discussed below.

Existing Land Use

Existing land uses within a mile of Grove Field rural residential s and agricultural areas. Many of the homes on the north side of the property line are through-the-fence operations. To the east of the property line, across the highway is the mobile home park. The south and west sides of the property are bordered by homes and agricultural areas.

Existing Zoning

Grove Field is controlled by Clark County's zoning ordinance. The Airport resides in the County's "Airport" district. All lots within this district must have a minimum 100-foot depth. The County's ordinance does not specify a minimum requirement for lot area or lot width. The County describes this district as an area "…intended to recognize and protect those areas devoted to public use aviation, and which are designated on the comprehensive plan. It is also intended to provide areas for those activities supporting or dependent upon aircraft or air transportation, when such activities benefit from a location within or immediately adjacent to primary flight operations and passenger or cargo service facilities." Some of the County's permitted uses include aerial mapping and surveying, aviation-related storage facilities, such as hangars, agricultural activities, and hazardous waste treatment and storage facilities. A detailed listing of allowed uses and discussion of the County's Airport Zone is provided in Appendix B. The current zoning for the Airport and the areas surrounding the Airport is depicted in **Exhibit 1E**.

The Clark County zoning ordinance includes an Airport Environs Overlay District, which is based on Part 77 regulations to further mitigate the adverse impacts of new development on airport operations. This zoning district is in place to assist in protecting the Airport from airspace obstructions, hazards and other incompatible land uses.

Clark County Comprehensive Plan

Clark County adopted its Comprehensive Plan in 2004, with revisions in 2005. The Plan includes a Framework Plan and 12 chapters that provide long range plans for eleven elements including Land Use, Annexation, Transportation, Parks and Recreation, and Economic Development. A review of the Comprehensive Plan Chapters shows the following discussions, goals and policies applicable either to airports and aviation in general, or specific to Grove Field.

- The County Framework Plan makes no reference to aviation or airports, either in land use or transportation.
- The Comprehensive Plan, Land Use Element (Chapter 1) defines the "Airport" zone as a designation applied to airports that allow public use. It is implemented with an airport base zone.

- The Transportation Element (Chapter 5) references Grove Field in a discussion of facilities owned and operated by the Port of Camas-Washougal, but provides no specifics. In the discussion regarding Aviation, there is no direct reference to Grove Field, although there is general discussion of the importance of aviation facilities in the county and the need to preserve existing operations.
- The Capital Facilities and Utilities Element (Chapter 6) does not specifically reference Grove Field. Policies are provided regarding airports as public facilities.
- The Economic Development Element (Chapter 9) does not contain any language supporting Grove Field or airports in general

Goals/policies provided in the Transportation Chapter that affect Grove Field include:

GOAL: Develop a multi-modal transportation system.

Policy: Regional airport planning shall include all affected jurisdictions to provide compatibility with surrounding land uses and to support adequate ground transportation to move people and goods to and from airports.

Implementation Strategies: Participate in any new airport site selection process led by the Ports, Washington State Department of Transportation Aviation Division or other governmental entity.

Goals/policies provided in the Capital Facilities and Utilities Element that relates to Airports in general include:

- The Comprehensive Plan of the county and each municipality shall include a process for identifying and siting essential public facilities such as airports, state education facilities and state or regional transportation facilities, state and local correctional facilities, solid waste handling facilities, and regional parks.
- Develop a process for identifying and siting essential regional public facilities such as state or regional transportation facilities, state education facilities, airports, corrections facilities, solid waste handling facilities and regional parks.

LIST OF SOURCES USED TO CREATE CHAPTER ONE: INVENTORY

Washington State Airport System Plan Inventory, 2002-2003
FAA Airport Master Record (Form 5010), Affective Date September 30, 2004
Pavement Consultants Incorporated Survey, August 1999
W&H Pacific Visual Field Observations, Richard Wilson, September 24, 2004
Camas-Washougal Chamber of Commerce Business Directory and Resource Guide, 2003-2004
Clark County Comprehensive Plan, 2005

Chapter Two
FORECAST

INTRODUCTION

Aviation demand forecasts help to determine the size and timing of needed airport improvements. This chapter indicates the types and levels of aviation activity expected at Grove Field during the forecast period of 2005 through 2025. The methodology followed is from "Forecasting Aviation Activity by Airport," GRA, Incorporated, July 2001.

AVIATION ACTIVITY PARAMETERS AND MEASURES TO FORECASTS

For Grove Field Airport, the following activity categories are projected:

- Based Aircraft, including fleet mix.
- Annual Aircraft Operations, including general aviation (GA), local vs. itinerant, and annual instrument approaches.
- Airport Reference Code, which defines the appropriate FAA criteria for airport design and is determined by the most demanding aircraft that regularly uses the airport.

PREVIOUS AIRPORT FORECASTS

The following previous airport forecasts for Grove Field were reviewed:

- FAA Terminal Area Forecast (TAF). The FAA provided an advance copy of the draft 2004 TAF
- Washington State Department of Transportation (WSDOT) Aviation Division, *Aviation System Plan – Forecast and Economic Significance Study,* 2000 (see Table 2B)

Historical and forecasted data from both of these sources is presented in the subsequent text below.

The FAA annually prepares aviation demand forecasts (for a 20-year period) called the Terminal Area Forecasts (TAF) for all airports included in the National Plan of Integrated Airport Systems (NPIAS). The FAA TAF provides forecast data for based aircraft, annual operations, and annual growth rates for each. Table 2A presents the FAA TAF data for Grove Field. As shown in the table, the average annual growth rate for all components of aviation activity at the Airport is 0%.

TABLE 2A: FAA TAF, Historical and Forecast, Based Aircraft and Annual Operations

Year	Based Aircraft [1/]	Total Annual Operations	GA Itinerant Operations	GA Local Operations
Historical:				
2001	61	12,600	7,000	5,000
2002	61	12,600	7,000	5,000
2003	61	12,600	7,000	5,000
Forecast:				
2004-2020	61	12,600	7,000	5,000
Avg. Annual Growth Rate	0.0%	0.0%	0.0%	0.0%

Source: FAA draft TAF, 2004
Notes: [1/] The TAF forecast indicates all based aircraft are singe-engine

WSDOT Aviation Division's *Aviation System Plan – Forecast and Economic Significance Study* contains forecasts for all airports in the state. Registered aircraft in the state were forecast by using the average of five forecasting models:

1) Time-Series Analysis (continuation of historical trends).
2) Regression analysis that examined per capita personal income (PCPI) in Washington compared to that in the United States.
3) Regression analysis using state population and PCPI as independent variables.
4) The FAA's nationwide growth rates for registered aircraft.
5) A multiple regression analysis that used pilot population as one of the variables.

The registered aircraft forecasts were distributed among the counties according to the actual distribution in 1998, with adjustments in the future to consider different population and PCPI growth forecast by the State. Based aircraft for individual airports were forecast by holding

constant the market share of the aircraft based in the county to the number of aircraft registered in that county. To forecast aircraft operations, the WSDOT methodology was to calculate a utilization rate (operations per based aircraft) for the base year. Except where specific conditions were noted, the utilization rate at each airport was increased uniformly by 0.3% for 2005, 0.33% for 2010, .36% for 2015, and 0.39% for 2020. Table 2B presents the WSDOT System Plan forecasts for based aircraft and annual operations at Grove Field.

TABLE 2B: WSDOT AVIATION SYSTEM PLAN FORECASTS

Year	Based Aircraft	Total Annual Operations	GA Itinerant Operations	GA Local Operations
Historical:				
2000	66	5,000	3,750	1,250
Forecast:				
2005	78	5,900	4,400	1,500
2010	89	6,800	5,100	1,700
2015	98	7,500	5,600	1,900
2020	106	8,100	6,000	2,100
Avg. Annual Growth Rate (2000-2020)	2.39%	2.44%	2.37%	2.62%

Source: WSDOT Aviation System Plan, 2001

BACKGROUND DATA

This section presents historical and forecasted national aviation trends as well as socioeconomic trends for the area surrounding Grove Field. It is important to relate how these trends are most likely to influence demand at the Airport over the planning period.

NATIONAL AVIATION TRENDS

The FAA has developed two different forecasts (*FAA Long-Range Forecasts and FAA Aerospace Forecasts)* which identify nationwide general aviation activity trends. These trends have been reviewed and are discussed within the text for purposes of providing background information and assisting in selecting among the three forecast models that were analyzed. The specific growth rates from these national forecasts will not be used to forecast aviation demand components related to Grove Field.

FAA-APO-03-3, *FAA Long-Range Forecasts, Fiscal Years 2015, 2020, 2025, and 2030*, June 2003, contains forecasts of long-term growth in GA aircraft, GA hours flown, and pilots. GA activity is very sensitive to changes in fuel price and economic growth. Forecast assumptions include sustained economic growth, relative stability in fuel prices, and continued growth in fractional ownership programs and corporate flying. Also important to GA growth is continued investment in production by GA aircraft manufacturers. Pilot growth is aided by recent industry program initiatives designed to promote GA. According to FAA-APO-03-3, the number of active

GA aircraft is expected to increase at an average annual growth rate of 0.5%, with slower growth for the piston engine portion of the fleet than the turbine portion, reflecting more business and corporate use of GA aircraft in an expanding U.S. economy. Flight hours are projected to increase at a faster rate than the fleet, 1.5% annually through 2014, and 1.2% annually from 2015 through 2030. The number of pilots is forecast to grow at an average annual rate of 1.2% over the 28-year period. Table 2C presents average annual growth rates through 2025 for the various aircraft categories as well growth rates for pilot hours flown.

TABLE 2C: FAA Long-Range GA Forecasts (Average Annual Growth Rates)

	2002-2005	2005-2010	2010-2015	2015-2025
Piston	0.2%	0.3%	0.2%	0.2%
Turbine	2.2%	3.2%	2.6%	2.3%
Helicopters	0.5%	0.9%	0.5%	0.5%
Experimental	3.0%	1.9%	1.5%	1.0%
Hours Flown	1.3%	1.6%	1.5%	1.3%

Source: FAA-APO-03-3

FAA-APO-04-1, *FAA Aerospace Forecasts Fiscal Years 2004-2015*, March 2004, contains the FAA's latest national forecasts for GA. The document begins with an assessment of recent trends. GA aircraft manufacturing has been declining: an estimated 15.9% decline in 2003 shipments compared to 2002. The active GA fleet declined 0.1% and hours flown increased 0.1% from the previous year. The business/corporate segment continues to offer the greatest potential for GA growth; fractional ownership activity has been increasing, with flight hours up 3.8% in 2003. Student pilots also increased in 2003, up 1.5% from 2002. Table 2D presents the FAA's average annual growth rates for the active GA and Air Taxi Fleets.

TABLE 2D: FAA Forecasts for GA and Air Taxi Active Fleet (Avg. Annual Growth Rates)

	2002-2005	2005-2010	2010-2015
Single Engine Piston	0.0%	0.4%	0.3%
Multi-Engine Piston	-0.5%	-0.5%	-0.5%
Turboprop	0.8%	1.6%	1.4%
Turbojet	2.6%	5.9%	5.3%
Rotorcraft (Piston)	1.2%	1.2%	0.8%
Rotorcraft (Turbine)	-0.1%	0.6%	0.4%
Experimental	0.2%	0.6%	0.3%
Sport Aircraft		3.1%	3.0%

Source: FAA-APO-04-1

The FAA's forecasts for 2004–2015 assume there will not be any successful terrorist incidents against either U.S. or world aviation. Business use of GA is projected to expand more rapidly than that for personal and sport use. The business/corporate side of GA should continue to benefit from safety concerns for corporate staff, increased processing times for airline travel, and the bonus depreciation provision of the Presidents economic stimulus package that should help stimulate jet sales. The new Eclipse jet aircraft is assumed to add 4,600 aircraft to the fleet by 2015. The Eclipse, priced under $1 million, is believed to have the potential to redefine the

business jet segment and support a true on-demand air taxi business. In addition, starting in 2003, owners of ultralight aircraft could register these aircraft as "light sport" aircraft, and the GA fleet forecast includes 20,915 aircraft in this new category by 2015. The active GA fleet is projected to increase at 1.3% annually over the forecast period, while the GA hours flown are projected to increase at 1.6% per year over the last 11 years of the forecast period. Table 2E presents the FAA forecasted average annual growth rates for GA and Air Taxi Hours Flown.

TABLE 2E: FAA Forecasts for GA and Air Taxi Hours Flown (Avg. annual growth rates)

	2002-2005	2005-2010	2010-2015
Single Engine Piston	-0.3%	0.9%	0.7%
Multi-Engine Piston	-0.6%	-0.4%	-0.4%
Turboprop	-0.2%	0.5%	0.5%
Turbojet	2.5%	8.0%	6.3%
Rotorcraft (Piston)	1.2%	2.0%	0.9%
Rotorcraft (Turbine)	-0.3%	1.4%	0.7%
Experimental	0.1%	0.9%	0.6%
Sport Aircraft		3.2%	3.2%

Source: FAA-APO-04-1

SOCIOECONOMIC TRENDS

In creating realistic forecasts for an airport, it is important to evaluate the socioeconomic trends of the surrounding area. Historical and projected population trends are often evaluated to determine the type of growth that is occurring in an area. This growth (or lack of growth) can influence demand levels at an Airport. Since the majority of aircraft owners that base aircraft at Grove Field are from Clark County, the County's population data have been analyzed. Table 2F presents historical and projected total resident population of Clark County. The population projections include low, intermediate, and high projections for years 2005 – 2025, using base year data from 2000.

TABLE 2F: Clark County Population

Year		Population	
Historical:			
1980		192,227	
1985		206,744	
1990		238,053	
1995		290,111	
2000		345,238	
Forecasts:			
	Low	**Intermediate**	**High**
2005	370,136	391,264	413,273
2010	400,908	432,479	465,996
2015	430,096	473,674	520,449
2020	453,280	509,876	571,061
2025	473,984	544,809	621,763
Average Annual Growth Rates:			
2000-2005	1.40%	2.53%	3.66%
2005-2010	4.61%	2.02%	2.43%
2010-2015	1.42%	1.84%	2.23%
2015-2020	1.06%	1.48%	1.87%
2020-2025	0.90%	1.33%	1.72%

Source: State of Washington Office of Financial Management, Projections released January, 2002

As shown in the above table, population in Clark County is expected to grow rather aggressively over the next 20 years. According to Census 2000, Clark County is the second fastest growing county in the State of Washington. This is a strong indicator that growth will continue at the Airport as well.

GROVE FIELD FORECASTS

For Grove Field forecasts, growth rates and methodologies from three different sources were reviewed - the FAA's Terminal Area Forecast, the Washington Aviation System Plan and the State of Washington Office of Financial Management Population Forecasts

BASED AIRCRAFT FORECASTS

The inventory effort for this report found that the actual number of existing based aircraft, 73, differs from the TAF and the WSDOT System Plan forecasts, which both reported 61 based aircraft in 2003 and 2000, respectively. The differences in these numbers imply that the fleet based at Grove Field has been growing in recent years. This growth is evident by examining the demand for hangars at Grove Field. Airport Management indicates that there is a hangar waiting list of 20 people. In preparing based aircraft forecasts, it is important to consider the existing number of aircraft stored at the Airport *as well as* the existing demand (hangar waiting list). For planning purposes, since not all aircraft owners on a waiting list typically sign a lease if a hangar is available, it is common to assign a 50% probability of "takers" to the waiting list (i.e. ten aircraft owners would accept a hangar). Based on the current number of aircraft housed at the

Airport, and the hangar waiting list of 20, the 2004 demand for aircraft based at Grove Field is 83.

Table 2G compares the based aircraft forecasts that resulted by applying the *average annual growth rates* from each of the three sources previously discussed (FAA TAF, WSDOT Aviation System Plan, and County population forecasts) to the existing based aircraft demand. The average annual growth rates presented in Table 2G were derived by interpolating and extrapolating the data presented in Tables 2A, 2B, and 2C so that all methodologies reflect the same base year and projected milestones.

TABLE 2G: COMPARISON OF BASED AIRCRAFT FORECAST MODELS

Year	Based Aircraft Demand	FAA TAF Based Aircraft Growth Rate	WSDOT Based Aircraft Growth Rate	High County Population Growth Rate
Current:				
2004	83			
Forecast:				
2005		83	85	85
2010		83	94	94
2015		83	104	105
2020		83	116	116
2025		83	128	129
Avg. Annual Growth Rate (2004-2025)		0.0%	2.10%	2.14%

Source: Current Data- Airport Management, Forecast Data- W&H Pacific, Inc.
Notes: 0.0% average annual growth from Terminal Area Forecasts, August 2004, Table 2A
2.10% average annual growth calculated by interpolation and extrapolation from Washington Aviation System Plan – Forecast and Economic Significance Study, Table 2B
2.14% Average Annual growth calculated from high population projections of State of Washington Office of Financial Management, Table 2F

The FAA's projection for no growth is unreasonably low, considering that Clark County is one of the fastest growing areas in Washington State. In addition, the Airport has recently added six additional tie-down spaces and two new T-hangars. Both the WSDOT and Clark County models are projecting growth rates of approximately 2.1%, significantly higher than the national FAA forecasts for general aviation, however, more reflective of the growth at the Airport and the area around the Airport.

The WSDOT Aviation System Plan model is the recommended forecasting model for projecting based aircraft at Grove Field. This model is indicative of local factors and most accurately represents the growth expected to occur at Grove Field.

Throughout the 20 year planning period, the fleet mix of based aircraft is expected to change slightly. Discussions with the airport management have indicated that the Airport will maintain its role serving small general aviation aircraft, primarily single and multi engine piston aircraft. Table 2H presents the based aircraft fleet mix projected through 2025.

TABLE 2H: BASED AIRCRAFT FLEET MIX

Year	Single Engine	%	Multi Engine	%	Total
Current:					
2004	82	99 %	1	1%	83
Projected:					
2005	84	99%	1	1%	85
2010	93	99%	1	1%	94
2015	102	98%	2	2%	104
2020	114	98%	2	2%	116
2025	126	98%	2	2%	128
Avg. Annual Growth Rate (2004-2025)	2.08%		3.36%		2.10%

Source: W&H Pacific, Inc.

AIRCRAFT OPERATIONS FORECASTS

Aircraft operations numbers for Grove Field vary widely depending on which source is being consulted. The FAA's draft TAF forecast reported 12,600 annual operations for 2003, while the WSDOT System Plan Forecasts reported 5,000 annual operations for the year 2000. Discussions with airport management indicate that a realistic annual operations number is between 7,000 and 7,500. To be conservative and for planning purposes, 7,500 annual operations are used for the current year.

Table 2I presents annual aircraft operations forecasts that resulted by applying the *average annual growth rates* from each of the three sources previously discussed to the actual number of existing annual operations (7,500) at Grove Field. Similar to based aircraft forecasts, the average annual growth rates presented in Table 2I were derived by interpolating and extrapolating the data presented in Tables 2A, 2B, and 2C so that all methodologies reflect the same base year and projected milestones.

TABLE 2I: COMPARISON OF ANNUAL AIRCRAFT OPERATIONS

Year	Approximate Total Annual Operations	FAA TAF Annual Operations Growth Rate	WSDOT Annual Operations Growth Rate	Clark County High Population Growth Rate
Current:				
2004	7,500 [1/]			
Forecast:				
2005		7,500	7,614	7,774
2010		7,500	8,210	8,766
2015		7,500	8,854	9,790
2020		7,500	9,547	10,742
2025		7,500	10,295	11,696
Avg. Annual Growth Rate (2004-2025)		0.0%	1.52%	2.14%

Source: Current Data- Airport Management, Forecast Data- W&H Pacific, Inc.
Notes: [1/] Estimated number from Airport Management
0.0% average annual growth from Terminal Area Forecasts, August 2004, Table 2A
1.52% average annual growth calculated by interpolation and extrapolation from Washington Aviation System Plan – Forecast and Economic Significance Study, Table 2B
2.14% average annual growth rates from high population projections of State of Washington Office of Financial Management, Table 2B

As with based aircraft projections, the FAA's 0% growth rate is unreasonable due to the aggressive growth that appears to be occurring in the area surrounding the Airport. The WSDOT annual operations forecast is projecting a 1.52% average annual growth, which is somewhat low considering that based aircraft are expected to grow at 2.10%. The County population model provides the same growth rate for operations as for based aircraft, 2.14%.

The recommended methodology for forecasting annual operations at Grove Field is the methodology using the Clark County High Population growth rate. This growth rate, 2.14%, is slightly higher than the based aircraft growth rate (2.10%) which is consistent with the FAA's national forecasts projecting an increase of hours flown in GA aircraft.

Table 2J shows the operational fleet mix projections. It is estimated that 50% of local and itinerant operations are in aircraft which fall into ARC A-I (small), the remaining 50% of local and itinerant operations are by B-I (small). It is assumed that this split will remain at approximately 50/50 throughout the planning period.

TABLE 2J: Operational Mix Forecast

Airport Reference Code	A-I (small)	B-I (small)
Takeoff Weight (pounds)	**Max. of 12,500**	**Max. of 12,500**
Base Year (2004)		
Local	937	938
Itinerant	2813	2812
2005		
Local	972	972
Itinerant	2916	2915
2010		
Local	1096	1096
Itinerant	3288	3287
2015		
Local	1224	1224
Itinerant	3672	3671
2020		
Local	1343	1343
Itinerant	4028	4029
2025		
Local	1462	1462
Itinerant	4386	4386

SELECTED FORECASTS

Table 2K presents a summary of the selected forecasts for based aircraft, aircraft operations, and instrument approaches. Local and itinerant operations numbers were derived by using the existing ratio of 25% versus 75%, respectively. This ratio corresponds with the ratio presented in the WSDOT Aviation System Plan.

The airport does not have an instrument approach now. The Washington Aviation System Plan forecasts assumed that all public-use airports in the state would have a minimum of one GPS approach. For this Airport Layout Plan Report, it is assumed that Grove Field will have an instrument approach in place by 2010. The forecast of instrument approaches in Table 2J follows the methodology in the Washington Aviation System Plan, which makes two assumptions: 1). 46.1% of general aviation aircraft approaches are assumed to be instrument approaches and 2). Instrument weather in the area west of the Cascade Mountains is estimated to occur 13% of the time.

TABLE 2K: Grove Field Aviation Demand Forecast Summary

Year	Total Based Aircraft	Total Operations	Local GA Operations	Itinerant GA Operations	Instrument Approaches
Current:					
2004	83	7,500	1,875	5,625	0
Forecast:					
2005	85	7,774	1,944	5,831	0
2010	94	8,766	2,192	6,575	197
2015	104	9,790	2,448	7,343	220
2020	116	10,742	2,686	8,057	241
2025	128	11,696	2,924	8,772	262
Avg. Annual Growth Rate (2004-2025)	2.10%	2.14%	2.14%	2.14%	1.91%[1/]

Source: Current – Airport Management, Forecast – W&H Pacific, Inc.
Note: [1/] Average Annual Growth Rate is for years 2010-2025

AIRPORT REFERENCE CODE

As discussed in Chapter One, the Airport Reference Code (ARC) is an important parameter for airport design. The appropriate ARC for an airport is determined by its design, or critical, aircraft, which is the most demanding aircraft that regularly, uses the airport. Regular use is defined as at least 500 annual itinerant operations--equivalent to an average of one departure per weekday.

The current ARC for Grove Field is A-I (small), which covers the current critical aircraft, based on the minimum activity threshold of 500 annual operations. The critical aircraft operating at Grove Field is the Cessna 172 (A-I (small)), which has a Maximum Takeoff Weight of 2,450 pounds. Since it is estimated that 50% of all local and itinerant operations will be conducted by B-I (small) aircraft (as shown in Table 2J), the appropriate future ARC is B-I (small).

AIRPORT PLANNING FORECAST RESULTS COMPARED WITH TAF

Table 2L compares the selected forecasts for Grove Field with the FAA TAF forecasts.

TABLE 2L: Comparison of Selected Forecasts with Terminal Area Forecasts

	Based Aircraft Forecast			Operations Forecast		
Year	FAA TAF	Selected	Difference	FAA TAF	Selected	Difference
Base Year						
2004	61	83	+36.1%	12,600	7,500	-40.5%
Forecast						
2005	61	85	+39.3%	12,600	7,774	-38.3%
2010	61	93	+54.1%	12,600	8,766	-30.4%
2015	61	104	+70.5%	12,600	9,790	-22.3%
2020	61	116	+ 90.2%	12,600	10,742	-14.7%

Sources: FAA draft 2004 TAF, W&H Pacific
Note: TAF data is projected through 2020

As shown in the above table, the selected based aircraft forecast are 90.2% higher than that of the FAA TAF forecast. The difference is due largely to the TAF's 2003 based aircraft data being less than the actual number of based aircraft in 2004. In addition, the TAF is projecting no future growth, while the selected forecast is projecting rather aggressive growth due to increase in local populations and economic development.

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

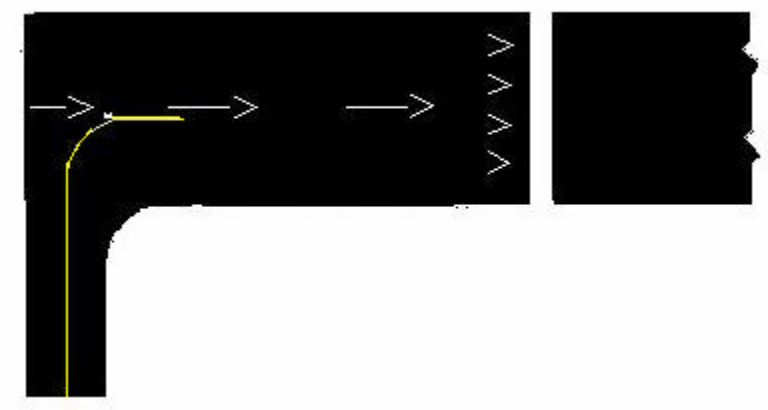
Airfield signage identifies runways, taxiways, and apron areas. These aid pilots in determining their position on the airport and provide directions to their desired location on the airport. Signage at Grove Field consists of runway direction signs, distance remaining signs, and noise abatement procedure 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.

Chapter Five
CAPITAL IMPROVEMENT PROJECTS

Through the evaluation of the facility requirements and the development of the airport layout plan, the improvements needed at Grove Field over the next 20-year period have been determined. The capital improvement plan provides the basis for planning the funding of these improvements. The planned phases of development are in the 5-, 10- and 20-year time frames.

CAPITAL IMPROVEMENT PROJECTS

The Capital Improvement Plan (CIP) develops both the timeline for the airport improvements and estimated costs for those improvements. The plan is divided into three phases: Phase I, 2006-2010, Phase II, 2011-2015, and Phase III, 2016-2025.

Phase I

Phase I is the first five years of the planning period, 2006 to 2010. The projects included in this stage are focused on removing object penetrations from critical areas, and constructing hangar buildings.

- Land Acquistion and Relocation of Mobile Home Park
- Delp Road Relocation
- Tree Removal on South Side of Runway
- Relocate Wind Cone and Segmented Circle
- Remove Six Tie-Down Pads

- Land Acquisition on South Side of Runway
- Construct Hangars (both T-hangars and conventional hangars)
- Install SuperUnicom

Phase II

Phase II is the second five years of the planning period, 2011- 2015. The projects planned during this stage focus on improving existing facilities and increasing the amount of hangar storage:

- Runway Shift/Widening/Extension & Txwy connector stub (includes runway & taxiway pavement removal on 25 end)
- Widen and Extend North Side Parallel Taxiway
- Construct Hangar buildings

Phase III

Phase III is the last ten years of the planning period, 2016 – 2025. These projects include enhancement and maintenance of existing facilities:

- Construct South Side Parallel Taxiway
- Construct Pilot Lounge
- Create Commercial Development Areas
- Pavement Maintenance
- ALP Update

PROJECT COSTS

A list of improvements and costs over the next 20-years are included in **Table 5A** at the end of this chapter. All costs are estimated in 2005 dollars. Total project costs include construction, temporary flagging and signing, construction staking, testing, engineering, administration, and contingency, as applicable. Utilities including phone and power are included in all new hangar projects, along with septic costs. No water service cost was added for the hangar developments. **Table 5B** presents the CIP in the FAA's formatted spreadsheet.

FUNDING SOURCES

Funding for a CIP can come from several different sources, including the FAA, the State of Washington, the Port of Camas-Washougal, and private sources. Each project listed in the CIP has been assigned a total cost, which is then assigned a percentage based on its funding source(s) eligibility.

FAA

Federal grants are available through the current Airport Improvement Program (AIP) legislation called Vision 100 – Century of Aviation Reauthorization Act. This program was funded at $3.4 billion in fiscal year 2004 and is allowed to increase $100 million each year through 2007. Under

most circumstances, projects that qualify for AIP funding are eligible for up to 95 percent of total project costs through 2007. It is anticipated that a similar reauthorization will continue in fiscal year 2008 and beyond. Typically, the remaining 5 percent of the project cost is funded by the airport sponsor. It is important to note that even though a project may be eligible for federal funding, this does not ensure that funds will be available or granted to the project by the FAA.

State

The Washington State Department of Transportation also provides grants. For projects eligible for AIP funding, the State typically matches the local share on a 50/50 basis, therefore, the funding percentages could be FAA -95%, State – 2.5%, Local – 2.5%. For projects funded by the State only, the minimum sponsor share is 5%.