CONTENTS

Cle Elum Municipal Airport
Cle Elum, Washington

AIRPORT LAYOUT PLAN REPORT

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Chapter One - INVENTORY

Chapter One - EXHIBITS

Chapter One - TABLES

Chapter Two - FORECAST

Chapter Two - TABLES

Chapter Three – AIRPORT FACILITY REQUIREMENTS/ ALTERNATIVES

Chapter Four - PLAN SHEETS

Chapter Five – CAPITAL IMPROVEMENT PROJECTS

Chapter Five - Tables

APPENDICES

Chapter One
INVENTORY

The initial step in the preparation of the Airport Layout Plan Report for Cle Elum Municipal Airport is the collection of information pertaining to the Airport and the area it serves. The information collected in this chapter is used in subsequent analyses in this study. The inventory portion of this chapter summarizes 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 presently summarize most 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

Cle Elum Municipal Airport is located one mile east of the City of Cle Elum, Washington in Kittitas County. Located in west-central Washington, Kittitas County is bordered by the Cascade Mountain Range to the north, with the City of Cle Elum at the base of the range. The City of Cle Elum is nestled between the Cle Elum Range, the South Cle Elum Range and Lookout Mountain.

Interstate 90 and State Highways 10, 903, and 970 provide roadway access to Cle Elum. Public transportation to and from the city includes Greyhound bus service and Central Cab both located in Ellensburg, about 25 miles to the east of Cle Elum.

AREA TOPOGRAPHY

The Cle Elum Municipal Airport has an elevation of 1,945 feet (NAVD 88) (surveyed by W&H Pacific, see Table 1A). The surrounding terrain is mountainous and forested. Elevations of mountain peaks around the area range from about 4,000 feet up to approximately 6,500 feet. The City of Cle Elum in recognized as the entrance to both the Wenatchee and the Mt. Baker-Snoqualmie National Forests.

Table 1A – Survey Information

	Latitude	Longitude	Elevation
Runway 7 End	N47°11'38.8303"	W120°53'18.7722"	1944'
Runway 25 End	N47°11'39.8373"	W120°52'41.8487"	1938'
Runway 7 End Controlling Obstruction	N47°11'39.5019"	W120°53'34.2558"	2015'
Runway 25 End Controlling Obstruction	N47°11'39.8373"	W120°52'07.54451"	2043'

The control points used have the following accuracy levels; Elevations are accurate from 0.017 meters to 0.020 meters, latitudes are accurate from 0.019 meters to 0.020 meters, and longitudes are accurate to 0.027 meters. Survey completed by W&H Pacific in August 2002. The survey certification letter has been included in Appendix D.

CLIMATE

Winter temperatures in Cle Elum can range from lows of 20 to 40 degrees Fahrenheit in the winter, and summer temperatures can range from lows of 45 to 80 degrees Fahrenheit. Annual rainfall averages about 22.5 inches per year. Annual snowfall averages about 77 inches per year and typically occurs between November and March.

COMMUNITY AND AIRPORT HISTORY

The City of Cle Elum was founded in the early 1880's. The construction of the Northern Pacific Railroad and the discovery of coal led to rapid growth in the City of Cle Elum. Coal mining had a large presence in the area until the early 1960's when the last coal mines were closed and logging became the main industry.

The airport land was purchased by the City of Cle Elum in 1959 from the Department of Natural Resources. The airport is now owned and operated by the City of Cle Elum.

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 and landing sequence at the Airport. There are currently five based aircraft at Cle Elum Municipal Airport. Current annual aircraft operations at the Airport are estimated to be 5,000. Projected based aircraft and annual operations data are presented in Chapter Two, *Forecasts.*

No significant airport service area studies have been conducted, but based on discussions with the Airport tenants and users, it is estimated that the service area includes upper (Western) Kittitas County. This area encompasses approximately 10 miles to the east (halfway to Bowers Field in Ellensburg), and 25 miles to the North, South and West.

CRITICAL AIRCRAFT

An airport is designed based on the characteristics of the most demanding aircraft, or critical aircraft, which currently uses 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. An itinerant operation is defined as an operation involving a trip extending more than 20 miles from and/or to the Airport. Airport records indicate that the critical aircraft for Cle Elum Municipal Airport is the Beech Baron 58. This aircraft has a wingspan of 37.8 feet and a maximum takeoff weight of 5,500 pounds.

EXISTING FACILITIES

The airport reference code is a criterion that defines the critical airport dimensions based on an airports critical aircraft. This code is defined specifically by the approach category and the design group of the aircraft. The approach category of the aircraft 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.

Cle Elum Municipal Airport has an existing ARC of B-I (small). Approach category B includes those aircraft that have an approach speed of 91 knots or more but less than 121 knots. Design group I includes those aircraft that have a wingspan up to but not including 49 feet. “Small” means that the maximum takeoff weight of the aircraft is 12,500 pounds or less. The Beech Baron 58 fits into this ARC. The existing facilities at Cle Elum Municipal Airport are discussed in the following paragraphs and are identified on **Exhibit 1B**.

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

Table 1B - Airport Design Standards

Design Feature	Existing (feet)	Standard B-I (small) (feet)
Runway Safety Area (RSA)		
-Width	66	120
-Runway 7 Length beyond runway end	140	240
-Runway 25 Length beyond runway end	140	240
Runway Object Free Area (OFA)		
-Width	140	250
-Length beyond Runway 7 end	148	240
-Length beyond Runway 25 end	180	240
Runway Obstacle Free Zone (OFZ)		
-Width	140	250
-Length beyond Runway 7 end	148	200
-Length beyond Runway 25 end	180	200
Runway Protection Zone	250 x 1,000 x 450	250 x 1,000 x 450

Sources: Existing – W& H Pacific, Inc. (September 2004)
Standard – FAA AC 150/5300-13, Change 8

As can be noted in Table 1A, the majority of existing critical areas do not meet B-I (small) ARC standards.

AIRFIELD FACILITIES

All existing pavement sections and pavement condition information were obtained from Pavement Consultants Inc.'s 1999 pavement survey (see **Exhibits 1C** and **1D**) and the 2002 WSDOT Aviation System Plan Inventory. 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. Current pavement conditions discussed below are reported based on visual observations by W&H Pacific through a recent (September, 2004) airport field visit.

Runway

Cle Elum Municipal Airport has one runway, Runway 7-25, at a length of 2,552 feet and a width of 40 feet. The runway has 130-foot displaced thresholds at both ends. Thresholds are located in their current position because fencing at the end of the runway is currently an obstruction. During the 2004 site visit, the pavement was observed to be in poor condition.

The pavement section for Runway 7-25 is four inches of gravel topped with bituminous surface treatment (BST). The runway was last fog sealed in 1989. The pavement design strength is unknown. The 1999 pavement condition survey shows that the western 125 feet and the eastern 130 feet of the runway are in fair condition, while the center 2,297 feet are in poor condition.

The WSDOT System Plan Inventory from 2002 shows that the entire runway pavement condition has deteriorated and is now in poor condition. Grass and weeds, up to two feet tall in some locations, are growing up through the cracks. Each runway end has a run-up pad/turn-around apron, both located on the north side of the runway. The turnarounds have the same pavement sections as the runway, and similarly to the runway, have also deteriorated in condition from good in 1999 to poor in 2002. The runway is equipped with a medium intensity lighting system installed under a WSDOT Aviation Division grant.

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. Cle Elum Municipal Airport does not currently have a wind rose and similar historic weather information is not available. Therefore, current wind coverage can not be identified.

Taxiways and Taxilanes

There is one midfield connector taxiway at the Airport (Taxiway A) with a length of 375 feet and a width of 30 feet. It is located on the south side of the runway and to the west of the midfield point. Taxiway A is lined with reflectors to provide guidance during night operations. It has the same pavement sections as the runway and has worsened from a fair pavement condition rating to a poor rating between 1999 and 2002. In addition to Taxiway A, there is also a gravel taxilane at the Airport which provides access to the aircraft hangar area.

Aprons and Aircraft Parking

There is not a paved aircraft apron area at the Airport; however, transient aircraft and gliders park in the grassy area to the north of the gravel taxilane and west of the connector taxiway. Steel cables are provided for aircraft tiedown and there is no charge to use the tiedown area.

Glider Operations

On the south side of the existing runway, glider operations are conducted during the summer months. The mechanism to support the glider operations includes a structure that is moved into the infield just to the south of the runway that pulls on a long rope. This rope is connected to a glider and then recoiled quickly to launch the glider into the air. While the launching mechanism is located adjacent to the runway in a position to launch the gliders, it becomes a hindrance to meeting the runway safety area requirements and runway object free area requirements.

LANDSIDE FACILITIES

Hangars and Airport Buildings

The Airport has five individual hangar buildings that can store a total of six aircrafts. All hangars are located on the south side of Runway 7-25. Each hangar is privately owned under a 20-year ground lease from the City at a rate of $0.025 per square foot per month.

In addition to hangars, there is also a 240 square foot building, owned by the City, which is used as a pilots' lounge, equipped with restrooms and a telephone. The pilots' lounge is located directly south of Taxiway A.

Fixed Based Operators (FBOs)

A fixed based operator (FBO) 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. There are currently no fixed based operators at the Airport.

Internal Circulation, Access and Vehicle Parking

There is currently not a complete perimeter fence around the airport; however, there is a section of fencing at the runway approach 7 end and at the east side of the airport on adjacent property. In addition there is a 3-strand barb wire fence and gate separating landside and airside traffic along the airport access road. Vehicular traffic uses Airport Road to access the airport's facilities. Prior to entering through the automobile gate along the airport access road, there is a gravel parking lot that can be used by automobile traffic.

AIRFIELD SUPPORT FACILITIES

Aircraft Rescue and Firefighting

There Department of Natural Resources and Emergency Medical services are located at the Cle Clum Municipal Airport.

Fueling Facilities

There are currently no fueling facilities available at the Airport.

Airport Maintenance

Airport maintenance is provided by the City of Cle Elum.

Utilities

No services are available at the airport.

Common Traffic Advisory Frequency (CTAF)

The Federal Communications Commission (FCC) issued Cle Elum Municipal Airport a Common Traffic Advisory Frequency (CTAF) of 122.9 MHz. This frequency is used by pilots to communicate their intentions 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 to the airport are based on the NAVAIDS in service at the airport.

Instrument Approach Aids

There is no air traffic control tower or any published instrument procedures at Cle Elum Municipal Airport; however, nearby airports (Ellensburg and Wenatchee) have a Very-High Omni-directional Frequency Range station, or a VOR, located on their airfields. VORs transmit signals to aircraft by providing heading and course information to assist a pilot in finding an airport. By following radials and distance information, found an aeronautical chart, the VORs located at the Ellensburg and Wenatchee airports could assist a pilot in locating the Cle Elum Municipal Airport.

Visual Approach Aids

The Airport is equipped with a rotating beacon, a lighted wind sock, and a segmented circle. There is also a two-box Precision Approach Path Indicator (PAPI) on both runway ends; however, both PAPI units are out of service indefinitely.

Airport Lighting and Signing

Runway 7-25 is equipped with medium intensity runway lights (MIRL) which are pilot activated by using the CTAF frequency of 122.3 MHz. The MIRL is currently out of service. There is no lighting on the airport taxiway, however, there are reflectors.

LAND USE PLANNING AND ZONING

ON-AIRPORT LAND USE

Cle Elum Municipal Airport is controlled by the Kittitas County zoning ordinance. The County has two zones designated on the Airport property. One zone is listed as an "AG-3 Zone" and the other is listed as "Forest and Range". Kittitas County describes an AG-3 Zone as "…an area where various agricultural activities and low-density residential developments co-exist compatibly." Kittitas County describes a Forest and Range Zone as "…areas of Kittitas County wherein natural resource management is the highest priority and where the subdivision and development of lands for uses and activities incompatible with resource management are discouraged." While the AG-3 zone description is generally compatible with airports, some of the specific permitted uses as described in the County's zoning ordinance, especially, parks, playgrounds, and forestry growing/harvesting and management are incompatible with FAA recommended uses for land surrounding an airport. It is recommended that the County reevaluate

the permitted uses near the Cle Elum Municipal Airport and adopt a similar zoning to that surrounding Bowers Field.

OFF-AIRPORT LAND USE

It is important to the health and future of an airport to restrict the uses of the surrounding areas so that they are compatible with airport uses and that consideration is given to prevent restrictions to future airport growth. There are a number of ways to protect the surrounding areas for airport use. These include zoning restrictions, height restrictions, avigation easements, and noise easements.

Existing Zoning and Compatibility

The current zoning around the Airport consists of forest and range areas to the north, and agricultural and low density residences to the east, west and south. The current zoning for the Airport and the areas surrounding the Airport are depicted in **Exhibit 1E**.

The runway protection zone (RPZ) is a trapezoidal area beyond each runway end. The FAA recommends that Airports own all land within the RPZs and that the RPZs be clear of all objects; however, some uses may be permitted as long as they do not attract wildlife, are outside of the runway object free area (OFA) and do not interfere with navigational aids. No structures should be allowed within the RPZ, unless they are structures accessory to airport operations that have been approved by the FAA. The zoning category of the areas within the airport RPZ fall under the AG-3 Zone. The Airport, City, and County should carefully review the uses around the Airport to ensure that the RPZs are clear of all incompatible uses.

FAR Part 77 Imaginary Surfaces

Federal Aviation Regulation 14 CFR Part 77, *Objects Affecting Navigable Airspace*, established obstruction standards used to identify potential adverse effects to air navigation and establishes notice standards for proposed construction. These imaginary surfaces are then used as the basis for protecting the airspace around an airport. It is ideal to keep these areas clear of any and all obstructions. 14 CFR Part 77 surfaces consist 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 (definitions for each surface are located in Appendix A). There are currently obstructions to 14 CFR Part 77 approach surfaces of Runway 7 and 25. The controlling obstruction to the approach surface for Runway 7 is a 71-foot tree 1,065 feet from the runway end, and 110 feet to the left of the extended centerline. These obstructions as well as obstruction to other Part 77 surfaces are addressed more specifically in the airport plans.

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 Cle Elum Municipal Airport 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 Cle Elum Municipal Airport, the following activity categories are projected:

- Based Aircraft, including fleet mix.
- Aircraft Operations, including air taxi, 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 FAA annually prepares aviation demand forecasts called the Terminal Area Forecasts (TAF) for all airports included in the National Plan of Integrated Airport Systems (NPIAS). The FAA provided an advance copy of the TAF for Cle Elum Municipal Airport, dated August 2004. The TAF (Table 2A) indicates no change in the number or composition of historical aircraft operations from 1999 through 2003 and projects 0% growth through 2020. Table 2B shows TAF data for based aircraft. In 1995, the number of based aircraft peaked at eight, Then, the number declined to four and the forecast for based aircraft is four through 2020 (0% growth).

Table 2A, FAA TAF Aircraft Operations, Historical and Forecast

Aircraft Operations	Actual/Forecast 1999-2020
Itinerant:	
Air Taxi	0
GA	500
Military	0
Local:	
GA	500
Military	0
Total:	1,000
Instrument Operations:	0

Table 2B, FAA TAF Based Aircraft, Historical and Forecast

Year	Single-Engine	Other Light Misc. Craft	Total Based Aircraft
Actual			
1985	2	0	2
1990	3	0	3
1995	7	1	8
2000	4	0	4
2003	4	0	4
Forecast			
2005	4	0	4
2010	4	0	4
2015	4	0	4
2020	4	0	4

WSDOT Aviation Division's *Aviation System Plan – Forecast and Economic Significance Study* contains the forecasts for Cle Elum Municipal Airport that appear in Table 2C. 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; and 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, a utilization rate (operations per based aircraft) was calculated. 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 2C, Washington Aviation System Plan Forecasts

	2000	2005	2010	2015	2020	Annual Growth 2000-2020
Aircraft Operations						
Itinerant:						
GA	3,500	3,500	3,500	3,500	3,600	0.1%
Local:						
GA	1,500	1,500	1,500	1,500	1,500	0.0%
Total Operations	**5,000**	**5,000**	**5,000**	**5,000**	**5,100**	0.1%
Instrument Approaches	0	73	73	73	75	0.2%*
Total Based Aircraft	**6**	**6**	**6**	**6**	**6**	0.0%
Single Engine Piston	6	6	6	6	5	
Multi-Engine Piston	0	0	0	0	1	

**Annual growth rate is for 2005-2020, since there were no instrument approaches in 2000.*

NATIONAL TRENDS FORECAST BY FAA

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 2D, 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.

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 President's 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. Starting in 2003, owners of ultralight aircraft can begin registering 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, FAA Forecasts for GA and Air Taxi Active Fleet (Average 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

POPULATION FORECASTS

Community population and income within an airport's service area usually correlate with activity levels at the airport. Cle Elum Municipal Airport's service area includes upper (Western) Kittitas County. This area encompasses approximately 10 miles to the east (halfway to Bowers Field in Ellensburg), and 25 miles to the North, South and West.

Table 2F indicates historical population and three forecasts for future populations in Kittitas County. The table shows growth has been moderate from 1980 through 2000, 1.4% per year on

average. The State of Washington Office of Financial Management projects future annual growth between -0.6% and 2.0%.

Table 2F, Kittitas County Population

Year		Population	
1980		24,877	
1985		25,407	
1990		26,725	
1995		31,195	
2000		33,362	
		Forecasts	
	Low	*Medium*	*High*
2005	32,341	34,314	36,759
2010	33,619	36,742	40,545
2015	35,013	39,451	44,806
2020	35,927	41,776	48,794
2025	36,629	43,999	52,810
		Average Annual Growth Rates	
1980-1985		0.4%	
1985-1990		1.0%	
1990-1995		3.1%	
1995-2000		1.4%	
	Low	*Medium*	*High*
2000-2005	-0.6%	0.6%	2.0%
2005-2010	0.8%	1.4%	2.0%
2010-2015	0.8%	1.4%	2.0%
2015-2020	0.5%	1.2%	1.7%
2020-2025	0.4%	1.0%	1.6%

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

The population of Upper Kittitas County primarily Cle Elum, Roslyn, and South Cle Elum, is 3,229 (2000), which is 10% of the county. In 1920, these three communities contained one-third of the population of Kittitas County. Their share of county population has been declining since then. As Table 2G shows, Upper Kittitas population changed very little between 1980 and 2000 (0.1% average annual growth rate).

Table 2G, Upper Kittitas County Population
Cle Elum, Roslyn, South Cle Elum

Year	Population
1980	3,160
1990	3,104
2000	3,229
	Forecast
2005	3,565
2010	4,765
2015	5,965

2020	7,165
2025	8,365
Average Annual Growth Rate	
1980-1990	-0.18%
1990-2000	0.40%
2000-2005	2.00%
2005-2010	5.97%
2010-2015	4.59%
2015-2020	3.73%
2020-2025	3.15%

Source: US Census Bureau for historical populations.
Forecast population is based on 2% annual growth from 2000-2005 and 240 additional residents per year from 2005-2025.

Now, however, Upper Kittitas County is on the verge of a population boom. The population of Upper Kittitas County is projected to nearly triple with the development of the residential resort community, Suncadia, located adjacent to Roslyn. Home construction in Suncadia began recently. The 6,000-acre development will include 3,200 residential units (single family and condominiums with whole and fractional ownership), a lodge/spa/conference center, retail center, golf course, and other recreational opportunities. Up to half the homes in Suncadia are expected to be primary residences. The build-out will take 20 to 30 years, with population reaching approximately 6,000.

Table 2G indicated historical and projected future population in Upper Kittitas County. This forecast assumes that the population has been and will grow at 2% per year (the County's high growth rate) from 2000 to 2005. The high County growth rate was assumed because the prospect of Suncadia has been known within the area in recent years, providing a positive economic outlook. The estimated 2004 population of upper Kittitas County resulting from 2% annual growth is 3,495. From 2004 to 2005, 2% growth equates to 70 people, leaving 5,930 more people to add to the Upper Kittitas County population to reach the 6,000 number attributed to Suncadia. Dividing 5,930 people by 25 years is approximately 240 persons per year, the number added to the population in Table 2E each year after 2005. The resulting average annual growth rate from 2005 to 2025 is 4.4%. The estimate of 240 new residents per year may actually be too conservative, since a recent analysis determined a market absorption rate of over 400 homes per year.

Suncadia will be the first drive-to resort serving the Seattle market to offer a highly appealing lifestyle/amenity package. Upper Kittitas County is already a second-home area, but it is not yet a true resort destination. The targeted market is Seattle area households with $100,000 to $300,000 annual income. Higher income usually correlates with a greater propensity for aircraft purchases and general aviation activity.

Suncadia will have many parallels to Sunriver, a smaller, but mature, resort community in Central Oregon. The Sunriver development is 3,300 acres in size, has a summer population of about 15,000, and a year-round population around 2,000. The greater community of Sunriver has a population of 4,700.

COMPARABLE AIRPORTS

The privately owned, public-use Sunriver Airport could provide some useful comparisons as to the type of aviation activity Suncadia might generate for Cle Elum Municipal Airport. Sunriver Airport has more facilities and services attractive to high-end general aviation and air taxi operators. However, the City of Cle Elum is taking steps to facilitate improvements to its airport. Sunriver Airport has a runway length of 5,500 feet, more than twice as long as Cle Elum Municipal's. However, Sunriver is more than 2,000 feet higher than Cle Elum is. The difference in density altitude affects aircraft performance, so that aircraft operating at Sunriver need approximately 1,000 feet more runway length than at Cle Elum. The Sunriver Airport accommodates instrument approaches, while Cle Elum Municipal is limited to visual operations. Fuel sales, aircraft maintenance, and other services are available at Sunriver Airport, but are not currently available at Cle Elum Municipal.

The Sunriver Airport advertises that it can accommodate 170 aircraft, with 16 of the spaces specifically designed for multi-engine piston and jet aircraft. According to AirNav.com, Sunriver has 47 based aircraft—36 single engine, 10 multi-engine, and 1 jet—and has over 16,000 annual aircraft operations—73% transient general aviation, 15% local general aviation, 12% air taxi, and less than 1% military.

It might be concluded that Suncadia would generate more than twice the aviation activity as Sunriver due to its larger size, except for some important differences between the two resorts. Suncadia is between a 60 and 90 minute-drive via interstate highway from Seattle. The drive to Sunriver takes 6.5 hours from Seattle or 3.5 hours from Portland, much of the way on a two-lane road. A smaller proportion of residents will probably want to fly to their second homes in Suncadia than do so at Sunriver because driving would be as convenient as and less costly than flying for most second-home owners. In addition, the Central Oregon wilderness is considered a more attractive tourist destination than Upper Kittitas County, so Suncadia may not be visited as often by out-of-state tourists and conference attendees who might fly rather than drive to the resort.

Bowers Field is another airport that should be analyzed when forecasting Cle Elum aviation activity. Bowers Field is located a half hour's drive southeast of Cle Elum in Ellensburg (population 15,414 in 2000), which is the largest city in Kittitas County. Bowers Field has a longer runway than Cle Elum, instrument approach capability, 49 based aircraft, and 55,000 annual aircraft operations.

CLE ELUM MUNICIPAL AIRPORT FORECASTS

For the Cle Elum Municipal Airport forecasts, growth rates and methodologies from six different sources were examined—the FAA's Terminal Area Forecasts, the Washington Aviation System Plan, the State of Washington Office of Financial Management Population Forecasts, Upper Kittitas County Population Forecasts, and comparisons to Sunriver Airport and Bowers Field.

BASED AIRCRAFT FORECASTS

The inventory effort for this report found that the actual number of based aircraft in 2004, 5, differs from the TAF, which reports 4 for 2003, and from the Washington Aviation System Plan, which reports 6 for 2000.

Table 2H presents the based aircraft forecasts that resulted from five different models, using the actual number of based aircraft, 5, instead of the base year numbers in the TAF and Washington Aviation System Plan. Table 2H does not contain the actual forecast numbers that are in the TAF.

Table 2H, Comparison of Based Aircraft Forecast Models

Year	FAA & State Growth Rates	High County Population Growth Rates	**Selected** Upper Kittitas County Population Growth Rates	Comparable to Sunriver	Bowers Field Growth Rate
2004	5	5	**5**	5	5
			Forecast		
2005	5	5	**5**	7	5
2010	5	6	**7**	17	5
2015	5	6	**9**	27	6
2020	5	7	**10**	37	6
2025	5	7	**12**	47	6
			Average Annual Growth Rate		
2004-2025	0.0%	1.8%	**4.2%**	11.3%	1.6%

Notes:
FAA and State growth rates = 0.0% annual growth from Terminal Area Forecasts, August 2004, and from Washington Aviation System Plan – Forecast and Economic Significance Study
High County population growth rates from Table 2D
Upper Kittitas County population growth rates from Table 2E

The model comparable to Sunriver projects gradual growth in based aircraft to reach the current number of aircraft based at Sunriver.
Bowers Field growth rate, 1.6% per year, from June 2004 Airport Master Plan Update

The FAA and State projections of no growth appear unreasonably low, considering the Suncadia development. The High County population and Bowers Field based aircraft forecast models also provide growth rates that seem too low, less than half the rate of Upper Kittitas County population growth. The forecasting model that uses Sunriver as a comparable airport is rejected because Suncadia is not expected to generate as much aviation activity as Sunriver, being more of a driving destination. As a result, the forecasting model that uses the Upper Kittitas County population forecast growth rates seems the most appropriate. The selected forecast is for 4.2% average annual growth through 2025.

Throughout the 20-year planning period, the fleet mix of based aircraft is expected to change from all single engine piston aircraft. A multi-engine aircraft is expected to be based at Cle Elum Municipal in the future, as the number and average income of aircraft owners grows. Light sport aviation is recreational and suited to people who come to Upper Kittitas County to enjoy outdoor recreation. According to TAF records, a light sport aircraft has been based at the airport in the past. Light sport aviation is expected to boom following the aviation regulation issued in mid-2004 that created Light Sport Pilot certification. Table 2I shows a gradual shifting of the fleet mix through 2025, 84% are single engine, 8% are multi-engine, and 8% are light sport. It is assumed that a turboprop or turbojet aircraft belonging to an Upper Kittitas County resident or business would be based at Bowers Field, because that facility is better suited to high-performance aircraft.

Table 2I, Based Aircraft Fleet Mix*

Year	Single Engine	Multi-engine	Light Sport
Current	100%	0%	0%
2005	93%	1%	6%
2010	91%	1%	8%
2015	87%	5%	8%
2020	84%	8%	8%
2025	84%	8%	8%

**The actual numbers of based aircraft derived from this fleet mix are in Table 2K.*

AIRCRAFT OPERATIONS FORECASTS

The inventory effort for this report found that the actual number of annual aircraft operations, 5,000, differs substantially from the TAF, which reports 1,000 base year operations, but 5,000 operations is consistent with the Washington Aviation System Plan. The Airport Manager estimated that of the 5,000 total operations, 3,000 are itinerant and 2,000 are local.

Table 2J shows the operations forecasts for Cle Elum Municipal Airport, using four different forecasting models. The FAA Growth Rate Model uses the TAF projection of no future growth, which seems unreasonable, considering the Suncadia development and City plans to improve the airport. The operations growth rate for Bowers Field (1.6% annual growth) also seems too low

for the upcoming population explosion. The forecasting model assumes Cle Elum Municipal Airport operations grow to the current level at Sunriver Airport (5.8% annual growth). This may be unrealistically high due to the differences between the Sunriver and Suncadia resorts.

The selected forecast uses the State Aviation System Plan's aircraft utilization method. Annual operations per based aircraft are projected to grow from 1,000 now to 1,018 in 2025. A slight increase in utilization is consistent with FAA forecasts for hours flown in GA and air taxi aircraft. The selected growth rate, 4.3% per year, is slightly higher than the based aircraft growth rate, reflecting the increase in utilization. This forecast was selected because it provides a more reasonable annual growth rate than the other three forecast models. It reflects the strong population and economic growth generated by Suncadia that will result in more pilots, more aircraft ownership, and more flights. On the other hand, Suncadia will not be as much of a flying destination as Sunriver, because it will be a convenient drive from the Seattle area. Consequently, the growth projected for Cle Elum Municipal is not as much as would result in operations levels equivalent to those at Sunriver Airport.

Table 2J does not contain the actual forecast numbers that are in the TAF.

Table 2J, Comparison of Aircraft Operations Forecast Models

Year	FAA	**Selected** State	Comparable to Sunriver	Bowers Field Growth Rate
2004	5,000	**5,000**	5,000	5,000
		Forecast		
2005	5,000	**5,115**	5,080	5,544
2010	5,000	**6,858**	5,500	8,264
2015	5,000	**8,614**	5,954	10,985
2020	5,000	**10,386**	6,446	13,705
2025	5,000	**12,179**	6,978	16,425
		Average Annual Growth Rate		
2004-2025	0.0%	**4.3%**	5.8%	1.6%

Notes:
FAA growth rate = 0.0% annual growth from Terminal Area Forecasts, August 2004
State growth = growing aircraft utilization method from Washington Aviation System Plan – Forecast and Economic Significance Study
The model comparable to Sunriver projects gradual growth to reach the current number of aircraft operations at Sunriver Airport
Bowers Field growth rate = 1.6% per year, from June 2004 Airport Master Plan Update

Table 2K shows the Aircraft Operation Mix at Cle Elum Municipal Airport. It is likely that Cle Elum will receive growing numbers of air taxi (charter) flights, as the Suncadia resort grows. Because Suncadia will serve more drive-in visitors than Sunriver, the proportion of operations by air taxi aircraft is not likely to be as high as the 12% at Sunriver. On the other hand, air taxi operations are likely to reach more than 3% of total operations, which is the proportion at

Bowers Field. This is because the luxury Suncadia Resort will provide more of a destination suited to air taxi operations than exists in Ellensburg.

Table 2K, Aircraft Operations Mix

Year	Air Taxi	Itinerant GA	Local GA
Current	0%	60%	40%
2005	1%	60%	39%
2010	3%	58%	39%
2015	4%	58%	38%
2020	5%	57%	38%
2025	6%	57%	37%

SELECTED FORECASTS

Table 2L presents the selected forecasts for based aircraft and aircraft operations. Based aircraft are projected to grow 4.2% annually and operations are projected to grow 4.3% annually. Table 2L's mix of based aircraft and aircraft operations and its forecast of instrument approaches are explained in the following section.

Table 2L, Cle Elum Municipal Airport Aviation Demand Forecasts

Year	Single Engine	Multi-engine	Light Sport	Total Based Aircraft	Air Taxi	Itinerant GA	Local GA	Total Operations	Inst. Approaches
Current	5	0	0	5	0	3,000	2,000	5,000	0
2005	5	0	0	5	51	3,120	1,995	5,115	0
2010	6	0	1	7	206	4,184	2,675	6,858	87
2015	8	0	1	9	345	5,341	3,273	8,614	111
2020	8	1	1	10	519	6,439	3,947	10,386	134
2025	10	1	1	12	731	7,673	4,506	12,179	159

Table 2L shows a forecast of the instrument approaches although 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 Cle Elum Municipal Airport will have an instrument approach in place by 2010. The forecast of instrument approaches follows the methodology in the Washington Aviation System Plan. Instrument weather is estimated to occur 9% of the time east of the Cascade Mountains and 13% of the time west of the Cascade Mountains. Because Cle Elum is in the Cascade Mountains, the 9% estimate may be low. On the other hand, instrument weather in Ellensburg occurs only 6.5% of the time, according to the Bowers Field Airport Master Plan Update. Because there is no actual weather data for Cle Elum, 9% is an adequate estimate. 46.1% of GA aircraft approaches are assumed instrument approaches, consistent with assumptions in the Washington Aviation System Plan.

AIRPORT REFERENCE CODE AND CRITICAL AIRCRAFT

The current and future critical aircraft is the Beech Baron 58 (5,500 pounds maximum takeoff weight). The current and forecast ARC for Cle Elum Municipal Airport is B-I (small), which covers the current and future critical aircraft. ARC B-I also includes many small business jets, such as some models of Learjet, Dassault Falcon 10, and the Rockwell Sabre 40/60, although some B-I jets have maximum takeoff weights that exceed 12,500 pounds.

Table 2M presents the breakdown of GA aircraft operations by Airport Reference Code (Aircraft Approach Category-Airplane Design Group) and weight.

Table 2M, Cle Elum Municipal Airport GA Operations Mix

Airport Reference Code	**A-I**	**B-I**	**B-I**
Takeoff Weight (pounds)	**Small (max. 12,500)**	**Small (max. 12,500)**	**13,000-19,000**
Current			
Local	98%	2%	0%
Itinerant	92%	8%	0%
2010			
Local	98%	2%	0%
Itinerant	91%	9%	0%
2015			
Local	98%	2%	0%
Itinerant	89%	10%	1%
2020			
Local	98%	2%	0%
Itinerant	84%	15%	1%
2025			
Local	98%	2%	0%
Itinerant	84%	15%	1%

AIRPORT PLANNING FORECAST RESULTS COMPARED WITH TAF

Table 2L compares the selected forecasts for Cle Elum Municipal Airport with the TAF numbers. The templates for comparing airport planning and TAF forecasts and for summarizing and documenting airport planning forecasts are attached to the end of this chapter. The selected forecasts are considerably higher than the TAF numbers. The base year data from the TAF is less than actual data, particularly the aircraft operations. In addition, the TAF projects no future growth in based aircraft or operations, while the selected forecasts project robust growth, due to the significant increase in average household income, the creation of a new luxury resort

destination, and 235% increase in population expected in the Upper Kittitas County over the forecast period.

Table 2N, Comparison of Selected Forecasts with Terminal Area Forecasts

	Based Aircraft Forecast			Operations Forecast		
Year	**TAF**	**Selected**	**Difference**	**TAF**	**Selected**	**Difference**
2005	4	5	25%	1,000	5,115	412%
2010	4	7	75%	1,000	6,858	586%
2015	4	9	125%	1,000	8,614	761%
2020	4	10	150%	1,000	10,386	939%

Recommended Operations Forecasts versus TAF

The recommended forecasts presented in this chapter are for planning purposes. The operations forecast with 4.3% growth rate has been selected as the recommended forecast for use in facilities programming associated with this airport layout plan study. However, the FAA does not accept the premise of an increased utilization rate since the rate exceeds FAA's recommended estimates of operations per based aircraft, and since actual traffic counts or other documentation from airport users is not available at this time. Therefore, it is important to note that the forecast presented are for planning purposes, however, the FAA will utilize a flat line operational count for their TAF projections.

The same premise applies to projected air taxi operations. The projections presented in Tables 2L and 2L are for planning purposes, however until air taxi operations are conducted at Cle Elum Municipal Airport, the FAA TAF will utilize a flat line trend.

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 forecast 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 these may be needed to accommodate forecast demands. Having established these facility requirements, alternatives for providing these facilities will be evaluated to determine the most cost-effective and efficient means for implementation.

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 and Approach Aids
Lighting, Marking, and Signage
Security Fencing
Weather Reporting

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

General Aviation Terminal
Aircraft Hangars and Parking Aprons
Auto Parking and Access
Airport Support Facilities

PLANNING HORIZONS

The cost-effective, safe, 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 Cle Elum Municipal Airport 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 important that the plan accommodate these changes so that the Airport can respond to unexpected changes in a timely fashion. These milestones provide flexibility, while potentially extending the 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 aircraft activity category.

TABLE 3A: Aviation Demand Planning Horizons

Demand Category	Current	Short Term (2010)	Intermediate Term (2015)	Long Term (2025)
Operations				
Local	2,000	2,675	3,273	4,506
Itinerant	3,000	3,978	4,996	6,942
Air Taxi	0	206	345	731
Total	5,000	6,858	8,614	12,179
Based Aircraft	5	7	9	12

Note: Itinerant forecast includes air taxi operations

AIRFIELD REQUIREMENTS

Airfield requirements include the need for those facilities related to the arrival and departure of aircraft. The adequacy of existing airfield facilities at Cle Elum Municipal Airport have 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

In order to determine facility requirements, the Airport Reference Code (ARC) and approach visibility minima must be referred to in order for the appropriate airport design criteria to be applied. As discussed in Chapter Two, the existing ARC for Cle Elum Municipal Airport is B-I (small) and the critical aircraft is a Beech Baron 58. The forecasts anticipate the Airport maintaining the current operational fleet mix, which will continue to place the Airport in the B-I (small) category. 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).

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 allowed 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.

As shown in **Table 3B**, the runway width is 20 feet short of the 60-foot standard, the RSA width is 54 feet short of the 120-foot standard, the RSA length beyond Runway 7 end is 100 feet short of the 240-foot standard, the RSA length beyond Runway 25 end is 100 feet short of the 240-foot standard, the OFA width is 110 feet short of the 250-foot standard, the OFA length beyond Runway 7 end is 92 feet short of the 240-foot standard, the OFA length beyond Runway 25 end is 60 feet short of the 250-foot standard. There are several buildings too close to the runway that

are penetrating the 14 CFR Part 77 Surfaces. Options for addressing how to meet the FAA's standards for the airfield are discussed in the Development Alternatives section of this report.

Table 3B - Airport Design Standards

Design Feature	Existing (feet)	Standard B-I (small) (feet)
Runway Width	40	60
Runway Centerline to Parallel Taxiway Centerline Separation	150	150
Runway Safety Area (RSA)		
-Width	66	120
-Runway 7 Length beyond runway end	140	240
-Runway 25 Length beyond runway end	140	240
Runway Object Free Area (OFA)		
-Width	140	250
-Runway 7 Length beyond runway end	148	240
-Runway 25 Length beyond runway end	180	240
Runway Obstacle Free Zone (OFZ)		
-Width	140	250
-Runway 7 Length beyond runway end	148	200
-Runway 25 Length beyond runway end	180	200
Runway Protection Zones	250 x 1,000 x 450	250 x 1,000 x 450
Threshold Siting Surface Runway 7*		
-Distance out from threshold to start of surface	0	0
-Width at start of trapezoid	250	250
-Width at end of trapezoid	700	700
-Length of trapezoidal section	2,250	2,250
-Length of rectangular section	2,750	2,750
-Slope of Surface	20:1	20:1
Threshold Siting Surface Runway 25*		
-Distance out from threshold to start of surface	0	200
-Width at start of trapezoid	250	400
-Width at end of trapezoid	700	3,800
-Length of trapezoidal section	2,250	10,000
-Length of rectangular section	2,750	0
-Slope of Surface	20:1	20:1
Taxiway Width	30	25
Taxiway Safety Area Width	N/A	49
Taxiway Object Free Area Width	N/A	89
Type of Instrument Approach	None	None
Instrument Approach Visibility Minimums	> 1 mile	> 1 mile

Sources: Existing – W& H Pacific, Inc.
Standard – FAA AC 150/5300-13, Change 9
**Threshold Siting Surface Standards from AC 150/5300-13, Change 9, Appendix 2, Runway Type 5. Not based on Category B-I (small) standards.*

RUNWAYS

The adequacy of the existing runway system at Cle Elum was analyzed from a number of perspectives, including airfield capacity, runway orientation, runway length, runway width, and pavement strength. From this information, requirements for runway improvements were determined for the airport.

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 airfield capacity at Cle Elum Municipal Airport, the Advisory Circular 150/5060-5, Airport Capacity and Delay was referenced. A typical airport with a single runway configuration and a parallel taxiway has an annual capacity of 230,000 operations. Because Cle Elum does not have a parallel taxiway and back taxiing is required, it is estimated that the runway has an annual capacity of about 100,000 operations.

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). Cle Elum has a single runway (Runway 07-25) oriented east-west.

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.

No current wind data was available for Cle Elum. The closest available wind data is located at the Stampede Pass Weather Station and this location is too far from the airport to assume similar wind information. At nearby airfield, Bowers Field, the primary runway, Runway 11-29, meets the 95% wind coverage. The weather patterns and topography of Cle Elum are different from Bowers Field, so the runway orientations may not be the same. In discussions with current airport users, the existing runway orientation has not been considered an issue due to the wind patterns. The airport may wish to collect wind information over the next year to confirm wind information and runway orientation.

Glider Operations

The airport also has a turf area currently used as a runway for glider operations. This is located on the south side of Runway 7-25, west of the midfield connector taxiway. The glider launch

equipment must be outside of the Runway Safety Area and Runway Object Free Area at all times. Maintaining the launch equipment within these areas create an unsafe condition and do not meet FAA requirements. In order to meet FAA standards, gliders will need to be launched using a different method or the equipment will need to be moved so that it is outside of the Runway Safety Area and the Taxiway Object Free Area. Also, the airport must develop Airport Rules and Regulations to restrict simultaneous runway operations. At the time the parallel taxiway is constructed all glider operations in this area will have to either cease to continue or be relocated elsewhere.

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 each of these factors 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 airport elevation is 1,946 feet above mean sea level (MSL) and the mean maximum temperature of the hottest month is 80 degrees Fahrenheit (F). Runway elevation varies by approximately 6 feet along Runway 07-25.

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 3C** summarizes FAA's generalized recommended runway lengths for Cle Elum. (See Appendix C for print out of recommended runway lengths).

As shown in the table, the current runway length of 2,552 feet accommodates less than 75% of small aircraft operating at Cle Elum. An extension to 3,060' would accommodate 75% of small aircraft, an extension to 3,660 feet would accommodate 95% of small aircraft, and an extension to 4,260' would accommodate 100% of small aircraft. A runway extension will be evaluated in the development alternatives section of the report. The recommended runway length will be 3,060 feet.

It should be noted that the existing 2,552' runway has 130' displaced thresholds at each end due to the inadequate safety area lengths beyond the runway ends. In addition, since the displaced thresholds still do not provide the required safety area lengths beyond the runway ends, declared distances for accelerate-stop distance available (ASDA) and landing distance available (LDA) are 2,322 feet and 2,092 feet respectively.

Table 3C - Runway Length Requirements: Cle Elum Municipal Airport

AIRPORT AND RUNWAY DATA	
Airport elevation	1,946 feet
Mean daily maximum temperature of the hottest month	80° F
Maximum difference in runway centerline elevation	6 feet
Wet and slippery runways	
RUNWAY LENGTHS RECOMMENDED FOR AIRPORT DESIGN	
Small airplanes with approach speeds of less than 30 knots	360 feet
Small airplanes with approach speeds of less than 50 knots	960 feet
Small airplanes with less than 10 passenger seats	
To accommodate 75 percent of these small airplanes	3,060 feet
To accommodate 95 percent of these small airplanes	3,660 feet
To accommodate 100 percent of these small airplanes	4,260 feet
Small airplanes with 10 or more passenger seats	4,470 feet

Reference: FAA's airport design computer software utilizing Chapter Two of AC 150/5325-4A, *Runway Length Requirements for Airport Design*, no changes included.

RUNWAY WIDTH

The width of the existing runway was also examined to determine the need for facility improvements. Runway 07-25 currently has a width of 40 feet. According to FAA Standards, the minimum runway width for ADG I, category A and B, visual and non precision runways is 60 feet. It is recommended that Runway 07-25 be widened to 60 feet to meet ADG I standards.

RUNWAY PAVEMENT STRENGTH

The most important feature of airfield pavement is its ability to withstand repeated use by aircraft of significant weight. At Cle Elum Municipal Airport, this includes a wide range of general aviation aircraft including small engine and multi-engine aircraft. The current runway strength is not known. It has been reported at 7,000 lbs. It is recommended that Runway 07-25 be strengthened to provide a strength-rating of 12,500 lbs.

RUNWAY SAFETY AREA

There are currently ditches within the runway safety area that limit the width to 66'. This should be expanded to an FAA standard width of 120' by regrading the ditches and installing drainage pipe and structures as needed. This will require an evaluation of the current site drainage that currently flows under the runway from the hill on the north side of the runway.

The runway safety area currently extends 140' beyond the Runway 25 end. This should be extended to a FAA standard 240' by property acquisition or further displacement of the threshold to bring the RSA into compliance.

Similarly, the runway safety area currently extends 140' beyond the Runway 7 end. This should be extended to a FAA standard 240' by property acquisition or further displacement of the threshold to bring the RSA into compliance.

TAXIWAYS

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 at an airport to provide safe and efficient use of the airfield.

Taxiway width is determined by the ADG of the critical aircraft to use the taxiway. As previously mentioned, the most demanding aircraft to use the airfield fall within ADG I. According to FAA design standards, the minimum taxiway width for ADG I is 25 feet. Cle Elum is served by a midfield connector taxiway (Taxiway A) with a length of 375 feet and a width of 30 feet. Taxiway A is asphalt surfaced and generally in poor condition, with signs of failure of the subgrade in some areas. The taxiway should be reconstructed to a width of 25 feet.

The airport does not currently have a parallel taxiway. Aircraft currently use the turnaround pads at each end of the runway. These turnarounds do not meet current FAA design standards; the turnaround should be located far enough from the runway so that an aircraft can remain behind the hold line. Using Design Group I standards, the turnaround should be located a minimum of 150' to the side of the runway centerline.

It is recommended that a full length parallel taxiway be constructed. If a parallel taxiway is constructed, it should be a minimum of 25' wide, located a minimum of 150' from the runway centerline to taxiway centerline, per Design Group I standards.

The airport also has a gravel taxilane used to access the aircraft hangar area. This taxilane should be reconstructed with asphalt pavement.

NAVIGATIONAL AND APPROACH AIDS

As discussed in Chapter One, Cle Elum does not currently have any navigational or approach aids. However, pilots flying into or out of Cle Elum can utilize NAVAIDS at nearby airports. A Very High Omnidirectional Frequency Range/Tactical Air Navigation device (VORTAC) is available at Bowers Field in Ellensburg.

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 that are provided.

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 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.

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 8.

The minimum runway length of an instrument approach is 3200', although runways as short as 2400' could support an instrument approach provided the lowest HAT is based on clearing any 200' obstacle within the final approach segment.

The FAA Flight Procedures Offices has determined that a straight-in, non precision approach procedure is feasible for both runway ends. Implementing a straight-in approach would require the Airport to have a 500' primary surface width. It is recommended that the Airport implement a GPS approach to Runway 25 with visibility minimums equal to or greater than one statute mile. The approach was designated to Runway 25, as this is the predominant approach end when instrument approach conditions are present.

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

Cle Elum is equipped with a lighted airport beacon to assist pilots in locating the airport at night. The existing beacon is in poor condition and should be replaced.

Runway and Taxiway Lighting

Airport lighting systems provide critical guidance to pilots during nighttime and low visibility operations. Runway 07-25 is equipped with medium intensity runway lighting (MIRL). This existing system includes direct-buried cable and stake mounted fixtures, and is currently out of service. This should be replaced with an FAA-standard lighting system. This would include lights mounted in base cans and cable installed in conduit.

Effective ground movement of aircraft at night is enhanced by the availability of taxiway lighting. The existing connector taxiway has edge reflectors. Implementing a GPS approach at the airport will require the installation of taxiway edge lights.

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. Both ends of the runway previously had 2-box Precision Approach Path Indicators (PAPI). The eastern PAPI's have been removed and are currently in storage. Both sets of PAPI's are out of service, and should be either repaired or replaced.

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 (R.E.I.L.s). There are no REILs available at the airport at this time. It is recommended that REILs be installed on both runway ends.

Pilot-Controlled Lighting

Cle Elum is equipped with pilot-controlled lighting (PCL). PCL allows pilots to activate the lighting systems at the Airport using the radio transmitter in the aircraft. This system should be maintained through the planning period.

Airfield Signage

Airfield signage is used to identify 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. Cle Elum currently has one hold sign and one Distance Remaining Sign. There are currently no lighted directional signs at the airport. It is recommended that directional signs should be installed on the existing connector taxiway, and directional and hold signs be installed if parallel taxiway and connector taxiways are constructed. During installation of a new runway lighting system, lighted Distance to go and hold signs are recommended.

Pavement Markings

Runway markings are designed according to the type of instrument approach available on the runway. FAA Advisory Circular 150/5340-1, *Standards for Airport Markings*, provides the guidance necessary to design airport markings. Runway 07-25 is currently marked for visual approaches to the Airport. It has been reported that the existing markings are barely visible from the ground. If the runway remains a visual runway, these markings should be restriped and maintained through the planning period. If the runway becomes a non-precision approach runway, non-precision markings should be applied. This will include the addition of threshold markings.

The existing connector taxiway's markings should also be maintained. The connector taxiway should also be marked with runway/taxiway hold lines.

WEATHER REPORTING

Cle Elum 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 ATCT.

An approved altimeter source will be required for a GPS approach. The airport should plan for installation of an Automated Weather Observing System (A.W.O.S.), which will provide this information. Installation of an AWOS will require additional height restrictions within a 500' radius and clearing of existing trees may be required to meet the AWOS standards.

A superunicom can also provide the altimeter source, and does not have the height restrictions of an AWOS.

LANDSIDE REQUIREMENTS

Landside facilities include hangars, aircraft apron, aircraft tiedowns, and automobile parking. 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.

GENERAL AVIATION TERMINAL BUILDING

The airport has a 240 square foot building that is used as a pilot's lounge. This building has restrooms and a telephone. This building could be expanded for additional space for airport management and storage.

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 tiedowns.

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. It is worth noting that hangar development should be based on actual demand trends and financial investment conditions, not solely on forecasts.

There are currently five hangar buildings on the airport. The airport forecast shows growth in based aircraft from five to twelve by the year 2025. However, the airport manager has estimated that there could be as many as twelve based aircraft as early as next year, based on his conversations with potential hangar owners.

Potential hangar layouts are shown in the "Development Alternatives" section of this chapter. The layouts include more hangar space than is necessary based on the forecasting although providing location for additional hangars creates a system of development at the airport.

AIRCRAFT PARKING APRON

The FAA recommends that tiedown space be provided for all based aircraft not stored in hangars. The existing tiedown apron is a well-graded grass area located west of Taxiway A. The tiedown apron is used generally for itinerant aircraft, as currently all based aircraft are housed in the hangar buildings. This tiedown apron could be replaced with an asphalt pavement tiedown apron for both itinerant and based aircraft.

Transient Aircraft Tiedowns

In regard to transient aircraft tiedowns, the FAA has developed an approach for determining the number of tiedowns 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: $\{[(7{,}673 \times 0.5) \div 12] \div 30\} \times 0.5 = 6$

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

VEHICLE PARKING

Vehicular traffic uses Airport Road to access the airport's facilities. Prior to entering through the automobile gate along the airport access road, there is a gravel parking lot that can be used by automobile traffic. It is typical at general aviation airports, such as Cle Elum Municipal Airport, for pilots to park their vehicles in their hangars while utilizing their aircraft. For this reason, it is not necessary to provide parking for the same number of vehicles as the number of based aircraft. A designated automobile parking lot will reduce the need for vehicles to drive on aircraft movement areas; it will also provide a location for airport patrons and transient traffic to park their vehicles. It is recommended that a parking lot be constructed to accommodate approximately forty vehicles. Future tiedown spaces are proposed, so these pilots will need space for parking, both aircraft using hangars and tiedown spaces may have passengers who will need parking space, and maintenance personnel need parking space. Planning standards use a ratio of about 44 square yards per vehicle. Using this ratio, an area of approximately 1760 square yards is needed to accommodate twenty vehicles.

HELICOPTER FACILITIES

There are no existing helicopter pads located on the airport. It is recommended that a paved helicopter parking facility be constructed to accommodate four helicopters. FAA Advisory Circular 150/5390-2B, *Heliport Design*, provides the guidance necessary to design a helicopter parking facility. All proposed heliports must be given an on-site operational evaluation by operations specialists or inspectors.

SUPPORT FACILITIES

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

PILOTS' LOUNGE

There is currently a pilots' lounge at the airport. It is recommended that the pilot's lounge be reconstructed to accommodate flight planning and a future vending machine, as funds become available.

AIRCRAFT RESCUE AND FIREFIGHTING

Aircraft Rescue and Firefighting (ARFF) is not a required service at Cle Elum Municipal Airport. In the event of an emergency, these services are provided by Kittitas County and the City of Cle Elum Police Department. This will be adequate through the planning period.

AIRPORT MAINTENANCE/STORAGE FACILITIES

The City maintains the Airport utilizing equipment that is stored off-site and will continue to do so over the next 20 years.

AVIATION FUEL STORAGE

There are currently no fueling facilities available on the airport. It is recommended that fueling facilities be constructed at the airport.

FENCING

There is currently not a complete perimeter fence around the airport; however, there is a section of fencing at the runway 7 end and at the east side of the airport on adjacent property. In addition there is a 3-strand barb wire fence and gate separating landside and airside traffic along the airport access road. Although neither the FAA nor the TSA requires fencing of the airport, it is recommended to enhance safety and security. The installation of a new perimeter fence would aide in keeping wildlife off airport property, limit pedestrian access and create a visual property

line for the airport.

UTILITIES

Power and teleophone are currently available on the airport in the pilots' lounge. Water and sewer services are provided by the City of Cle Elum. These utilities are adequate for the planning period.

SUMMARY

The intent of this chapter has been to outline the facilities required to meet potential aviation demands projected for Cle Elum through the long term planning horizon. The next step is to develop alternatives that best meet these projected needs.

Based on the facility requirements, five alternatives were created. The alternatives are shown in **Exhibit 3A** (Alternative 1), **Exhibit 3B** (Alternative 2), **Exhibit 3C** (Alternative 3), **Exhibit 3D** (Alternative 4), **Exhibit 3E** (Alternative 5) and are described below.

AIRSIDE DEVELOPMENT

Alternative 1 proposes the following airside development:

- The runway would be widened from the current 40' width to a standard 60' width.
- Acquire the land in the Runway Safety Area.
- The Runway Safety Area would be expanded from the current 66' width to a standard 120' width by regrading the adjacent ditches and installing storm drainage improvements as needed.
- These improvements would bring the airport to current FAA dimensional standards for the safety area. The airport would not meet OFA, OFZ, and RPZ standards. A modification to standards would be required for those elements.

Alternative 2 proposes the following airside development:

- Avigation easements for the Runway Protection Zones would be acquired.
- The Runway Safety Area would be expanded from the current 66' width to a standard 120' width by regrading the adjacent ditches and installing storm drainage improvements as needed.
- The runway would be widened from the current 40' width to a standard 60' width.
- The Runway 25 threshold would be relocated to obtain a standard safety area behind the threshold. The pavement behind the threshold would be removed.
- The Runway 07 threshold would be relocated to obtain a standard safety area behind the threshold. The pavement behind the threshold would be removed.
- The ASDA and LDA would be reduced.
- A standard turnaround would be constructed at each runway end.
- Land would be reserved for future construction of a parallel taxiway. This area would meet FAA standards for runway-taxiway centerline separation. New taxilanes would be constructed as shown. The northernmost taxilane would be spaced far enough from the runway such that if a parallel taxiway was ever constructed, the taxilane would meet FAA standards for taxiway-taxilane separation.
- The area south of the Runway would be designated as a glider operations area.
- The existing airport beacon would be replaced.
- The existing lighting system would be replaced with a FAA standard Medium Intensity Runway Edge Lighting system.
- Taxiway edge reflectors would be installed.
- The existing 2-box Precision Approach Path Indicator would be repaired or replaced.
- Non-lighted hold signs would be installed at each connector taxiway.
- A Super Unicom would be installed to provide altimeter data.
- The segmented circle would be relocated to accommodate development.
- These improvements would bring the airport to current FAA dimensional standards. A modification to standards would not be required.

Alternative 3 proposes the following airside development:

- The land in the Runway Protection Zone would be acquired.
- The Runway Safety Area would be expanded from the current 66' width to a standard 120' width by regrading the adjacent ditches and installing storm drainage improvements as needed.
- The runway would be extended from the current length of 2,552 feet to 3,060 feet. This would accommodate 75% of small aircraft at the airport.
- The runway would be widened from the current 40' width to a standard 60' width.
- A 25' wide parallel taxiway would be constructed.
- The existing airport beacon would be replaced.
- The existing lighting system would be replaced with a FAA standard Medium Intensity Runway Edge Lighting system.
- A Medium Intensity Taxiway Edge Lighting System would be installed.

- The existing 2-box Precision Approach Path Indicator's would be repaired or replaced.
- Lighted hold signs would be installed at each connector taxiway.
- Distance Remaining Signs would be installed.
- An Automated Weather Observing System would be installed to provide weather reporting data.
- The segmented circle would be relocated to accommodate development.
- These improvements would bring the airport to current FAA dimensional standards. A modification to standards would not be required.

Alternative 4 proposes the following airside development:

- The land in the Runway Protection Zone would be acquired.
- The Runway Safety Area would be expanded from the current 66' width to a standard 120' width by regrading the adjacent ditches and installing storm drainage improvements as needed.
- The runway would be extended from the current length of 2,552 feet to 3,060 feet. This would accommodate 75% of small aircraft at the airport. Extension is to the west
- The runway would be widened from the current 40' width to a standard 60' width.
- A 25' wide parallel taxiway would be constructed.
- The existing airport beacon would be replaced.
- The existing lighting system would be replaced with a FAA standard Medium Intensity Runway Edge Lighting system.
- A Medium Intensity Taxiway Edge Lighting System would be installed.
- A straight-in, non-precision approach would be developed. This would increase the primary surface width to 500', which could increase the penetrations to the Part 77 surfaces.
- The existing 2-box Precision Approach Path Indicators would be repaired or replaced.
- Lighted hold signs would be installed at each connector taxiway.
- Lighted Distance Remaining Signs would be installed.
- An Automated Weather Observing System would be installed to provide weather reporting data.
- The segmented circle would be relocated to accommodate development.
- These improvements would bring the airport to current FAA dimensional standards. A modification to standards would not be required.

Alternative 5 proposes the following airside development:

- The land in the Runway Protection Zone would be acquired.
- The Runway Safety Area would be expanded from the current 66' width to a standard 120' width by regrading the adjacent ditches and installing storm drainage improvements as needed.
- The runway would be extended from the current length of 2,552 feet to 3,060 feet. Extension is to the west and east.
- The runway would be widened from the current 40' width to a standard 60' width.
- A 25' wide parallel taxiway would be constructed.

- The existing airport beacon would be replaced.
- The existing lighting system would be replaced with a FAA standard Medium Intensity Runway Edge Lighting system.
- A Medium Intensity Taxiway Edge Lighting System would be installed.
- A straight-in, non-precision approach would be developed. This would increase the primary surface width to 500', which could increase the penetrations to the Part 77 surfaces.
- The existing 2-box Precision Approach Path Indicator's would be repaired or replaced.
- Lighted hold signs would be installed at each connector taxiway.
- Distance Remaining Signs would be installed.
- An Automated Weather Observing System would be installed to provide weather reporting data.
- The segmented circle would be relocated to accommodate development.
- These improvements would bring the airport to current FAA dimensional standards. A modification to standards would not be required.

LANDSIDE DEVELOPMENT

Alternative 1 includes only the improvements required to bring the airport to current FAA standards. There are no proposed landside developments associated with Alternative 1.

Alternative 2 proposes the following landside development:

- The south side of the airport would be developed with a mix of Nested T-hangars and 50' box hangars. A total of 35 T-hangars and 14 box hangars are proposed.
- A Fixed Base Operator building would be constructed near the entrance to the airport.
- A service building would be constructed on the west side of the airport.
- Tiedown areas would be constructed adjacent to the proposed hangars.

Alternative 3 proposes the following landside development:

- The south side of the airport would be developed with 50' box hangars. Twenty hangar units are proposed.
- A tiedown apron would be constructed north of the existing hangar buildings.
- The pilot's lounge would be expanded to provide additional space for flight planning and storage.

Alternative 4 proposes the following landside development:

- The south side of the airport would be developed with 50' box hangars. Twenty hangar units are proposed. The hangars would be set back further to the south to accommodate the future 500' wide primary surface.
- A tiedown apron would be constructed east of the proposed hangar buildings.

- The pilot's lounge would be expanded to provide additional space for flight planning and storage.
- The existing entrance road and automobile parking lot would be relocated as necessary to accommodate the proposed development.

Alternative 5 proposes the following landside development:

- The south side of the airport would be developed with 50' box hangars. Twenty hangar units are proposed. The hangars would be set back further to the south to accommodate the future 500' wide primary surface.
- Two 50' by 50' rectangular hangars would be constructed at the south side of the airport.
- A tiedown apron would be constructed east of the proposed hangar buildings.
- The pilot's lounge would be expanded to provide additional space for flight planning and storage.
- The existing entrance road and automobile parking lot would be relocated as necessary to accommodate the proposed development.

Each of the five alternatives were evaluated with respect to airside and landside development needs.

Alternative Number 1 widens the runway to meet current FAA standards but does not lengthen the runway to provide a runway length that would accommodate 75% of small aircraft. Also, it provides for widening and lengthening the RSA to meet FAA standards. Additional land at each end of the runway would need to be acquired to lengthen the RSA. The alternative did not include property acquisition to provide for compliance with FAA requirements with respect to the OFA, OFZ, and RPZ, and therefore would require modification to standards. In addition, the alternative did not include proposed landside development. Alternative Number 1 was eliminated because it would require a modification to FAA standards and did not provide the desired runway length. The FAA recommends that runway lengths accommodate at least 75% of the aircraft that use it. In addition, if the FAA is investing a substantial amount of money in an airport, a minimum runway length of 3000' is preferred.

Alternative Number 2 widened the runway and the RSA to meet FAA requirements. In order to provide the required RSA length without acquiring additional property, the runway thresholds at each end were relocated, thus reducing the runway length. Landside improvement included adding hangars, an FBO building, a service building, and additional tiedowns. Alternative Number 2 was eliminated because it reduced the length of the existing runway, therefore it would not meet the needs of the existing and forecast aircraft utilizing the Cle Elum Airport.

Alternative Number 3 widens and lengthens the existing runway and adds a parallel taxiway. The runway is lengthened at the west end. Property acquisition is necessary at the west end for the runway extension, RSA, OFA and RPZ, as well as, the east end for the RSA, OFA and RPZ. This alternative includes one residence located in the RPZ at the west end. Landside improvement included adding hangars, tiedowns, and expanding the pilot's lounge. Alternative Number 3 was not chosen because it did not include a non-precision approach for Runway 25.

Alternative Number 4 includes everything in Alternative 3, as well as, a non-precision approach for Runway 25 and the entrance road and vehicle parking improvements included in Alternative Number 5.

Alternative Number 5 widens and lengthens the existing runway and adds a parallel taxiway. The runway lengthening is achieved by extending the runway east and west. Property acquisition is necessary at each end for the runway extension, RSA, OFA, and RPZ. This alternative does not include the residence located in the RPZ at the west end as in Alternatives Number 3 and 4. Landside improvement included adding hangars, tiedowns, expanding the pilot's lounge, and relocating the existing entrance road and vehicle parking. Alternative Number 5 was eliminated because the Technical Advisory Committee (TAC) determined that the property owner at the east end of the runway was only willing to sell a small portion of land. As a result, the only way to acquire the property would be through eminent domain which was not a desired course of action.

PREFERRED ALTERNATIVE

Alternative Number 4 has been selected as the preferred alternative for airside improvements. A combination of several alternatives was chosen for landside improvements. Alternative 4 provides the greatest long term flexibility to the airport, extends the runway length, constructs a parallel taxiway, provides for future aircraft tiedown locations, provides for a non-precision approach, and allows the airport the greatest amount of landside expansion of the five alternatives presented.

This alternative also meets the FAA design standards for runway width, runway safety area and object free area, and maintains a clear approach to the runway. Again, the proposed runway length of 3,060 feet meets the FAA's criteria of airport runways meeting the length requirements for 75% of aircraft operations in their ARC category. Additionally, the runway length of 3,060 feet meets local FAA guidance to improve general aviation facilities to at least 3,000 feet.

The preferred alternative differs slightly from Alternative Number 4, as the land in the RPZ may have an avigation easement or property acquisition. Property will need to be acquired for the extension of the runway at the west end and at each runway end for the Runway Safety Area and Object Free Area. In order to avoid acquiring property at the east end of the runway, the runway would need to be shifted at least 160' to the west. Currently, there is one residence located in the proposed RPZ. Shifting the runway would place another residence in the RPZ, which was not desirable. During the preparation of the ALP, TAC members met with the property owner to the east of the airport and reported back that the land owner may be willing to sell a small portion of

land to accommodate the airport's safety improvement project.

As reference above, this alternative includes a full-length parallel taxiway. If funding is not available to construct the taxiway at the same time the runway is reconstructed, turnarounds can be constructed at each end of the runway until additional funding is obtained. Additionally, the taxiway could be constructed in two or more phases, based on available funding.

A 20' by 30' pilots' lounge will be constructed to accommodate flight planning, vending and storage. Also, the following will be constructed in addition to proposed landside development, two vehicle parking areas, four T-Hangars, three rectangular 50' by 50' hangars, a fuel pad, two tie down aprons and an FBO building will be constructed. This preferred alternative is depicted in **Exhibit 3F** and will be used as the basis for completing the ALP set.

Chapter Four
AIRPORT PLANS

The airport plans are one of the last steps in the development of an airport layout plan report. They are a pictorial representation and summarization of the efforts made in the airport layout planning process. The previous chapters on Inventory, Forecasting, and Facility Requirements/Alternatives and the reviews provided by the Airport Advisory Committee supply the basis for the existing and future airport layouts that are shown in the airport layout drawings. As was previously discussed, the development at an airport should rely more on actual demand rather than a time-based forecast. The development shown in the airport plans reflects planned development, but the course and timing of this development must be carried forward as airport activity demands rather than in the exact form it has been presented.

AIRPORT LAYOUT PLAN DRAWING SET

COVER SHEET

The cover sheet shows both the location and the vicinity map for Cle Elum. A sheet index to the airport layout plan drawing set is also provided on this sheet.

AIRPORT LAYOUT PLAN DRAWING

The airport layout plan depicts the current airport layout and the proposed improvements to the airport for the 20-year planning period. Descriptions of the improvements and costs over the next 20-years are included in *Chapter 5, Capital Improvements Projects (CIP)*. As previously mentioned, the needs defined in the Facility Requirements/Alternatives (Chapter 3) and the

reviews provided by the Advisory Committee were the basis for determining the proposed improvements at Cle Elum. The future airport development is shown on the airport layout plan as required by the FAA. The plan can be modified to accommodate development as dictated by demand.

Runway visibility minimums, runway protection zones, object free areas, safety areas and other standard airport dimensions are shown in the plan and in the runway data tables. Other tables include an airport data table, buildings/facilities table, and a non-standard conditions and disposition table.

AIRPORT AIRSPACE DRAWING

This drawing shows the Part 77 Imaginary Surfaces for the future layout of Cle Elum with a USGS map as the background. Airport imaginary surfaces consist of five different types of surfaces. The surface shapes and dimensions as they apply to Cle Elum are as follows:

Primary Surface: A rectangular surface with a width (centered on the runway centerline) that varies for each runway and a length that extends 200 feet beyond each end of the runway. The elevation of the primary surface corresponds to the elevation of the nearest point of the runway centerline. The ultimate width of the primary surface of Runway 7-25 is 500 feet.

Approach Surface: A surface centered on the extended runway centerline, starting at each end of the primary surface (200 feet beyond each end of the runway), at a width equal to that of the primary surface and an elevation equal to that of the end of the runway. The approach surfaces at Cle Elum reflect non-precision approach on Runway 25 end and a visual on Runway 7 end. The surface extends at a horizontal distance of 5,000 feet at a slope of 20:1 for Runway 7 and 25 ends, to a width of 1,250 feet at the Runway 7 end and to a width of 2,000 feet at the Runway 25 end.

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

Horizontal Surface: An elliptical surface at an elevation 150 feet above the established airport elevation created by swinging arcs of a 10,000-foot radius from the center of each end of the primary surface.

Conical Surface: A surface extending outward and upward from the horizontal surface at a slope of 20:1 for a horizontal distance of 4,000 feet.

It is ideal to keep these surfaces clear of obstructions whenever possible. The Part 77 surfaces are the basis for protection of the airspace around the airport. Obstructions to these surfaces are identified in the Obstruction Data Tables (on sheets 3 and 4), along with the plan to address the described obstructions. Obstructions to the Part 77 surfaces were determined based on a review of the USGS map and a preliminary survey of obstructions performed by W&H Pacific and RLW Consulting in 2004. Past obstruction removal and the FAA 5010 form were also used to identify the existing obstructions. Obstruction removal has been incorporated into the capital improvement program.

INNER PORTION OF THE APPROACH SURFACE DRAWING

This drawing provides a plan and profile view of any obstructions within the primary and approach surfaces of the runway. Obstruction Data Tables with proposed dispositions are included for both existing and future scenarios.

LAND USE PLAN DRAWING

A land use plan has been developed for the airport and the surrounding area. This plan includes the zoning on and around the airport per Chapter 17 (zoning) of the Kittitas County Code.

In general, land use concerns associated with the areas around airports fall into one of the following categories:

- Lighting
- Glare, Smoke and Dust
- Bird Attractions/Landfills
- Airspace Obstructions and Height Restrictions
- Electrical Interference
- Concentrations of People
- Noise Impacts

Any of these activities can create safety concerns for airport users and people on the ground or can be impacted adversely by airport operations. It is important that these issues be addressed in the land use zoning and development around an airport.

EXHIBIT A DRAWING

An Exhibit A drawing has been prepared depicting existing property ownership and future land acquisition and avigation easement areas.

Chapter Five
CAPITAL IMPROVEMENT PROJECTS

Through the evaluation of the facility requirements and the development of the airport layout plan, the improvements needed at Cle Elum 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 improving existing facilities and removing obstructions:

1. Land Acquisition (Runway 7 and 25 Runway ends)
2. Environmental Assessment/Preliminary Design (Includes assessment for standard RSA, land acquisition, clear approach, standard runway length and width, and relocation of drainage ditch)

3. New Runway Construction/Extension
4. Removal of Part 77 Tree Obstructions
5. Construct Helicopter Pads
6. Install AWOS
7. New Taxiway Construction
8. Construct New Rectangle Hangar Buildings

Phase II

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

9. Relocate Segmented Circle
10. Construct New Tie Down Apron
11. Fuel Storage
12. Installation of REIL's on both runway ends
13. Install Perimeter Fence
14. Install PAPI
15. New Taxilane Construction
16. Construct New Rectangle Hangar Buildings
17. Remodel/Expand Pilots Lounge
18. Construct Parking Lot
19. Replace Airport Beacon
20. Install Access Control System
21. Pavement Maintenance

Phase III

Phase III is the last ten years of the planning period, 2016 – 2025. These projects include:

22. Construct New Tie Down Apron
23. Construct Parking Lot
24. New Taxilane Construction
25. Construct New T-Hangar Buildings
26. Construct New Rectangle Hangar Buildings
27. Construct New FBO Building
28. Update ALP
29. Construct Airport Access Road
30. Construct Gravel Road Surrounding Airport

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. No water or septic service costs were 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 City of Cle Elum, 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%.