Chapter 2

Existing Conditions Analysis

The existing conditions analysis documents existing facilities and conditions that affect airfield operations and development within the context of the regional setting, landside, airside, and administrative functions of the Airport. The existing conditions analysis utilized the 2010 Airport Master Plan and other subsequent work product in addition to numerous meetings with tenants, stakeholders, and City staff, to support the effort. The findings documented in the Existing Conditions Analysis chapter will be used to support subsequent studies and recommendations throughout the development of the master plan.

Regional Setting

The Regional Setting section is comprised primarily of the those features that provide a better understanding of the social, economic, and environmental impacts airports can have in a region, county, and city. This section of the existing conditions analysis includes a discussion of the location & vicinity of the Madras Municipal Airport, as well as the socio-economic conditions, airport history, airport role, area airports, historic airport operations, relevant studies, environmental data, local surface transportation, and land use on-and-around the Airport.

LOCATION & VICINITY

Madras is located in Jefferson County in Central Oregon. Jefferson County has a land area of 1,791 square miles that extends eastward from the crest of the Cascade Range. Madras is the county seat and the largest incorporated city in Jefferson County. Other incorporated cities in Jefferson County include Culver and Metolius.

U.S. Highways 97 and 26 are major travel routes through Oregon that converge in Madras. Highway 97 extends north and south, and is a primary travel route between Washington and California. Highway 26 extends from U.S. Highway 101, near Canon Beach and travels through Portland, before continuing eastward to Madras, and south and east into Idaho. Driving distances from Madras to nearby cities include: 26 miles to Redmond; 29 miles to Prineville; and 43 miles to Bend. More distant cities include The Dalles (87 miles); Portland (120 miles); John Day (145 miles); Klamath Falls (180 miles); and Boise (350 miles).

The eastern section of Madras Municipal Airport, including the airport industrial park, is located within the City of Madras city limits and urban growth boundary (UGB). The remaining portion of the Airport, including the entire runway-taxiway system, is located outside the Madras UGB, in unincorporated Jefferson County. Surface access to the Airport is provided by NW Cherry Lane, which connects to Highway 26, about 2 miles north of the Madras city center.

COMMUNITY SOCIO-ECONOMIC DATA

In 2018, Madras made up a population of 6,345 people out of the 23,560 within Jefferson County. Madras' population is predominantly a mix of Caucasian (48%) and Hispanic (40%), with a small percentage of American Indian (6%). The median household income in Madras was $34,966, compared to the national average of $61,937 and $63,426 for Oregon. There are approximately 2,500 employees within Madras' employment sectors with the highest in retail trade, followed by manufacturing.

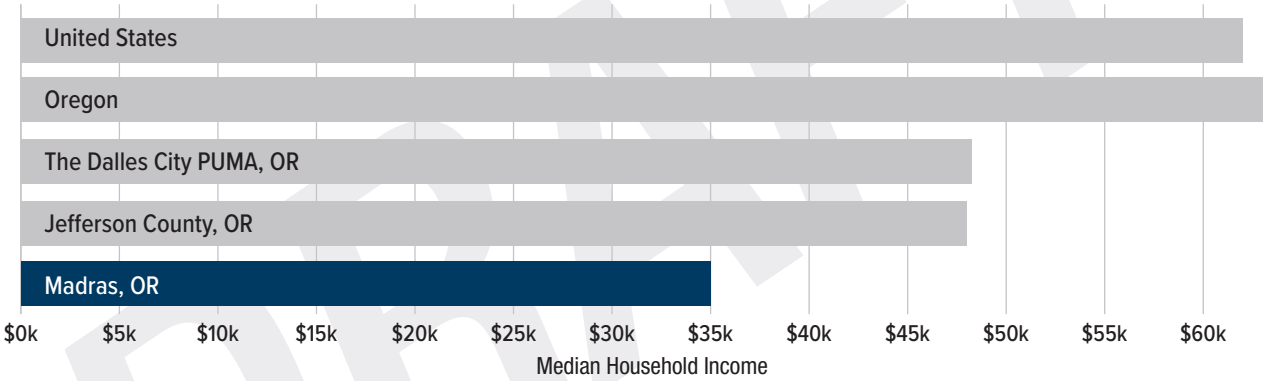
More detailed socio-economic data and analysis is presented in Chapter 3: Aviation Activity Forecasts to supplement the projections of future aviation activity. The information presented in **Tables 2-1 through 2-3** are intended to provide a summary of the local and regional economics of the Madras Municipal Airport.

TABLE 2-1: HISTORICAL POPULATION

	2000	2010	2015	2016	2017	2018	2019
Oregon	3,421,399	3,831,074	4,013,845	4,076,350	4,141,100	4,195,300	4,236,400
Jefferson County	19,009	21,750	22,445	22,790	23,190	23,560	23,840
Madras	5,078	6,050	6,265	6,275	6,300	6,345	6,380

Source: Portland State University (PSU) Certified Population Estimates – Madras

TABLE 2-2: MEDIAN HOUSEHOLD INCOME



Source: censusreporter.org

TABLE 2-3: EMPLOYMENT INDUSTRIES

AIRPORT ROLE (NATIONAL, STATE, AND LOCAL)

The role of an airport may vary slightly within the context of the National, State, or Local perspective. Understanding the existing roles of the Airport is key to establishing the long-term vision and development of the facility.

National Role

The FAA maintains an inventory of U.S. aviation facilities through the National Plan of Integrated Airport Systems (NPIAS). The NPIAS lists existing and proposed airports significant to the air transportation of the United States, and thus are eligible for federal funding though the Airports Improvement Program (AIP) which cover 90% of eligible costs of planning and development projects. According to the 2018 National Plan of Integrated Airport Systems (2019-2023), Report to Congress, Madras Municipal Airport is classified as a Local General Aviation Airport and as such, supports regional economies by connecting communities to statewide and interstate markets.

State Role

The Oregon Department of Aviation (ODA) has developed and regularly updates the Oregon Aviation Plan (OAP) to provide guidance on preserving the State's system of airports. The OAP presents a framework for improving the system for continued support of communities and economic development. The most recent update to the OAP (v.6.0) classifies Madras Municipal Airport as a Category IV- Local General Aviation Airport. Category IV airports support primarily single-engine aircraft with capabilities of accommodating smaller multi-engine aircraft. These airports support local air transportation needs and special-use aviation activities.

AIRPORT HISTORY

Madras Municipal Airport began as a small airstrip, developed by the Madras Airport Association in 1938 to support a local agricultural aircraft and a Civil Air Patrol aircraft. In 1942 the United States Army Air Corps constructed a training base known as the Madras Army Airfield, for B-17 and P-63 pilots in World War II. Following the war, the federal government transferred ownership through quitclaim deed to the City of Madras and Jefferson County in July 1948. Jefferson County subsequently transferred its ownership in the Airport by quitclaim deed to the City of Madras in 2004, with the exception of 20 acres that currently accommodates the county jail facility.

Over the past twenty years, Madras rehabilitated its primary runway, taxiways, and aprons; constructed an airport terminal building, and built a turf landing area. As depicted in **Table 2-4** below, federal funding provided over the last 20 years for a variety of improvements and standards upgrades has totaled nearly $7 million. In addition of the publicly-funded improvements at the Airport, significant private investment in facilities at the Airport has also occurred.

TABLE 2-4: 20-YEAR FAA GRANT HISTORY

	Fiscal Year	State Apportionment	Entitlement	Discretionary	Total Federal
Rehabilitate Apron	2005	$0	$67,500	$150,000	$217,500
Construct Terminal Building	2005	$79,569	$300,000	$0	$300,000
Conduct Airport Master Plan	2009	$0	$146,736	$0	$146,736
Rehabilitate Apron	2010	$0	$106,000	$0	$106,000
Rehabilitate Apron	2011	$0	$313,522	$0	$313,522
Rehabilitate Runway (EA)	2011	$0	$34,637	$0	$34,637
Rehabilitate Runway (Design)	2012	$0	$191,774	$0	$191,774
Rehabilitate Runway (Const.)	2014	$900,000	$1,288,174	$698,765	$1,986,939
Reconstruct Taxiway	2017	$0	$241,997	$0	$241,997
Reconstruct Taxiway	2018	$0	$358,003	$2,509,496	$2,867,499
Update Airport Master Plan	2019	$147,547	$297,547	$0	$297,547
Total		**$1,127,116**	**$3,345,890**	**$3,358,261**	**$6,704,151**

AREA AIRPORTS CONTEXTUAL ANALYSIS

The contextual analysis of the airport service area refers to the geographic area surrounding an airport that is directly affected by the activities at that airport. Normally a 30 or 60-minute surface travel time is used to approximate the boundaries of a service area. Airports located beyond a 30-minute travel time have less impact on local airport activity due largely to the redundancy provided by closer facilities.

With numerous airports nearby, service areas often overlap, creating competition between airports. Having several airports located within a relatively short distance affects user demand for items such as hangar space, fuel and aviation services. These items are sensitive to cost, convenience and the quality of facilities or services.

The majority of local users of Madras Municipal Airport will live or work within 30 minutes of the airport. Some specialized activities may draw users from greater distances. It is also recognized that Madras Municipal Airport attracts a wide variety of general aviation and business aviation aircraft from outside the local area.

The Madras Municipal Airport service area extends north and south along Highway 97, overlapping with service areas for several other central Oregon airports including Roberts Field, Bend, Prineville, Sisters, Lake Billy Chinook, and Sunriver.

Roberts Field - Redmond Municipal Airport (RDM)

Demand for major or regional airline service often involves greater travel distances due to the limited number of airports providing that service. Redmond Municipal Airport (RDM) is the only commercial service airport in Central Oregon and is currently served by four air carriers; Alaska Air, American Airlines, Delta Airlines, and United/United Express with daily direct flights to Denver, Los Angeles, Phoenix, Portland, Salt Lake City, San Francisco, Seattle, and Chicago.

RDM has two asphalt runways (05/23 – 7,040’x150 and 11/29 – 7,006’x100’) and many of the facilities and infrastructure consistent with commercial service Airports including an Air Traffic Control Tower (ATCT). Leading Edge Jet Center is the primary provider of air charter, FBO, and aircraft maintenance services. Hillsboro Aero Academy recently began providing flight training out of RDM and is expected to grow significantly. The U.S. Department of Agriculture - Forest Service (USDA-FS) Redmond Air Center regional fire operations base is located at the Airport.

According to recent FAA 5010 data, RDM generates approximately 41,922 annual operations and has 85 based aircraft. 20% of the operations at RDM are from commercial operators and over half of the based aircraft are single-engine aircraft.

Bend Municipal Airport (BDN)

Bend Municipal Airport serves predominantly single-engine and multi-engine piston and turbine fixed-wing aircraft, and helicopters associated with transient and locally-based general aviation aircraft activity. The Airport accommodates significant flight training activity, including both helicopter and fixed-wing aircraft. BDN also accommodates aircraft manufacturing, including production of the Epic E1000 single engine turboprop.

BDN has one asphalt runway (16/34 – 5,200’x75’) and many of the facilities and infrastructure consistent with general aviation airports. The primary provider of FBO services is Leading Edge Jet Center, with other operators providing flight training and aircraft maintenance.

Based on recent FAA 5010 data, BDN generates approximately 142,000 annual operations and has 253 based aircraft.

Prineville-Crook County Airport (S39)

Historically, Prineville-Crook County Airport has served a variety of general aviation users, including business, commercial, and government aviation. The United States Forest Service (USFS) and the Bureau of Land Management (BLM) utilize the airport to support their helicopter operations.

S39 has two asphalt runways (10/28 – 5,751'x75' and 15/33 - 4054'x40') and many of the facilities and infrastructure consistent with general aviation airports.

Based on recent FAA 5010 data, S39 generates approximately 10,400 annual operations and has 125 based aircraft.

Sunriver Airport (S21)

The Sunriver Airport is a privately-owned public-use airport able to accommodate aircraft ranging from small single- engine piston aircraft to larger more demanding turbine aircraft activity associated with business aviation aircraft (turboprop or business jet).

S21 has one asphalt runway (18/36 – 5,461'x75') and many of the facilities and infrastructure consistent with general aviation airports.

Based on recent FAA 5010 data, S21 generates approximately 6,150 annual operations and has 29 based aircraft.

Sisters Eagle Air Airport (6K5)

Sisters Eagle Air Airport is a privately-owned public-use airport able to accommodate aircraft ranging from small single-engine piston aircraft to larger more demanding turbine aircraft activity associated with business aviation aircraft (turboprop or business jet).

6K5 has one asphalt runway (02/20 – 3,560'x60') and many of the facilities and infrastructure consistent with general aviation airports.

Based on recent FAA 5010 data, 6K5 generates approximately 1,400 annual operations and has 17 based aircraft.

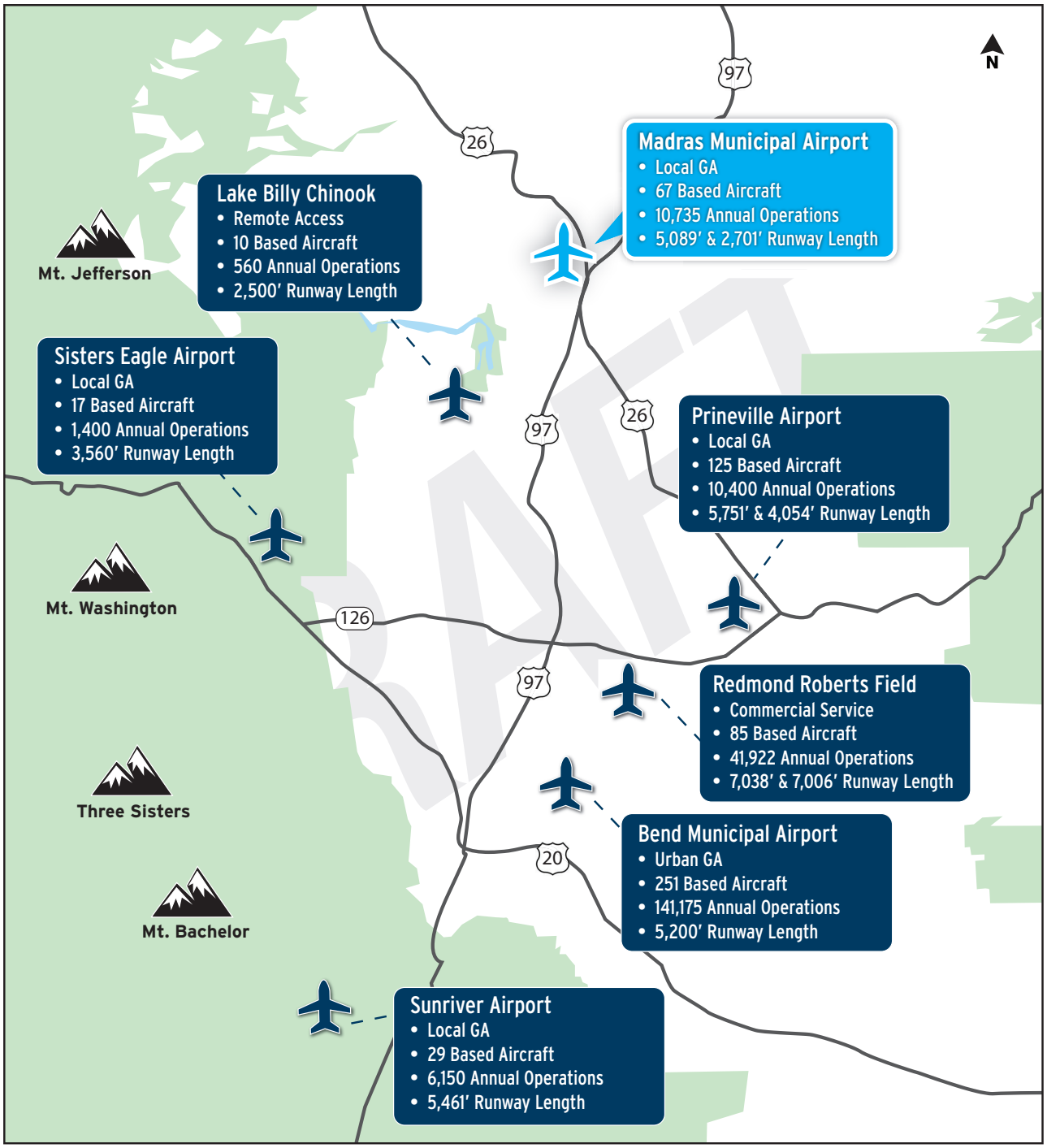
Lake Billy Chinook State Airport (5S5)

Lake Billy Chinook State Airport is a privately-owned public- use airport designed to accommodate aircraft ranging from small single-engine piston aircraft to slightly larger twin- engine aircraft. The Airport is used primarily to access the residential airpark homes located adjacent to airfield facilities.

5S5 has one asphalt runway (16/34 – 2,500'x32') and limited facilities and infrastructure.

Based on recent FAA 5010 data, 5S5 generates approximately 560 annual operations and has 10 based aircraft.

Area Airports



A ccording to FAA 5010 data estimates depicted in **Table 2-5**, Madras Municipal Airport accounts for 5% of the total aircraft operations and 10% of the based aircraft within Central Oregon. Local socio-economic conditions and continued expected growth within the Madras area suggests the Madras Municipal Airport will maintain its status as a general aviation fa cility of significant economic value for Central Oregon well in to the future. However, as the region grows and n continuous coordination and cooperation between local municipalities and governing bodies in the area will be critical to aviation facilities within Central Oregon.

TABLE 2-5: FAA 5010 DATA

	Madras	Lake Billy Chinook	Bend	Prineville	Redmond	Sisters Eagle	Sunriver	Central Oregon Airports Totals
Air Carrier	0	0	0	0	8,534	0	0	8,534
Air Taxi	600	0	1,000	300	7,149	100	600	9,749
GA Local	6,000	500	70,338	3,000	15,361	400	2,500	98,099
GA Itinerant	4,035	60	69,737	7,000	10,522	900	3,000	95,254
Military	100	0	100	100	356	0	50	706
Total Operations	**10,735**	**560**	**141,175**	**10,400**	**41,922**	**1,400**	**6,150**	**212,342**
Total Based Aircraft	**54**	**10**	**251**	**125**	**85**	**17**	**29**	**571**
Single Engine	38	9	190	107	55	15	15	429
Multi Engine	7	1	19	1	15	2	10	55
Jet	8	0	10	1	9	0	2	30
Helicopters	1	0	21	5	6	0	0	33
Glider	0	0	8	0	0	0	2	10
Military	0	0	0	0	0	0	0	0
Ultra-Light	0	0	3	11	0	0	0	14
OPBA	199	56	160	83	493	82	212	372

Source:http://www.gcr1.com/5010WEB/

SUMMARY OF AIRPORT OPERATIONS DATA

Madras Municipal Airport accommodates a wide variety of aeronautical activity, including small single- and multi- engine aircraft, business class turbine aircraft (business jets and turboprops), and helicopters. The Airport's updated count (April 2020) included 97 based aircraft. The updated count identified a net increase of 35 aircraft since 2009, which equates to a 4.2% average annual percenta ge growth in based aircraft. Updated based aircraft counts are presented in **Table 2-6.** As presented in **Table 2-7**, annual aircraft operations are estimated at 10,735 in the current FAA Airport Record Form (5010-1), which is approximately 17.5 percent lower than the 2009 operations level estimated in the previous Airport master plan.

A summary of the Airport's recent fuel sales provided in **Table 2-8** indicates a steady increase in AVGAS fueling activity, while jet fuel activity has experienced significant upward and downward spikes with a moderately upward trend. The fueling activity, based aircraft and operations data will be examined further in Chapter 3: Aviation Activity Forecasts.

TABLE 2-6: BASED AIRCRAFT

	2010 Master Plan	FAA 5010 01/02/2020	2020 Updated Count
Single Engine	58	38	71
Multi Engine	2	7	17
Jet	0	8	8
Helicopter	1	1	1
Glider	0	0	0
Ultra Light	1	2	0
Total	**62**	**54**	**97**

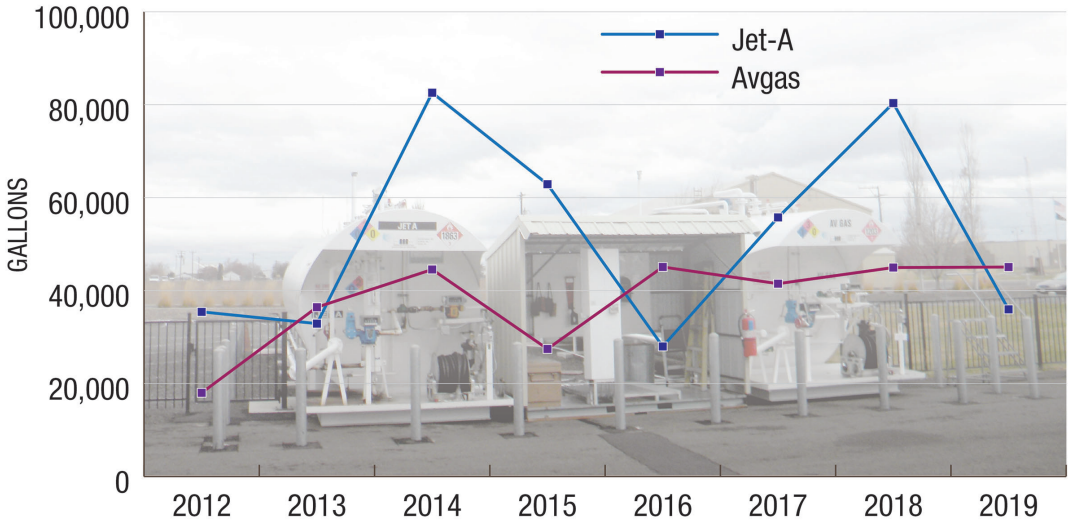
Source: Updated Count provided by Madras Airport Management (April 2020) and 2010 Master Plan (2009 base year).
*Glider and ultralight aircraft are not considered in the validated aircraft count.
**The increased count in the inventory column includes aircraft that may have N-numbers reported at other airports or aircraft that are not in FAA registry.

TABLE 2-7: ESTIMATED AIRCRAFT OPERATIONS

	2010 Master Plan (2009)	FAA 5010 01/02/2020
General Aviation (Local)	7,812	6,000
General Aviation (Itinerant)	5,058	4,035
Air Taxi	100	600
Military	50	100
Total Operations	**13,020**	**10,735**

Source: Estimates obtained from the 2010 Airport Master Plan (2009 base year), and FAA 5010 Airport Master Record (Operations for 12 Months Ending 08/27/2019).

TABLE 2-8: FUEL SALES



ENVIRONMENTAL DATA

Physical Geography

Madras is located in Central Oregon, adjacent to the eastern foothills of the Cascade Range. Madras is located in the lower Deschutes Valley that makes up the Blue Mountain ecoregion of Central Oregon, characterized by volcanic mountains, lava flows, foothills and river canyons carved over millions of years.

Madras Municipal Airport is located 2 miles north of the Madras city center in the area known as the Agency Plains, which sits about 200 feet above the city. Airport elevation is 2,437 feet above mean sea level (MSL) with nearby terrain rising to more than 3,000 feet MSL within 10 miles. As noted earlier, the current airport site was selected in the late 1930s to construct a local airfield with dirt runways, and was later selected by the Army Air Corps as a preferred airport site in Central Oregon to support its training mission due to its favorable site and meteorological characteristics.

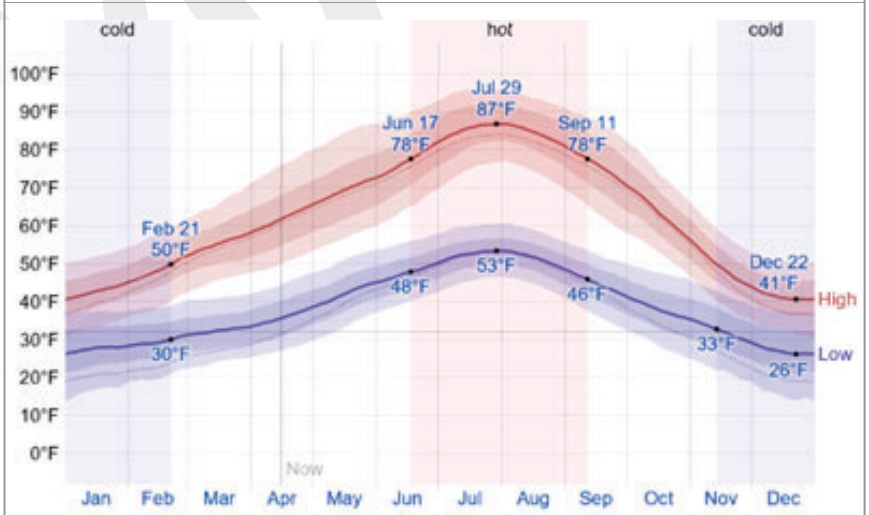
Lake Simtustus (3 miles W) and Lake Billy Chinook (7-15 miles SW) are major reservoirs located west of Madras. The reservoirs are prime recreational destinations in Central Oregon, providing a wide range of recreational opportunities including water sports, fishing and camping. The lakes were created by the Pelton Round Butte project, which constructed the Pelton and Round Butte Dams, and a third, Re-Regulating dam on the Deschutes River between 1958 and 1964. Portland General Electric and the Confederated Tribes of the Warm Springs Reservation of Oregon co-manage the Pelton Round Butte hydroelectric project. In addition to energy generation, the Pelton Round Butte project is actively engaged in efforts to restore steelhead and salmon runs in the Deschutes River Basin.

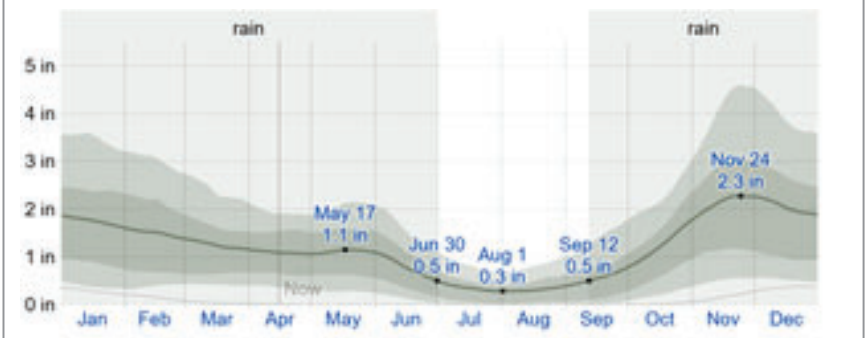
Local Climate/Wind Analysis

Jefferson County has a relatively dry, high desert climate with moderate winter and summer temperature ranges. Temperature and precipitation varies with elevation and proximity to the Cascade Range. This region produces moderate amounts of winter snow.

Historic climatic data for Madras is maintained by the Western Regional Climatic Center. The nearest observation station to the airport (Madras 2N, Station No. 355142) has data for the 62-year period from 1952 to 2014. The data indicate that July and August are typically the warmest months; December and January are the coldest. On a monthly basis, the average maximum temperature is 85 degrees Fahrenheit (July) and the average minimum temperature is 24.7 degrees (January). Annual precipitation averages 11.66 inches and annual snowfall averages 14.9 inches.

The following graphics retrieved from weatherspark.com illustrate the typical temperature and precipitation patterns in Madras, based on an analysis of historical weather reports and model reconstructions.





Wind data for Madras indicates prevailing winds are generally northwest-southeast, which favors the primary runway (16/34) at Madras Municipal Airport. Local pilots report seasonal crosswinds are common, which results in increased use of Runway 4/22. Prior wind analyses conducted at the Airport are limited, but include a wind rose developed using one year of onsite observations (May 1943 - May 1944) when the original three-runway (triangle) configuration was constructed. The wind rose indicated that Runway 16/34 accommodated 98.1 percent of wind conditions up to 12 miles per hour (10.5 knots), and the combination of Runway 16/34 and 4/22 accommodated 98.5 percent of wind conditions up to 12 miles per hour.

The automated weather observation system at Madras Municipal Airport collects wind data, although currently, there is less than three years of data available. The wind analysis tool from Iowa State University (Iowa Environmental Mesonet) indicates the crosswind coverage (NWS data) for the orientation of Runway 16/34 satisfies the FAA minimum 95% wind coverage requirements for all categories of aircraft. However, the FAA requires wind roses developed for use on ALP drawing sets to provide a minimum of ten years of data.

In cases where on-site observation data is limited, FAA recommends using a wind rose from a nearby airport to approximate wind coverage. These data are approximate and do not attempt to account for unique terrain or localized weather patterns. **Table 2-9** approximates the crosswind coverage for Runways 16/34 and 04/22 based on seven years of Redmond Airport (RDM) wind data readily available. Additional RDM data will be added to meet the FAA 10-year requirement, although the crosswind coverages summarized below are not expected to change significantly.

TABLE 2-9: RUNWAY WIND ANALYSIS

	Runway 16/34		Runway 04/22		Combined	
	10.5 KTS	13 KTS	16 KTS	10.5 KTS	13 KTS	16 KTS
IFR	97.88%	98.73%	93.81%	96.44%	98.82%	99.43%
VFR	97.28%	98.65%	93.81%	96.44%	97.56%	98.96%
All-Weather	95.84%	97.91%	90.47%	94.53%	97.69%	99.00%

Source: NCDC Data (2009-2015) Redmond Airport

Airport Solid Waste and Recycling

The following section provides a summary of the solid waste generated at Madras Municipal Airport and recycling practices in anticipation of identifying any opportunities for reducing waste at the Airport.

On September 30, 2014, the FAA established guidance on preparing airport recycling and solid waste management plans as an element of an airport master plan update. This guidance was in response to Section 133 of the **FAA Modernization and Reform Act (FMRA) of 2012** that established the requirement for all airport master plan updates to include a recycling plan that addresses the following:

- Local Recycling Management and Programs;
- Waste Audit;
- Recycling Feasibility;
- Plan to Minimize Solid Waste Generation;
- Operational and Maintenance Requirements;
- Waste Management Contracts;
- Potential for Cost Savings or Revenue Generation; and
- Future Development and Recommendations.

The types of waste typically generated at general aviation airports include:

- Construction and Demolition Waste – Solid waste produced during the excavation, clearing, demolition, construction, and or renovation of airport pavements, buildings, roads, or utilities.
- Yard Waste – Yard waste includes grass clippings, weeds, trees, shrubs, and other debris generated during landscape maintenance.
- Hazardous Wastes – Hazardous wastes are identified in regulation 40 CFR 261.31-33, which are typically corrosive, ignitable, toxic, or reactive. This type of waste requires specific handling, treatment, and disposal.
- Universal Hazardous Waste – The Environmental Protection Agency (EPA) provide less stringent regulations for universal wastes as defined in 40 CFR Part 273, Universal Waste Rule.

To assist airports in developing their recycling program, the FAA has created the Recycling, Reuse, and Waste Reduction at Airports: A Synthesis Document. The FAA provides guidance to airports in two key focus areas:

- Programs to encourage recycling, reduction and reuse of materials; and
- Programs to encourage airports to reduce their energy consumption.

As noted in the Synthesis Document, the guidance may be scaled accordingly for the size and type of airport that is utilizing it.

LOCAL RECYCLING MANAGEMENT AND PROGRAMS

Madras Sanitary Service provides solid waste removal and cardboard recycling for Madras Municipal Airport. The Recycling Depot operated by Madras Sanitary Service will accept new aircraft/motor oil; however, used oil can only be recycled through Motor Oil Thermal Fluids company. Bulk waste can be disposed at the Box Canyon Transfer Station.

State, County, and City recycling management and solid waste programs pertinent to the Airport include:

State of Oregon

In 1983, the **Recycling Opportunity Act** was the first law in the U.S. to require that people statewide be provided with an opportunity to recycle. This statute established solid waste management policies for waste prevention, reuse and recycling. In order to conserve energy and natural resources the statute uses a solid waste management hierarchy:

- Reduce the amount of waste generated;
- Reuse materials for their original intended use;
- Recycle what can't be reused;

- Compost what can be reused or recycled;
- Recover energy from what cannot be reused, recycled, or composted;
- Dispose of residual materials safely.

The Recycling Opportunity Act also required that:

- Wasteshed counties, except for the City of Milton-Freewater and the greater Portland tri-county area known as the Metro wasteshed, to have recycling depots; and
- Cities with populations over 4,000 to provide monthly curbside recycling collection service to all garbage service customers.

The **1991 Oregon Recycling Act** (Senate Bill 66) strengthened the states recycling requirements and created a recovery goal of 50 percent by year 2000. This statute also established a household hazardous waste program; required recycled content in glass containers, directories and newsprint publications; established requirements for recycling rigid plastic containers to promote market development; and required the Department of Environmental Quality to calculate annual recovery rates and develop a solid waste management plan. In 2005, House Bill 3744 established a new wasteshed goal and extended Oregon's statewide recovery goals of 45 percent in 2005 and 50 percent in 2009.

Waste Audit

Tenants and users of the Madras Municipal Airport create a limited amount of waste on site. Specific sources of on-site waste include:

- Fixed base operator (FBO) building generates paper waste, plastic bottles, aluminum cans and other typical office trash. As part of the FBO operations, they can produce used oil and aircraft parts such as tires, filters, etc.
- Private hangars and buildings can create a variety of waste, depending on the function of the building. Hangars typically produce anything from typical household trash to used oil and aircraft parts.
- The Erickson Collection museum generates a waste stream similar to other commercial activities, including a small snack bar that generates a minimal amount of food waste. The Erickson Collection museum reports more than 10,000 annual visitors.
- The Daimler High Desert Proving Grounds can produce used oil and parts such as tires, filters, etc., used in their vehicle testing work.
- Manufacturers and on-airport businesses generate similar waste to off-airport businesses such as paper waste and other typical office trash. They can also produce used oil and aircraft parts such as tires, filters, etc. depending on the nature of their business.

Waste Disposal

No state or federal requirements apply to the waste that is generated on the airport. Each individual tenant is responsible for disposal of their own waste and any hazardous materials.

Cultural Resources Analysis

AINW has completed a cultural resource reconnaissance survey for the Madras Municipal Airport Master Plan. The pedestrian survey of the project Area of Potential Effect (APE) resulted in the identification of ten potential historic-period archaeological resources, including two structural remains, seven segments of irrigation or drainage ditches, one of which contained possible historic-period debris, and a possible historic-period debris scatter. The entire APE has a high probability for finding historic-period archaeological resources.

Twelve historic-period buildings, structures, and one object were identified in the APE. One of these resources, the North Hangar, has been previously listed in the National Register of Historic Places (NRHP). A lateral canal listed as the North Unit Main Canal in the NRHP intersects the APE. Three additional historic-period buildings and structures were identified as eligible to contribute to a potential Madras Municipal Airport Historic District. Seven resources within the APE have not been evaluated for listing in the NRHP. Additional work is recommended to evaluate a potential Madras Municipal Airport Historic District. A formal cultural resource survey is recommended when specific future development plans are proposed in the APE to document and evaluate archaeological and historic resources.

NEPA Review

An environmental screening for the following environmental impact categories were included as part of the Master Plan and are summarized in the following:

- Section 4(f) of the U.S. Department of Transportation Act
- Biotic Resources
- Federally-listed Endangered and Threatened Species and Critical Habitats
- Wetlands and Waters of the U.S.
- Floodplains
- Stormwater and Water Quality
- Air Quality

Section 4(F) of the US Department of Transportation Act

There are no parks or other public lands adjacent to the Airport.

Biotic Resources

Biotic resources are defined as the various types of flora (plants) and fauna (fish, birds, reptiles, amphibians, etc.) in a particular area. The term also refers to rivers, lakes, wetlands, forests, upland communities, and other habitat types supporting flora and aquatic and avian fauna.

Vegetation or habitat cover types found at the Airport include shrub-steppe habitat, agricultural land, palustrine emergent wetlands, and developed areas. Shrub-steppe habitat consists largely of open grassland on well-drained soils with scattered shrubs and occasional trees. The shrub-steppe habitat at the Airport has been substantially disturbed from past land-use activities and is dominated by non-native grasses and forbs including: cheatgrass (Bromus tectorum), rattail fescue (Vulpia myuros), plumeless thistle (Carduus acanthoides), knapweed (Centaurea sp.), dandelion (Taraxacum officinale), common mullein (Verbascum thapsus), and medusahead (Taeniatherum caput-medusae). Native species of this habitat type are found in small pockets in the southwestern portion of the study area and include: bluebunch wheatgrass (Pseudoroegneria spicata), rabbitbrush, (Chrysothamnus viscidiflorus), and a few western juniper (Juniperis occidentalis).

Agricultural land consists of cultivated fields grown in carrots, garlic, grass, wheat and alfalfa. Portions of Campbell Creek on site were channelized and several ditches were constructed to support irrigation for farm use.

Six seasonal, palustrine wetlands totaling less than 3 acres have been delineated on-site (ESA 2015, 2016a, 2016b). The wetlands are widely dispersed on-site, dominated by non-native plant species, and provide limited support to the biota. Campbell Creek and the ditches occur on-site have ephemeral hydrology and do not support resident or migratory fish species. Campbell Creek vanishes in a farm field and does not connect with downstream waters. Because of the transitory nature of the water, no suitable amphibian habitat is present in the study area.

Dominant wildlife types that occur at the Airport include birds and small to medium mammals. The open landscape including the cultivated areas and airport structures provide raptor foraging habitat while the remnant shrub steppe habitat supports feeding and breeding habitat for common songbirds. The airport buildings and developed areas likely support non-native species such as European starlings, rock doves and house sparrows.

Federally-listed Endangered and Threatened Species and Critical Habitats

Fish. No habitat for listed salmon or steelhead is located within the study area or immediate vicinity based on the lack of perennial streams. The nearest mapped critical habitat for listed fish (Middle Columbia River Steelhead) is located near Warm Springs, over 10 miles north of the study area (70 Federal Register 52630). The study area is; however, within mapped essential fish habitat (EFH) for Pacific Salmon regulated under the Magnuson-Stevens Fisheries Conservation and Management Act. This mapping is based on the historic accessibility of the Deschutes River to salmon (Pacific Fishery Management Council 2014).

Mammals. The fisher, a forest-dwelling member of the weasel family, is proposed for listing as threatened because of habitat loss and over-hunting (84 Federal Register 644). The fisher is limited to small regions in Southern Oregon, Northern California, and the southern Sierra Nevada. No suitable habitat for fishers is located in the study area or immediate vicinity.

No other listed species or critical habitat is located in the project vicinity.

Wetlands and Waters of the U.S.

National Wetland Inventory (NWI) maps waterways and several wetlands on Airport property (Exhibit B) (USFWS, 2020b). Campbell Creek is ditched through the center of the Airport and extends off-site to the north. Freshwater ponds are mapped where the wastewater treatment plant is located in the northwest portion of Airport property.

Results from on-site water resource delineations depart somewhat from the NWI mapping because no wetlands occur where NWI wetlands are shown in the southwest portion of the property (ESA 2016a; DSL 2016). Water resources delineated on Airport property from 2015 to 2016 include Wetland 1, Wetlands A-F; Campbell Creek, a portion of North Unit Canal and several ditches.

The U.S. Army Corps of Engineers (Corps) determined that only Wetland C (< 0.10 acre) and the portion of North Canal Unit within the study area are Waters of the US (Exhibit C; Corps 2019). All other water resources were determined to be non-jurisdictional. The approved jurisdictional determination provided by the Corps is valid for 5 years.

Floodplains

The Federal Emergency Management Agency administers the National Flood Insurance Program to reduce the impact of flooding on private and public structures. The proposed project is not located within, would not encroach upon, and would not otherwise affect a floodplain (FEMA 1989).

Stormwater and Water Quality

Stormwater from impervious surfaces at the Airport is collected in a series of vegetated ditches for treatment and infiltration. Campbell Creek has been channelized and modified for past agricultural purposes and no longer connects with downstream waters. No stormwater is discharged to a water of the state or US. Consequently, no water quality issues have been identified at the Airport.

Air Quality

The Airport is not located within an air quality attainment area or maintenance area. The nearest areas of concern for air quality are several miles to the west in Salem, in the Willamette Valley (DEQ 2020).

Noise Contours

As part of this master planning effort, once a preferred alternative has been selected, noise contours will be developed for existing and future conditions. The noise contours will reflect existing and future aircraft operations as presented in Chapter 3: Aviation Activity Forecasts.

LAND USE & ZONING ANALYSIS

Madras Municipal Airport is located entirely within the Madras city limits and urban growth boundary (UGB). The Airport, in its entirety, was annexed into the city limits in 2020, expanding on the previous city jurisdiction that stopped just east of the runway-taxiway system. The City of Madras zoning code is contained in Madras Municipal Code Title 18 (Development Code).

Airport Zoning (City of Madras)

Large sections of the Airport were annexed into the City of Madras and rezoned in 2020. Previously, only the eastern section of the airport was within city limits and remaining sections were in unincorporated Jefferson County. The 2,000+ acre airport property currently has five different zones intended to support development that is compatible with airport operations:

AD – Airport Development. The purpose of the AD zone "is to provide land adjacent to the Airport facilities for future commercial and industrial uses, which may be dependent on air transportation." The permitted uses in the AD zone includes common airport activities such as hangar development, FBO services, and fuel storage. Several compatible non-aeronautical uses such as manufacturing, offices, warehousing, agricultural processing/storage, and call centers are also listed permitted uses. The northern section of the east landside area of the Airport and several adjacent off-airport parcels, extending to Highway 26 are zoned AD.

AM – Airport Management. Description of zone to be added.

OS – Open Space/public facilities. The OS zone is used for a variety of public land uses, including parks, public facilities, public uses, recreation facilities, schools, and communication towers. The Airport's runways, runway protection zones, taxiways, and the automated weather system clear area are zoned OS. The City of Madras waste water treatment plant (WWTP) is also zoned OS. Although the OS zone does not specifically list airports or airport development among the permitted or conditional uses, public use airport facilities and municipal treatment plants are considered to be consistent with the "public facilities" permitted use.

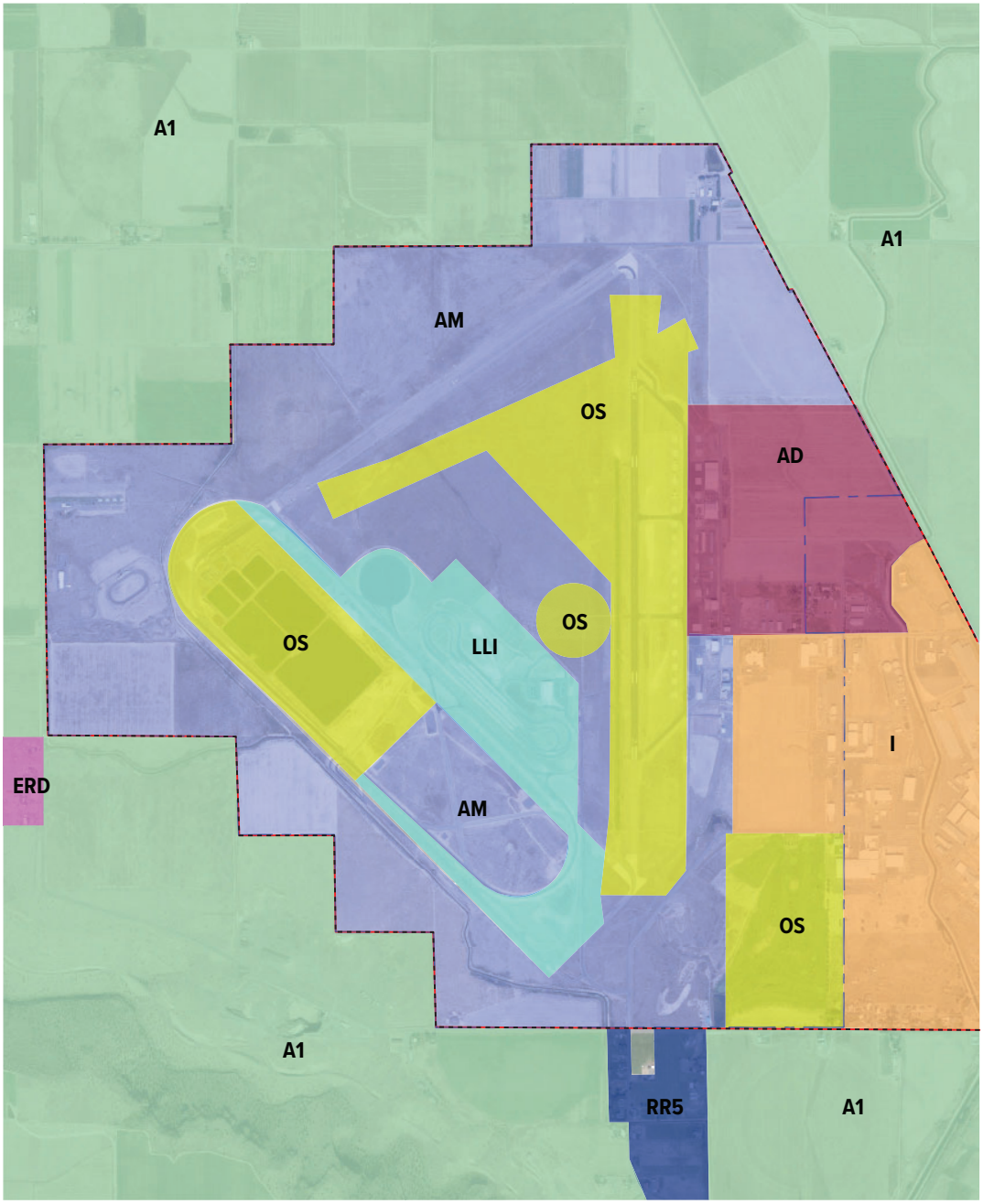
LLI – Large Lot Industrial. The LLI is intended to provide opportunities for the development of Traded Sector Uses. Development within the LLI zone is subject to compliance with aviation regulations including building heights, lighting, emissions and other uses. It also ensures that any development is consistent with the current airport master plan. The Daimler High Desert Proving Grounds facility is zoned LLI.

I – Industrial. The I zone is intended to provide suitable locations for a range of light and heavy industrial uses including aviation and aeronautics. The Airport's east industrial park and adjacent off-airport industrial park development are zoned I.

Airport Vicinity Zoning (Jefferson County)

The majority of Jefferson County-zoned lands surrounding Madras Municipal Airport are A1 Exclusive Farm Use (high value). An area of large lot residential zoning (RR-5) is located south of Straun Road, in the vicinity of the extended centerline of Runway 16/34. A small area of ERD – Existing Rural Development is located adjacent to NW Clackamas Drive, near the southwest section of airport property.

Airport Zoning



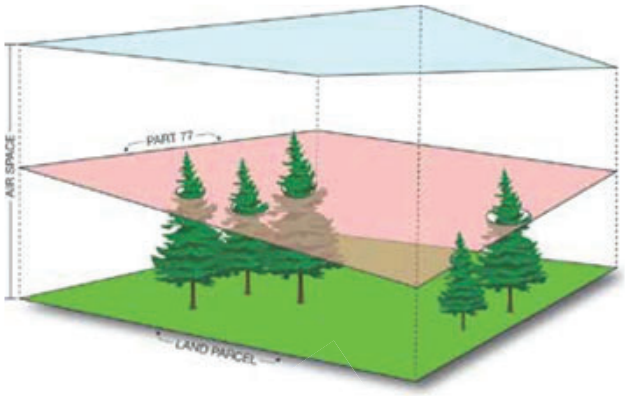
Airport Property
City Limits
Urban Growth Boundry

City of Madras
(AD) Airport Development
(LLI) Large Lot Industrial
(OS) Open Space
(I) Industrial
(AM) Airport Management

Jefferson County
(RR5) Rual Residental (5 ac.)
(ERD) Existing Rural Development
(A1) Exclusive Farm Use (high value)

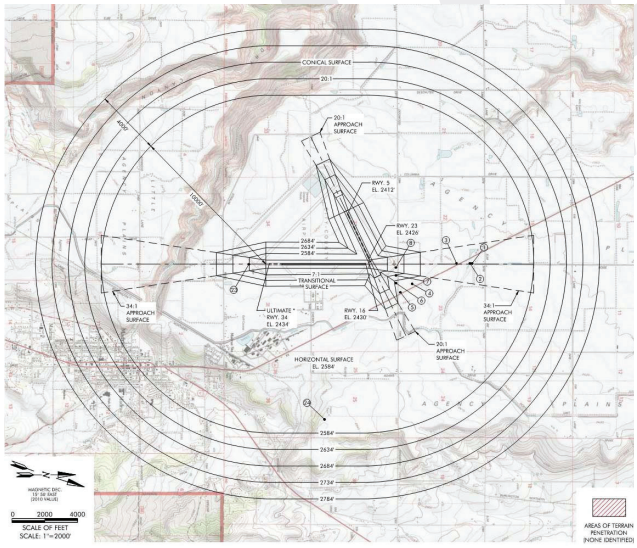
Airport Overlay Zoning

The City of Madras has adopted an Airport Overlay Designation (AO) for Madras Municipal Airport. The AO designation was prepared in 1986 and is depicted on the Airport Approach and Clear Zone Map. As described in the Ordinance No. 864, Section 3.11, "the overlay designation is intended to prevent the establishment of air space obstructions in airport approaches and surrounding areas through height restrictions and other land use controls as deemed essential to protect the health, safety, and welfare of the people of the City of Madras and Jefferson County." Its limitations do not explicitly protect FAR Part 77 airspace and runway protection zones as defined by FAA in Advisory Circular 150/5300-13. Instead, the zoning identifies specific imaginary surface slopes created by local planning.



COMPATIBLE LAND USE PLANNING

The table to the right is sourced from the Oregon Department of Aviation's Airport Land Use Compatibility Guidebook, which identifies land uses that are generally compatible or incompatible within airport safety areas and Part 77 surfaces like those depicted below for the Madras Municipal Airport.



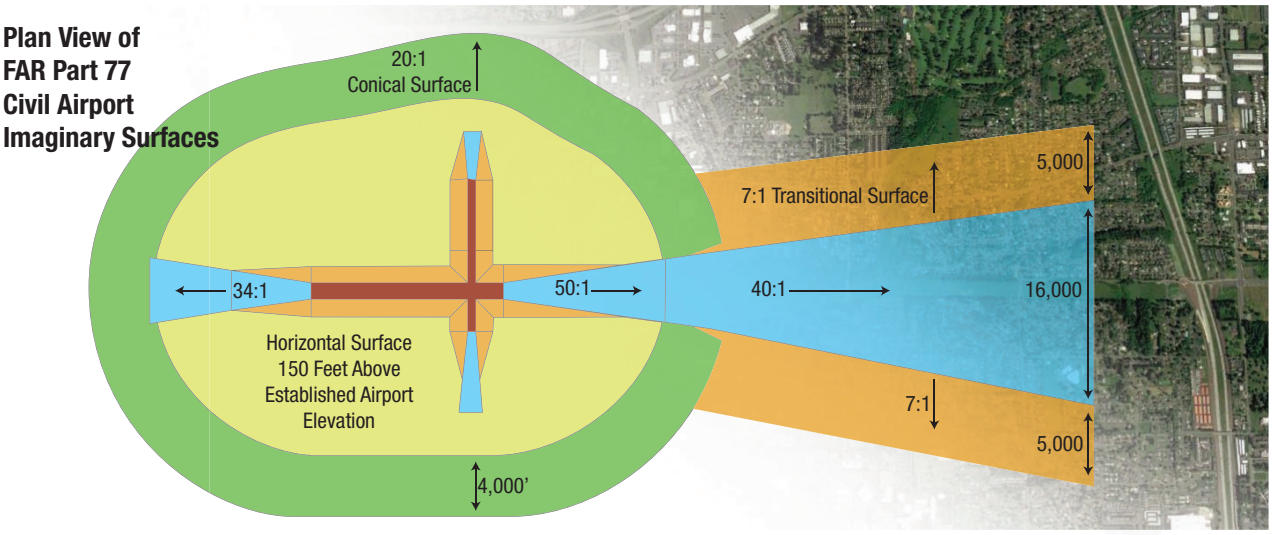
Compatible Land Uses per FAR Part 77 Surfaces and FAA Safety Areas

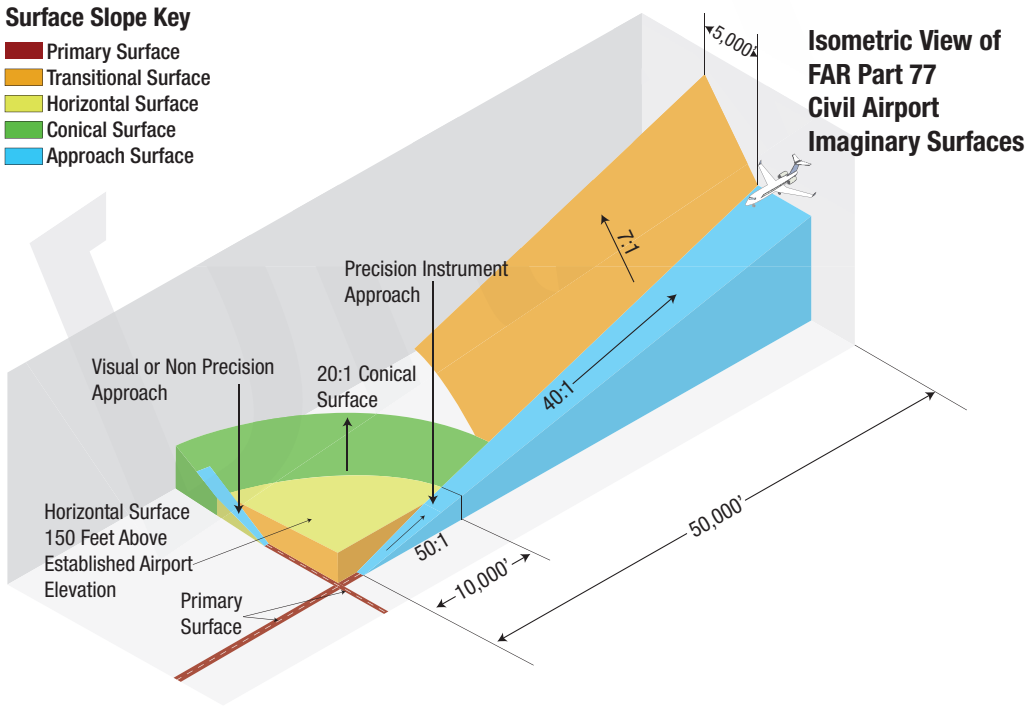
Legend:
C Generally compatible land use
NC Incompatible land use
• Not clearly compatible or incompatible, requires specific study

Criteria for Compatibility:
1: Does not exceed height standards
2: Does not attract large concentrations of people
3: Does not create a bird attractant
4: Does not cause a distracting light/glare
5: Does not cause a source of smoke
6: Does not cause an electrical interference
7: Does meet compatible DNL sound levels

Land Uses	Primary Surface	Transitional Surface	Horizontal Surface	Conical Surface	Approach Surface	Runway Protection Zone
Residential						
Residential, other than those listed below	NC	NC	•	C	•	NC
Mobile home parks	NC	NC	•	C	•	NC
Transient lodgings	NC	NC	•	C	•	NC
Public Use						
Places of public assembly (schools, hospitals, churches, auditoriums)	NC	NC	•	C	NC	NC
Government services	NC	•	C	C	•	NC
Transportation (parking, highways, terminals)	NC	•	C	C	•	•
Commercial Use						
Offices, business and professional	NC	•	C	C	•	NC
Wholesale & retail - building materials, hardware and farm equipment	•	•	C	C	•	NC
Retail trade - general	NC	•	C	C	•	NC
Utilities	NC	•	•	•	•	•
Communication	NC	•	•	•	•	NC
Manufacturing & Production						
Manufacturing - general	NC	•	•	•	•	NC
Agricultural (except livestock) and forestry	•	•	C	C	•	•
Livestock farming and breeding	NC	•	•	C	•	NC
Mining and fishing, resource production and extraction	NC	NC	•	•	•	NC
Recreational						
Outdoor sports arenas and spectator sports	NC	NC	•	C	NC	NC
Nature exhibits and zoos	NC	NC	•	C	NC	NC
Amusement park, resorts and camps	NC	NC	C	C	NC	NC
Golf courses	NC	NC	C	C	NC	NC
Parks	NC	•	•	•	•	•

FAR Part 77 Airspace





For Madras Municipal Airport, the approach surfaces for Runway 16/34 extend 10,000 feet beyond each runway end; the approach surfaces for Runway 04/22 extend 5,000 feet beyond each runway end (beginning 200 beyond the runway ends).

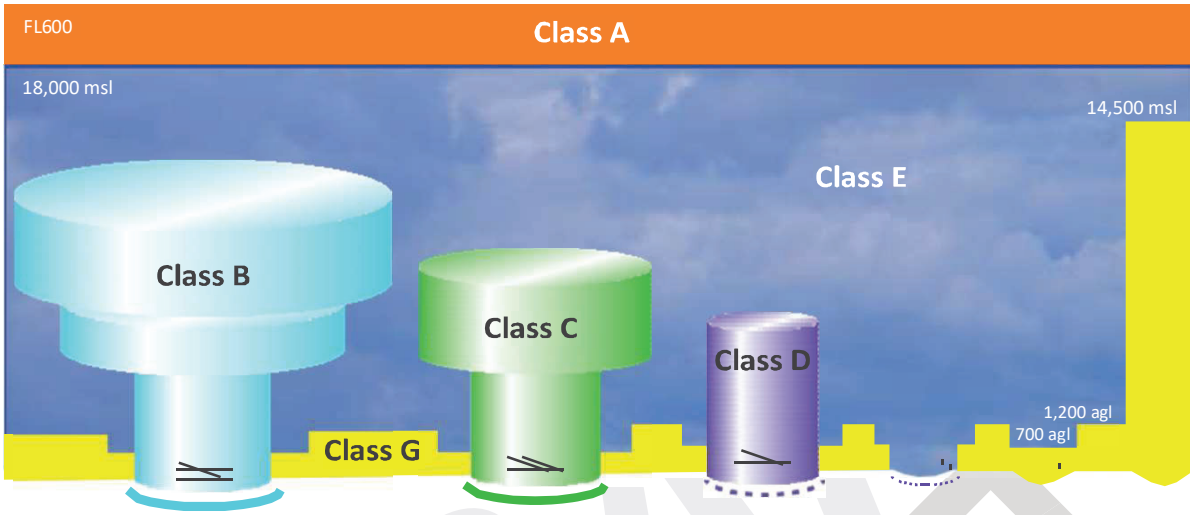
AREA AIRSPACE - SEATTLE/KLAMATH FALLS SECTIONAL CHART

LEGEND

	Airports with other than hard-surface runways		Class D Airspace
	Airports with hard-surfaced runways 1,500 ft. to 8,069 ft.		Class E Airspace with floor 700' above surface
	VOR/ VORTAC		Military Operations Area (MOA)
	Compass Rose (VOR/DME or VORTAC)		Prohibited, Restricted, Warning, and Alert Areas
	VOR or RNAV Airways		Airports with hard-surfaced runways greater than 8,069 ft. or some multiple runways less than 8,069 ft
	Class E Airspace (surface)		

Airspace within the United States is classified by the FAA as “controlled” or “uncontrolled” with altitudes extending from the surface upward to 60,000 feet above mean sea level (MSL). Controlled airspace classifications include Class A, B, C, D, and E. Class G airspace is uncontrolled.

Aircraft operating within controlled airspace are subject to varying levels of positive air traffic control that are unique to each airspace classification. Requirements to operate within controlled airspace vary, with the most stringent requirements associated with very large commercial airports in high traffic areas. Uncontrolled airspace is typically found in remote areas or is limited to a 700 or 1,200-foot AGL layer above the surface and below controlled airspace.



COMMUNICATION REQUIREMENTS AND WEATHER MINIMUMS

	Class A	Class B	Class C	Class D	Class E	Class G
Airspace Class Definition	Generally airspace above 18,000 feet MSL up to and including FL 600.	Generally multi-layered airspace from the surface up to 10,000 feet MSL surrounding the nation’s busiest airports	Generally airspace from the surface to 4,000 feet AGL surrounding towered airports with service by radar approach control	Generally airspace from the surface to 2,500 feet AGL surrounding towered airports	Generally controlled airspace that is not Class A, Class B, Class C, or Class D	Generally uncontrolled airspace that is not Class A, Class B, Class C, Class D, or Class E
Minimum Pilot Qualifications	Instrument Rating	Student*	Student*	Student*	Student*	Student*
Entry Requirements	IFR: ATC Clearance VFR: Operations Prohibited	ATC Clearance	IFR: ATC Clearance VFR: Two-Way Communication w/ ATC	IFR: ATC Clearance VFR: Two-Way Communication w/ ATC	IFR: ATC Clearance VFR: None	None
VFR Visibility Below 10,000 msl**	N/A	3 Statute Miles	3 Statute Miles	3 Statute Miles	3 Statute Miles	Day: 1 Statute Mile Night: 3 Statute Miles
VFR Cloud Clearance Below 10,000 msl***	N/A	Clear of Clouds	500 Below 1,000 Above 2,000 Horizontal	500 Below 1,000 Above 2,000 Horizontal	500 Below 1,000 Above 2,000 Horizontal	500 Below 1,000 Above 2,000 Horizontal***
VFR Visibility 10,000 msl and Above**	N/A	3 Statute Miles	3 Statute Miles	3 Statute Miles	5 Statute Miles	5 Statute Miles
VFR Cloud Clearance 10,000 msl and Above	N/A	Clear of Clouds	500 Below 1,000 Above 2,000 Horizontal	500 Below 1,000 Above 2,000 Horizontal	1,000 Below 1,000 Above 1 Statute Mile Horizontal	1,000 Below 1,000 Above 1 Statute Mile Horizontal

*Prior to operating within Class B, C or D airspace (or Class E airspace with an operating control tower), student, sport, and recreational pilots must meet the applicable FAR Part 61 training and endorsement requirements. Solo student, sport, and recreational pilot operations are prohibited at those airports listed in FAR Part 91, appendix D, section 4.
**Student pilot operations require at least 3 statute miles visibility during the day and 5 statute miles visibility at night.
***Class G VFR cloud clearance at 1,200 agl and below (day); clear of clouds.

LOCAL AREA AIRSPACE STRUCTURE

The Seattle/Klamath Falls Sectional Aeronautical Charts depict nearby airports, notable obstructions, special airspace designations and IFR routes in the vicinity of Madras Municipal Airport.

Madras Municipal Airport is located in an area of Class E airspace with a floor 700 feet above ground level. Radio communication is not required for visual flight rules (VFR) operations in Class E airspace, although pilots are encouraged to use the common traffic advisory frequency (CTAF) when operating at the airport. Aircraft are required to obtain an air traffic control (ATC) clearance prior to operating in Class E airspace during instrument flight rules (IFR).

The local Class E airspace extends southwest from the Madras Airport in a rectangular shape that connects to other sections of Class E airspace in the vicinity of the Deschutes VOR. Redmond-Roberts Field's Class D airspace, which is in effect when the Airport's air traffic control tower (ATCT) is in operation (0600- 2200 local), is located approximately 23 miles south. The Class D airspace extends in a 5-mile radius from the Airport from the surface to 5,600 feet MSL. Aircraft operation in Class D airspace requires two-way radio contact with the Redmond control tower. When the tower is not in operation, the airspace surrounding Roberts Field reverts to Class E.

SPECIAL USE AIRSPACE

Areas of special use airspace (SUA) in the vicinity of Madras Municipal Airport include the Redhawk C Military Operations Area (MOA) (7 miles east), Juniper A & Juniper Low MOA (50 miles southeast), and the Mount Jefferson Wilderness Areas (25 miles west). Although VFR operations are not restricted in an MOA, pilots are advised to exercise extreme caution while flying within, near, or below an active MOA.

CONTROLLED & UNCONTROLLED AIRSPACE

Madras Municipal Airport is an uncontrolled field and pilots use the airport Unicom/common traffic advisory frequency (CTAF) for communications on the ground and in the vicinity of the Airport.

AIRSPACE - FAR PART 77, TERPS, AND RUNWAY END SITING SURFACES

In addition to the airspace classifications and operating environment pilots are more familiar with (described in the previous section above) there are a variety of rules, regulations, design standards, and policies associated with the protection of airspace, evaluation of proposed objects on and near airports, and their effects on navigable airspace. Airport Cooperative Research Program (ACRP) Report 38 - Understanding Airspace, Objects, and Their Effects on Airports provides a comprehensive description of the regulations, standards, evaluation criteria, and processes designed to protect the airspace surrounding airports and is summarized below for additional context of airspace evaluation and design to serve the Madras Municipal Airport.

FAR Part 77—Objects Affecting Navigable Airspace

This FAR is the central regulation governing airspace protection, with cross-references to many other criteria documents. It sets forth the requirements for notifying the FAA of proposed construction; defines obstruction criteria; and describes aeronautical studies required to assess hazard status.

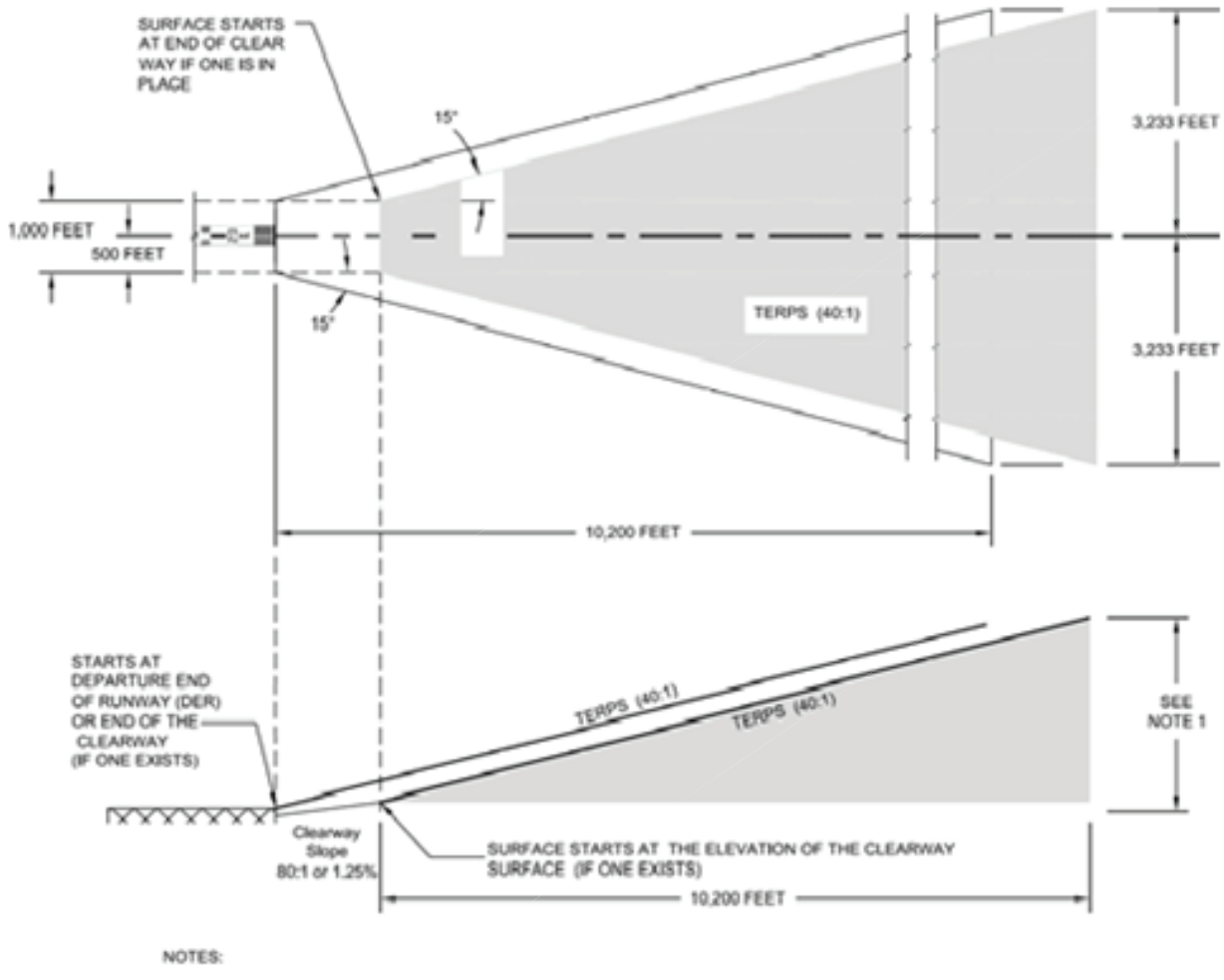
FAA Order 8260.3B—United States Standard for Terminal Instrument Procedures (TERPS)

This Order, along with several derivative orders in the 8260 series and other related orders, define criteria that FAA flight procedure designers utilize when designing instrument flight procedures. Airspace protection requirements for instrument flight procedures are one of the types of obstruction standards referenced in FAR Part 77; they are also one of the most common criteria analyzed for hazard status in aeronautical studies.

FAA AC 150/5300-13A—Airport Design

This AC is the principal document utilized by the FAA, airport sponsors, and planning consultants when planning and designing new airports or modifications to airports. Airspace clearances for key runway end features are defined in the AC's discussion of Runway End Siting Surfaces.

TERPS (40:1) DEPARTURE SURFACE FOR INSTRUMENT RUNWAYS



NOTES:

1. THIS IS AN INTERPRETATION OF THE APPLICATION OF THE TERPS SURFACE ASSOCIATED WITH A CLEARWAY.

Source: FAA AC 150-5300/13

INSTRUMENT FLIGHT PROCEDURES

Instrument approach and departure procedures are developed by the FAA using electronic navigational aids to guide aircraft through a series of prescribed maneuvers in and out of an airport's terminal airspace. The procedures are designed to enable continued airport operation during instrument meteorological conditions (IMC), but are also used during visual conditions, particularly in conjunction with an instrument flight plan. The capabilities of each instrument approach are defined by the technical performance of the procedure platform (ground based navigational aids or satellite navigational aids) and the presence of nearby obstructions, which may affect the cloud ceiling and visibility minimums for the approach, and the routing for both the approach and missed approach procedure segments. The aircraft approach speed and corresponding descent rate may also affect approach minimums for different types of aircraft.

Madras Municipal Airport currently has two published non-precision instrument approaches. Both approaches are straight-in global positioning system (GPS) procedures that provide vertical guidance (LPV) to the runway end for aircraft equipped with the appropriate FAA-certified GPS receiver. The approaches also provide procedures with course guidance only. Both instrument approaches are authorized for category A-C aircraft, with varying approach minimums for straight-in and circling procedures.

TABLE 2-10: APPROACH PROCEDURE MINIMUMS

	Minimum Altitude (MSL)	Minimum Visibility (SM)	Aircraft Category
RNAV (GPS) RWY 16			
LP MDA	2783	1 1/8	A-C
LNAV/VNAV MDA	2843	1 3/8	A-C
LNAV/MDA	3040	1	A-B
LNAV/MDA	3040	1 3/4	C
Circling	3040	1	A-B
Circling	3040	1 3/4	C
RNAV (GPS) RWY 34			
LP MDA	2687	1	A-C
LNAV/VNAV MDA	2687	1	A-C
LNAV/MDA	3000	1	A-B
LNAV/MDA	3000	1 5/8	C
Circling	3000	1	A-B
Circling	3000	1 5/8	C

AIRSIDE ELEMENTS

The Airside Elements are comprised of facilities that facilitate the movement and operation of aircraft on the ground and in the air at Madras Municipal Airport. This section of the existing conditions analysis includes a discussion of the runways, taxiways, airfield pavements condition/strength/marking, support facilities, FAA design standards, area airspace, and instrument approach procedures.

RUNWAYS

Madras Municipal Airport has two paved runways (16/34 and 04/22) and a turf alternate landing area located along the west side of Runway 16/34.

Runway 16/34 (5,090 x 75 feet) is oriented in a north-south direction (160-340 degree bearing) and Runway 04/22 (2,700 x 50 feet) is oriented in an east-west direction (040-220 degree bearing). Runway 4/22 provides crosswind coverage for a wide variety of aircraft, particularly tailwheel equipped aircraft including sport aircraft, aerial applicators, and antique large military aircraft.

Runway 16/34 has a full-length parallel taxiway (Taxiway A) on the east side with four exit taxiways (Taxiways A1-A4), including one at each runway end, and two mid-runway exit taxiways. The mid-runway exit taxiways are 90-degree connectors; the taxiways connecting to each runway end have 45-degree connectors.

Runway 04/22 is accessed by taxiway that connects the ends of Runway 16 and 22. Both ends of the taxiway are aligned with the runway ends.

A summary of runway conditions is provided below:

- **Runway Markings:** Both ends of Runway 16/34 have non-precision instrument markings that include threshold bars, threshold markings, runway designation markings, centerline stripe, and aiming point markings. Runway 04/22 has visual markings, consisting of runway designation markings, centerline stripe, and threshold bars. During recent site visits, the Runway 16/34 markings were observed to be in good condition; the Runway 4/22 were observed to be in fair condition. All runway markings are consistent with FAA standards for configuration, color (white paint), and approach type.
  - » During the master plan data collection/inventory, the addition of edge stripes on Runway 16/34 was suggested by users to better differentiate between the pavement edge and the gravel runway shoulders. Pilots of large tailwheel aircraft associated with the Erickson Collection indicate that they often use Runway 4/22 during mild crosswind conditions due to the limited visual references available along the sides of the 75-foot wide Runway 16/34.
- **MIRL:** Runway 16/34 is equipped with a Medium Intensity Runway Lighting (MIRL) system, which includes white edge lights (with amber lights located near the runway ends to indicate runway remaining) and split lens (green/red) threshold lights. The threshold lights consist of two sets of four fixtures near each corner of the runway ends. The fixtures have split lenses (green/red) indicating the beginning and end of the runway. The MIRL is pilot-activated using the common traffic advisory frequency (CTAF) 122.8 MHz. The current MIRL system was installed in 1991 as part of a runway reconstruction project. A portion of the runway has stake-mounted white edge reflectors installed adjacent to MIRL fixtures.
- **REIL:** Runway 34 is equipped with Runway End Identifier Lights (REIL), which consist of two high-intensity sequenced strobe lights located near the corners of the runway end. For instrument runways without an approach lighting system, REILS assist pilots in establishing visual contact with the runway environment during periods of darkness or reduced visibility. The REIL is pilot-activated using the common traffic advisory frequency (CTAF) 122.8 MHz. The REIL was installed in 2011, surplused from RDM.
- **Visual Guidance Indicators (VGI):** Runway 34 is equipped with a 4-light Visual Approach Path Indicator (VASI). The VASI projects light along a standard 3-degree glide path to a runway end, with red and white colored lights indicating the aircraft's vertical position (above, below, or on glide path) relative to the glide path. The VASI is pilot-activated using the common traffic advisory frequency (CTAF) 122.8 MHz. The VASI is FAA-owned and is believed to have been installed in 1991 as part of a runway reconstruction project.

- **Taxiway Lighting:** The taxiways are equipped with Medium Intensity Taxiway Lighting (MITL), which consist of blue lens LED fixtures. The MITL system was installed in 2019 when the parallel taxiway was reconstructed.
- Other Lighting: Limited overhead lighting is available in the terminal area, fueling area, and in various hangar areas. Some hangars also have exterior wall-mounted flood lights.

The Airport also has a turf-surfaced alternate landing area (approximately 100 feet wide) on the west edge of Runway 16/34. The construction of the alternative landing area was approved by FAA in 2017 (FAA Form 7480) as a modification to Runway 16/34. For planning purposes, the area is not considered a designated runway with its own protected airspace. Aircraft operations on the turf area are fully integrated into the use of Runway 16/34 (no simultaneous operations permitted).

TABLE 2-11: RUNWAY DATA SUMMARY

	Runway 16/34	Runway 04/22
Dimensions	5,089’ x 75’	2,701’ x 50’
Bearing	N 0° 28.41’ E	N 55° 29’ E
Effective Gradient	0.13%	0.26%
Surface Condition	Asphalt/Good	Asphalt/Poor
Weight Bearing Capacity	75,000 pounds - Single Wheel Gear 120,000 pounds - Double Wheel Gear 180,000 pounds - Tandem Double Gear	16,000 pounds - Single Wheel Gear
Markings	Non-precision Instrument (NPI) Designation markings, threshold bar, threshold markings, centerline stripe, and aiming point markings.	Visual Designation markings, threshold bar, and centerline stripe.
Lighting	Medium Intensity Runway Edge Lighting (MIRL) Runway 34: Visual Approach Slope Indicators (VASI) 4 Light (3.0 degree glide path) Runway 34: Runway End Identifier Light (REIL)	None
Signage	Mandatory, Location, Directional	None
Turf Landing Area	Turf/Good White Edge Reflectors No designed weight bearing capacity No lighting or markings	N/A

TAXIWAYS & TAXILINES

Madras Municipal Airport has an extensive taxiway system, including an eastside parallel taxiway (Taxiway A) for Runway 16/34 that provides access to both runway ends and landside facilities on the east side of the runway. An access taxiway extends from the north end of Runway 16/34 to the east end of Runway 4/22. A system of taxilanes provides access to aircraft parking aprons and hangar development areas.

Aircraft hold lines are located on all taxiway connections to the runways 200 feet from runway centerline, which corresponds to the edge of the runway obstacle free zone (OFZ). Taxiway A and all connectors have centerline and edge striping. All taxiway markings are yellow.

Taxiway A

Taxiway A is the east parallel taxiway for Runway 16/34. The taxiway is 35 feet wide with a runway separation of 690 feet. The taxiway was fully reconstructed, including new edge lighting and signage, in 2019 and is in excellent condition. Taxiway A has four connections to the runway (Taxiways A1-A4). The end taxiways (A1, A4) are approximately 900 feet long and have 45-degree connections to the adjacent runway thresholds. The mid-runway taxiways (A2, A3) have 90-degree connections to the runway. Taxiway A3 was reconfigured to replace an existing acute angled exit taxiway as part of the 2019 reconstruction project. The number and location of the exit taxiways allow efficient aircraft movement in the runway-taxiway system. Portions of Taxiway A directly abut the main apron and the Erickson aprons located at the north end of the flight line. Several apron and hangar taxilanes connect to Taxiway A. Taxiway A and its exit taxiways are equipped with medium intensity taxiway lighting (MITL) with LED fixtures.

Taxiway A has an aircraft hold area is located at its south end (placed near the end of the parallel section). A bypass taxiway was constructed for access to Runway 4/22 during the reconstruction of Runway 16/34 back in 2015. The pavement was maintained after the project, but is permanently closed and marked with yellow “X” placed at the ends.

The aircraft hold line, centerline and lead-in line striping on Taxiways A1-A4, and the centerline on Taxiway A are in excellent condition.

PAVEMENT CONDITION

The Oregon Department of Aviation (ODA) Pavement Evaluation Program (PEP) systematically identifies maintenance, repair, and rehabilitation projects needed to sustain functional pavements at Oregon Airports. The PEP provides a thorough evaluation of current conditions and future projections of condition in terms of pavement condition indices (PCI) for all eligible pavements on all paved airports across the state. For NPIAS airports that receive federal funding, this PEP assists in meeting FAA grant assurances.

The most recent Pavement Condition Index (PCI) survey for Madras Municipal Airport was performed in June 2017. The survey was performed using the Pavement Condition Index (PCI) methodology developed by the U.S. Army Corps of Engineers, and outlined in the current edition of ASTM D-5340, Standard Test Method for Airport Condition Index Surveys. The condition for the bulk of the pavements surveyed in 2017 was Fair to Good. Several pavement sections were rated Poor, Very Poor, or Failed in 2017:

- Two Portland cement concrete (PCC) sections of the south tiedown apron (Failed);
- Runway 4/22 (Poor);
- Sections of Taxiway A (Poor); and
- Main Apron (rear section adjacent to terminal and fueling area) (Poor).

Pavement upgrades completed since the 2017 inspection:

- Taxiway A and all four exit taxiways were reconstructed in 2019;
- The old Taxiway A3 (diagonal) was replaced with a new 90-degree taxiway;
- The south aircraft hold area was reconstructed in 2019 conjunction with the parallel taxiway project;
- The north aircraft pull out located just south of Taxiway A4 was eliminated as part of the parallel taxiway project and replaced with a new aircraft hold area.

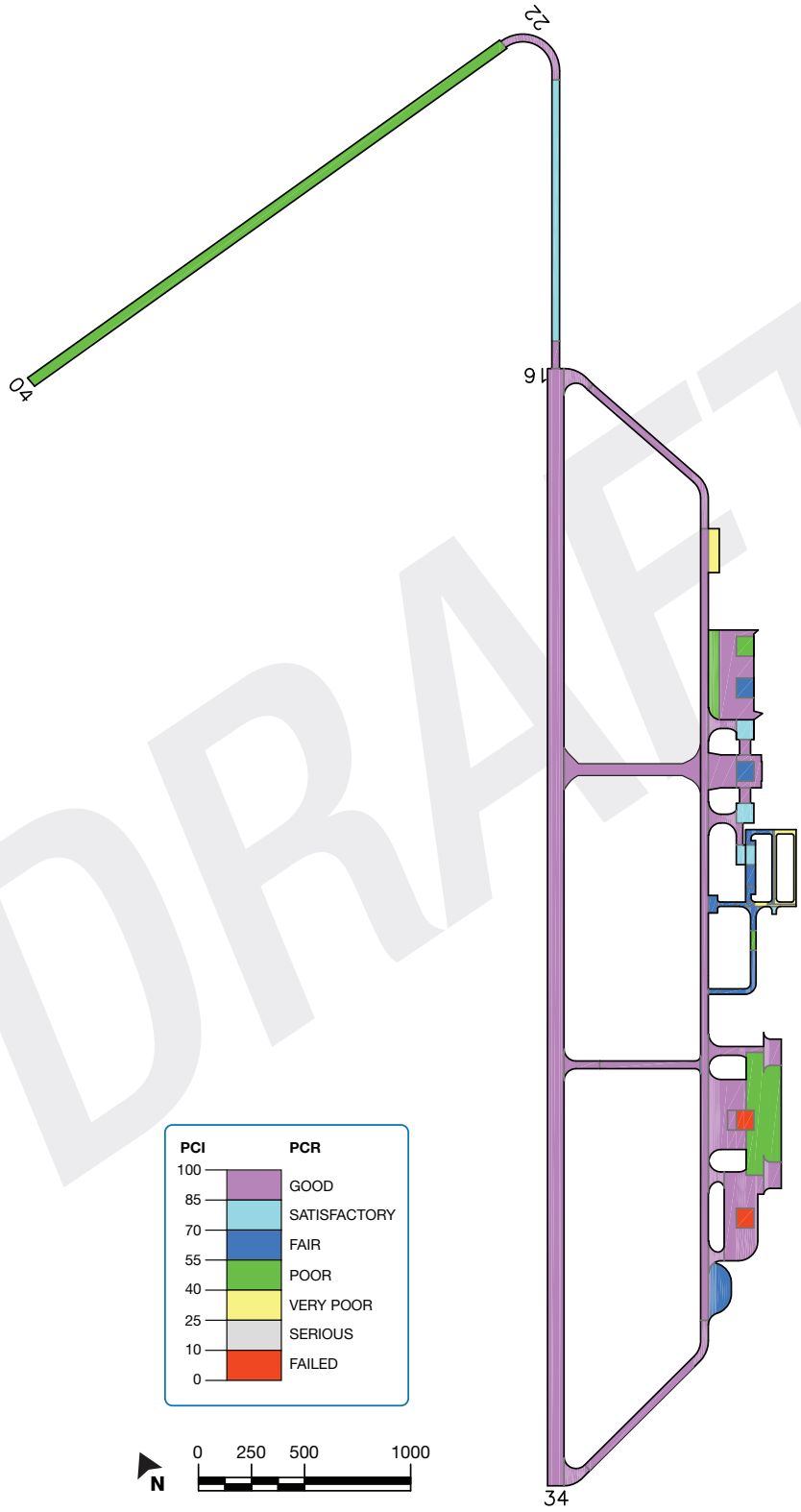
The reconstruction/construction of pavements effectively resets their current PCIs at 100. A review of the Five-Year (2018-2022) Pavement Maintenance and Rehabilitation Plan will be conducted when updated facility requirements are defined later in the master plan.

The military construction at the Airport in 1943 included 32 Portland cement concrete (PCC) aircraft hardstands (90’ x 80’ typ.) located along both sides of Taxiway A. Of the original 14 hardstands located east of the parallel taxiway, 10 (full or remnant sections) were included in the 2017 PCI survey. Two hardstands contained within the main apron were identified as Failed. None of the 18 hardstands located west of the Taxiway A were included in the survey, although many are in current use. It is noted that these hardstands have historically not been evaluated in previous PCI surveys.

The pavement evaluation depicted is consistent with airport user feedback and airport management understanding. New apron pavement constructed near the Erickson Collection museum is also not rated.

City staff are working with the FAA Seattle ADO to identify funding and schedule the necessary work to address the areas where pavement is in the worst condition. For pavement that is considered “ineligible” for FAA funding, other funding sources including ODA PMP and grant funds may be sought.

PAVEMENT CONDITIONS



AIRSIDE SUPPORT FACILITIES

Support facilities generally include airside support facilities such as airfield lighting, signage, weather reporting equipment and visual aids.

Airport Lighting and Signage

Madras Municipal Airport accommodates day and night operations in both visual and instrument meteorological conditions (IMC). The runway is equipped with lighting systems that are consistent with current instrument approach requirements and runway use. The runway-taxiway system has extensive signage that conveys directional, location, and runway clearance information to pilots. All airfield lighting observed during recent site visits appeared to be in good condition and fully operational.

Airport Lighting

The Airport has a rotating beacon mounted on the roof of the south Quonset hangar near the main apron, on the east side of the airfield. The beacon operates on a dusk-dawn photocell switch and reportedly functions normally. Rotating beacons are used to indicate the location of an airport to pilots at night or during reduced visibility. The beacon provides sequenced white and green flashing lights (representing a lighted land airport) that rotate 360 degrees to allow pilots to identify the airport from all directions for several miles.

One lighted wind cone is located on the east side of the runway, just south of the mid-runway exit taxiway. An unlighted tetrahedron wind indicator is located on the west side of Runway 16/34, opposite the Taxiway A2.

Airfield Signage

The runway-taxiway system has mandatory instruction signs (red background with white letters/numbers) marking the aircraft holding positions at each of the taxiway connections with the runway [16-34, 34-16, 16, 34]; the two-panel signs also include taxiway designations [A1, A2, etc.] with yellow background and black numbers/letters. The runway-facing side of each sign depicts the exit taxiway designation.

The signs are located to coincide with the painted aircraft hold lines on each taxiway that connects to the runway. The signs are internally illuminated and were installed new in 2019.

Weather Reporting

Madras Municipal Airport has an automated weather observation system (AWOS-3) that provides 24-hour weather information. AWOS-3 provides altimeter setting, wind data, temperature, dew point, density altitude, visibility, and cloud/ceiling data.

Navigation Aids (NAVAIDS)

The Deschutes VORTAC, located 25.8 miles south of the airport supports nearby enroute air navigational routes and instrument approach procedures to several area airports including Madras, Redmond, and Bend.

Traffic Pattern

Madras Municipal Airport uses standard left-hand traffic patterns for Runway 16/34 and 4/22, with a pattern altitude of 1,000 feet above ground level (AGL) for fixed wing traffic and 1,500 feet AGL for larger turbine aircraft.

LANDSIDE ELEMENTS

The landside elements section includes the facilities designed to support airport operations, including aircraft parking aprons, fueling aprons and fuel storage, hangars, and taxilanes. Other facilities including utilities, fencing, surface access roads, vehicle parking, and fixed base operator (FBO)/terminal facilities are also addressed.

EXISTING CONDITIONS

AIRCRAFT APRONS

Main Apron

The main apron is centrally located directly in front of the general aviation terminal/FBO. The apron accommodates aircraft loading/unloading and large aircraft parking and access to the aircraft fueling area. The apron was reconfigured in 2012 to meet standards and construct four large aircraft drive-through positions.

North Hangar Aprons

The Erickson hangars have large apron areas between their hangars and Taxiway A.

South Tiedown Apron

The southern section of the apron area has twelve small airplane tiedowns configured in an east-west orientation with taxilane access on both sides. The asphalt pavement is in good condition and was constructed in 2011, the original concrete portion of the apron is in poor condition.

AIRPORT PERIMETER FENCING

The airport has limited areas of fencing, which consists primarily of four-foot chain link fence around the fuel facility, and along the apron adjacent to the general aviation building. The remainder of the apron and hangar areas along NW Berg Drive is without perimeter fencing. There is three strand barbed wire fencing around the airfield perimeter.

AIRPORT SURFACE ROAD ACCESS

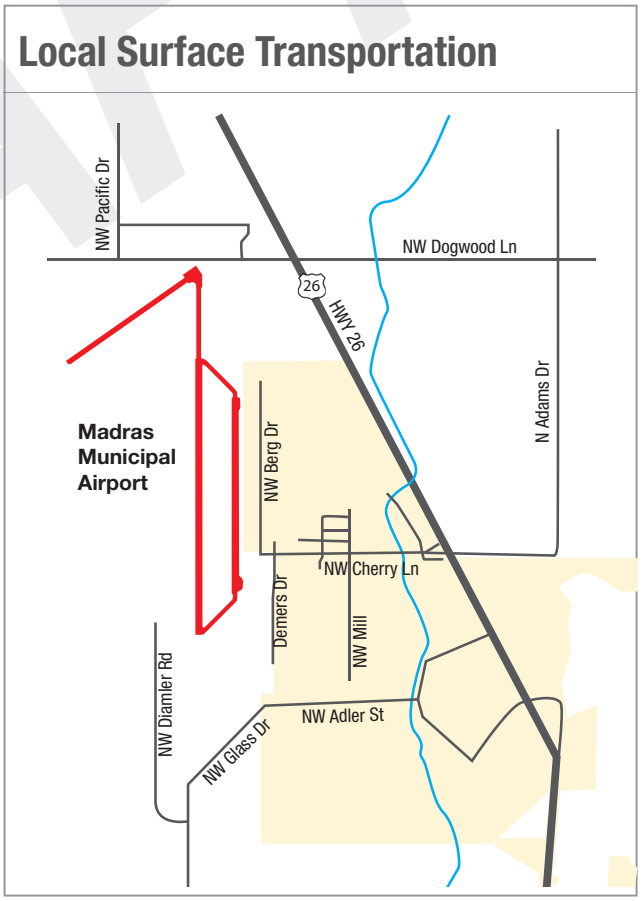
Access to Madras Municipal Airport is provided by Highway 26 and NW Cherry Lane. NW Berg Drive provides vehicle access to the hangar and apron areas and connects with NW Cherry Lane.

VEHICLE PARKING

Designated automobile parking areas on the Airport are typically located in front of each individual hangar. A public parking area is located adjacent to the general aviation terminal building. Vehicle parking is also available adjacent to individual large hangars.

AIRCRAFT FUEL

Madras Municipal Airport has 100-octane low lead (100LL) aviation gasoline (AVGAS) and jet fuel (Jet-A) available for sale through the local fixed base operator (FBO), Berg Air, LLC. The City of Madras owns and maintains the fuel storage and dispensing system that includes two 12,000 gallon above ground double-wall tanks and a 24-hour credit card payment system for self-fueling. The fixed point fueling system is located immediately north of the terminal/FBO building. Berg Air also has mobile fuel trucks available for aircraft fueling.



AIRPORT ADMINISTRATION

The Airport Administration section provides a summary of Airport Ownership & Management, Airport Finance, Rates and Charges, Rules and Regulations, and overview of FAA Grant Assurances and Compliance.

Airport Ownership & Management

Madras Municipal Airport is owned and operated by the City of Madras. All of the Airport's land area is within the Madras city limits. The Airport is managed by the City with a contract Airport Manager who owns and manages the Airport's Fixed Base Operator (FBO). The Airport Manager and staff perform airfield maintenance, snow removal services, as well as mowing with assistance from City staff. City of Madras staff provide finance, legal, human resources, information technology, and administration services for the Airport.

Airport lessees are responsible for managing their facilities and leased areas to meet the requirements defined in their leases and the airports Minimum Standards document.

Airport Finance

The Airport operates as an enterprise fund with all revenue generated by the Airport remaining in the Airport's budget. This is required by FAA to prevent revenue diversion from Airport operations to general city services. The primary revenue generating sources for the Airport include hangar and ground lease rents and fuel sales. The primary expenditures for the Airport include Airport administration, maintenance, and facility improvements. Many Airport administration responsibilities such as human resources, finance, grant administration, procurement and legal services are provided by City internal service departments. The Airport's capital improvement projects are typically funded through FAA grants with a local (City) match that may be supplemented by ODA grants.

TABLE 2-12 AIRPORT REVENUE/EXPENSE SUMMARY

	Airport Revenue
Ground & Light Maintenance Fees	$15,217
WW Operations Lease	$9,900
Aviation Fuel Sales	$303,571
Daimler Lease	$365,262
Old Hangar Lease	$22,300
T-Hangar Lease	$18,480
Heavy Aircraft & Equipment Hangar	$96,087
Airport Pad Lease	$2,682
Airport Fire	$6,750
Land Leases	$67,509
Interfund Transfers & Investment Interest	$111,560
Grant Funding (FAA, ODA, Daimler)	$635,000
Total Airport Revenues	**$1,951,218**

	Airport Expenses
Ending Fund Balance	$247,034
Operating Contingency	$75,000
Materials & Services 1. Aviation Fuel Purchases 2. Airshow 3. IT and Communications 4. FBO 5. Insurance 6. Legal 7. Maintenance & Repair - Buildings & Airfield 8. Utilities 9. Inter-City Services 10. Other	$758,484
Capital Outlay 1. Airport Improvements 2. Taxiway Improvement Project 3. ARFF & Maintenance Building 4. Airport Master Plan Update	$780,000
Debt Service 1. OBDD Heavy Aircraft Hangar 2. Berg Drive Extension	$85,700
Total Airport Operating Expenses	**$1,951,218**
Net Operating Income	**$0**

The 2019-2020 adopted budget for Madras Municipal Airport (Table 2–10) identifies $1,951,218 in revenues for the Airport and $1,951,218 in operating expenses, which results in a net operating income of $0. The revenues includes $295,875 in carry-over funding from the prior year, as well as $635,000 of grant funding and cost sharing with Daimler, and $110,000 in inter-City fund transfers. Therefore, the annual operating revenues are anticipated to be $909,343.

The Airport's operating expenses include FBO services and commissions of $115,902, inter-City fund expenses of $216,725, aviation fuel purchases of $242,857, and debt services of $85,700. The Airport's capital improvement projects make up $780,000 of the budget, which cover the taxiway improvement project, Aircraft Rescue and Firefighting (ARFF) and maintenance building, as well as the Airport Master Plan update. The City charges the Airport approximately $216,725 annually for City services including central services, public works personnel, buildings and fleet maintenance.

CITY OF MADRAS RULES AND REGULATIONS

The City of Madras Code provides the legal framework and authority for actions regulated by the City of Madras as the sponsor of the Madras Municipal Airport. The City will operate the airport for the use and benefit of the public in order to make it available to all types, kinds, and classes of aeronautical activity on fair and reasonable terms and without unjust discrimination.

FAA Compliance Overview

A management program based on the FAA's "Planning for Compliance" guidance and the adoption of additional airport management "Best Practices" is recommended to address FAA compliance requirements and avoid noncompliance, which could have significant consequences.

Airport management "Best Practices" are developed to provide timely information and guidance related to good management practices and safe airport operations for airport managers and sponsors. The practices outlined herein are designed for use by the City of Madras for evaluating and improving their current and future operation and management program.

Airport sponsors must comply with various federal obligations through agreements and/or property conveyances, outlined in FAA Order 5190.6B, Airport Compliance Manual. The contractual federal obligations a sponsor accepts when receiving federal grant funds or transfer of federal property can be found in a variety of documents including:

- Grant agreements issued under the Federal Airport Act of 1946, the Airport and Airway Development Act of 1970, and Airport Improvement Act of 1982. Included in these agreements are the requirement for airport sponsors to comply with:
  - » Grant Assurances;
  - » Advisory Circulars;
  - » Application commitments;
  - » FAR procedures and submittals; and
  - » Special conditions.
- Surplus airport property instruments of transfer;
- Deeds of conveyance;
- Commitments in environmental documents prepared in accordance with FAA requirements; and
- Separate written requirements between a sponsor and the FAA.

Airport Compliance with Grant Assurances

As a recipient of both federal and state airport improvement grant funds, the City of Madras is contractually bound to various sponsor obligations referred to as "Grant Assurances", developed by the FAA and the Oregon Department of Aviation. These obligations, presented in detail in federal and state grants and state statute and administrative codes, document the commitments made by the airport sponsor to fulfill the intent of the grantor (FAA and State of Oregon) required when accepting federal and/or state funding for airport improvements. Failure to comply with the grant assurances may result in a finding of noncompliance and/or forfeiture of future funding. Grant assurances and their associated requirements are intended to protect the significant investment made by the FAA, State, and City to preserve and maintain the nation's airports as a valuable national transportation asset, as mandated by Congress.

FAA Grant Assurances

The FAA's Airport Compliance Program defines the interpretation, administration, and oversight of federal sponsor obligations contained in grant assurances. The Airport Compliance Manual defines policies and procedures for the Airport Compliance Program. Although it is not regulatory or controlling with regard to airport sponsor conduct, it establishes the policies and procedures for FAA personnel to follow in carrying out the FAA's responsibilities for ensuring compliance by the sponsor.

The Airport Compliance Manual states the FAA Airport Compliance Program is: "...designed to monitor and enforce obligations agreed to by airport sponsors in exchange for valuable benefits and rights granted by the United States in return for substantial direct grants of funds and for conveyances of federal property for airport purposes. The Airport Compliance Program is designed to protect the public interest in civil aviation. Grants and property conveyances are made in exchange for binding commitments (federal obligations) designed to ensure that the public interest in civil aviation will be served. The FAA bears the important responsibility of seeing that these commitments are met. This order addresses the types of commitments, how they apply to airports, and what FAA personnel are required to do to enforce them." According to the FAA, cooperation between the FAA, state, and local agencies should result in an airport system with the following attributes:

- Airports should be safe and efficient, located at optimum sites, and be developed and maintained to appropriate standards;
- Airports should be operated efficiently both for aeronautical users and the government, relying primarily on user fees and placing minimal burden on the general revenues of the local, state, and federal governments;
- Airports should be flexible and expandable, able to meet increased demand and accommodate new aircraft types;
- Airports should be permanent, with assurance that they will remain open for aeronautical use over the long-term;
- Airports should be compatible with surrounding communities, maintaining a balance between the needs of aviation and the requirements of residents in neighboring areas;
- Airports should be developed in convert with improvements to the air traffic control system;
- The airport system should support national objectives for defense, emergency readiness, and postal delivery;
- The airport system should be extensive, providing as many people as possible with convenient access to air transportation, typically not more than 20 miles of travel to the nearest NPIAS airport; and
- The airport system should help air transportation contribute to a productive national economy and international competitiveness.

The airport sponsor should have a clear understanding of and comply with all assurances. The following sections describe the selected assurances in more detail.

Project Planning, Design, And Contracting

Sponsor Fund Availability (Assurance #3)

Once a grant is given to the City of Madras (airport sponsor), the City commits to providing the funding to cover their portion of the total project cost. Currently this amount is ten percent of the total eligible project cost, although it may be higher depending on the particular project components or makeup. Once the project has been completed, the receiving airport also commits to having adequate funds to maintain and operate the airport in the appropriate manner to protect the investment in accordance with the terms of the assurances attached to and made a part of the grant agreement.

Consistency with Local Plans (Assurance #6)

All projects must be consistent with city and county comprehensive plans, transportation plans, zoning ordinances, development codes, and hazard mitigation plans. The City of Madras (airport sponsor) should familiarize themselves with local planning documents before a project is considered to ensure that all projects follow local plans and ordinances.

Accounting System Audit and Record Keeping (Assurance #13)

All project accounts and records must be made available at any time. Records should include documentation of cost, how monies were actually spent, funds paid by other sources, and any other financial records associated with the project at hand. Any books, records, documents, or papers that pertain to the project should be available at all times for an audit or examination.

General Airport Assurances

Good title (Assurance #4)

The City of Madras (airport sponsor) must have a Good Title to affected property when considering projects associated with land, building, or equipment. Good Title means the sponsor can show complete ownership of the property without any legal questions, or show it will soon be acquired.

Preserving Rights and Powers (Assurance #5)

No actions are allowed, which might take away any rights or powers from the sponsor, which are necessary for the sponsor to perform or fulfill any condition set forth by the assurance included as part of the grant agreement.

Airport Layout Plan (ALP) (Assurance #29)

Madras Municipal Airport should maintain an up-to-date ALP, which should include current and future property boundaries, existing facilities/structures, locations of non-aviation areas, and existing and proposed improvements. FAA requires proposed improvements to be depicted on the ALP in order to be eligible for FAA funding. If changes are made to the airport without authorization from the FAA, the FAA may require the airport to change the alternation back to the original condition or jeopardize future grant funding.

Disposal of Land (Assurance #31)

Land purchased with the financial participation of an FAA Grant cannot be sold or disposed of by the airport sponsor at their sole discretion. Disposal of such lands are subject to FAA approval and a definitive process established by the FAA. If airport land is no longer considered necessary for airport purposes, and the sale is authorized by the FAA, the land must be sold at fair market value. Proceeds from the sale of the land must either be repaid to the FAA, or reinvested in another eligible airport improvement project.

Airport Operations and Land Use

Pavement Preventative Maintenance (Assurance #11)

Since January 1995, the FAA has mandated that it will only give a grant for airport pavement replacement or reconstruction projects if an effective airport pavement maintenance-management program is in place. The Oregon Department of Aviation prepares and updates pavement reports for Madras Municipal Airport. These reports identify the maintenance of all pavements funded with federal financial assistance and provides a pavement condition index (PCI) rating (0 to 100) for various sections of aprons, runways, and taxiways; including, a score for overall airport pavements.

Operations and Maintenance (Assurance #19)

All federally funded airport facilities must operate at all times in a safe and serviceable manner and in accordance with the minimum standards as may be required or prescribed by applicable Federal, State, and Local agencies for maintenance and operations.

Compatible Land Use (Assurance #21)

Land uses around an airport should be planned and implemented in a manner that ensures surrounding development and activities are compatible with the airport. The Airport is located inside the Madras city limits. Portions of the protected FAR Part 77 airspace for the Airport extends into unincorporated Jefferson County. The City of Madras, as airport sponsor, should work with Jefferson County to ensure there are zoning laws that protect the Airport from incompatible land uses. Incompatible land uses around Airports represents one of the greatest threats to the future viability of airports.

Day-To-Day Airport Management

Economic Non-Discrimination (Assurance #22)

Any reasonable aeronautical activity offering service to the public should be permitted to operate at the airport as long as the activity complies with airport established standards for that activity. Any contractor agreement made with the airport will have provisions making certain the person, firm, or corporation will not be discriminatory when it comes to services rendered including rates or prices charged to customers.

Exclusive Rights (Assurance #23)

No exclusive right for the use of the airport by any person providing, or intending to provide, aeronautical services to the public. However, an exception may be made if the airport sponsor can prove that permitting a similar business would be unreasonably costly, impractical, or result in a safety concern, the sponsor may consider granting an exclusive right.

Leases and Finances

Fee and Rental Structure (Assurance #24)

An airport's fee and rental structure should be implemented with the goal of generating enough revenue from airport related fees and rents to become self-sufficient in funding the day-to-day operational needs. Airports should update their fees and rents on a regular basis to meet fair market value, often done through an appraisal or fee survey of nearby similar airports. Common fees charged by airports include fuel flowage fees, tie-down fees, landing fees, and hangar or ground lease rents.

Airport Revenue (Assurance #25)

Revenue generated by airport activities must be used to support the continued operation and maintenance of the airport. Use of airport revenue to support or subsidize non-aviation activities or to fund other City departments who are not using the funds for airport specific purposes is not allowed and is considered revenue diversion. Revenue diversion is a significant compliance issue for FAA.

OREGON AVIATION LAWS

The Oregon Department of Aviation (ODA) has created both the Oregon Administrative Rules (OAR) and Oregon Revised Statutes (ORS) to govern airports within the state.

Oregon Administrative Rules (OAR)

- OAR Chapter 660, Division 13 – Airport Planning
- OAR Chapter 660, Division 13 – Exhibits
- OAR Chapter 738 – ODA
- Non-Commercial Leasing Policy
- Commercial Leasing Policy
- Category II Minimum Standards Policy
- Category IV Minimum Standards Policy
- Category V Minimum Standards Policy
- Insurance Requirements

Oregon Revised Statutes (ORS)

- ORS 197 – Land Use Planning I
- ORS 197A – Land Use Planning II
- ORS 319 – Aviation Fuel Tax
- ORS 835 – Aviation Administration
- ORS 836 – Airports and Landing Fields
- ORS 837 – Aircraft Operations
- ORS 838 – Airport Districts

For additional information on FAA Grant Assurances, please go to: https://www.faa.gov/airports/aip/grant_assurances/#current-