CHAPTER 2: RUNWAYS & TAXIWAYS

Introduction

This Chapter of the Airport Master Plan is focused on the Runway and Taxiway system at the airport which is commonly referred to as the airfield where aircraft takeoff, land and maneuver on the ground. Please note that **Chapter 3: Terminal Area and Support Facilities** will look at the apron, hangars and other facilities supporting the airport. These two chapters will address existing and future facility needs at Laurel Municipal Airport (6S8).

As the chapter analyzes various components of the runway and taxiways at 6S8, it will review current conditions and any deficiencies that do not meet FAA design standards. It will consider the future critical design aircraft and provide facility requirements to accommodate these aircraft through the planning period. The chapter will further present the alternatives that were considered to meet future needs and the preferred airfield alternative that was chosen. Included in this chapter will be the following elements:

- Critical Design Aircraft
- Meteorological Information
- Runways
- Taxiways
- Evaluation Process
- Alternatives
- Preferred Alternative

Critical Design Aircraft

As determined in Chapter 1, the existing and future critical design aircraft is an A/B-II (Small) aircraft which has an aircraft approach category (AAC) A or B, airplane design group (ADG) II, and a taxiway design group (TDG) 2A. The A and B AAC are noted together because they have the same FAA Airport Design Standards and are referenced as A/B in referring to the Critical Design Aircraft. The determination of Critical Design Aircraft helps look at the needs for the runway and taxiway system.

Table 2-1 – Critical Design Aircraft Summary

Design Characteristics	Existing	Future
Aircraft Make/Model	Various	Various
Airplane Approach Category	A/B	A/B
Airplane Design Group	II	II
Taxiway Design Group	2-A	2-A
Wingspan	Up to 79’	Up to 79’
Length	Up to 65’	Up to 65’
Height	Up to 25’	Up to 25’
Main Gear Width	Up to 20’	Up to 20’
Maximum Takeoff Weight	12,500 pounds	12,500 pounds

Source: KLJ Analysis

Meteorological Data

The runway discussion must start with meteorological information. For safety and to maximize performance capabilities, aircraft need to takeoff and land into the wind. In addition, aircraft must often operate in poor weather conditions to deliver passengers and cargo. For these reasons, weather needs to be addressed early in the discussions.

Weather Reporting

There are two types of weather reporting systems that are certificated for use on an airport which are the ASOS and AWOS. The Automated Surface Observing System (ASOS) program was a joint effort between the Federal Aviation Administration and the National Weather Service (NWS) to deploy a network of high-grade weather monitoring stations across the United States. ASOS serves as a primary climatological observing network in the United States and have equipment that provides weather observations every minute. The AWOS is a second-tier system which is maintained locally or by states and contains varying sets of instrumentation packages to provide local weather observations. Laurel has an AWOS-II weather observation system located on the airfield. The AWOS-II does not include ceiling and visibility and is not reported into the NWS National Airspace Data Interchange Network (NADIN) system for weather reporting so it is only available for current conditions and there is no historic information from the AWOS. For the wind analysis at Laurel, the Billings (BIL) ASOS is being used for wind coverage and meteorological analysis. **It is recommended the AWOS-II be upgraded to an AWOS-III to provide visibility information, broader dissemination of the current conditions and to record historic conditions.**

Wind coverage and weather conditions are evaluated based on the two different flight rules, VFR and IFR. Visual Meteorological Conditions (VMC) are encountered when the visibility is 3 nautical miles or greater, and the cloud ceiling height is 1,000 feet or greater. Conditions less than these weather minimums are considered Instrument Meteorological Conditions (IMC) requiring all flights to be operated under IFR.

Meteorological conditions that affect the facility requirements of an airport include but are not limited to wind direction, wind speed, cloud ceiling, visibility, and temperature. Hourly metrological data was reviewed from BIL ASOS available from the National Climatic Data Center (NCDC). Periodic “special” weather observations within each hour were removed. This method provides and considers the true average weather trends at an airport without skewing conditions toward IFR where multiple observations may be taken each hour due to changing conditions.

In addition to wind, temperature affects runway length required. From weather reports over the last 30 years (1991-2020) the average maximum temperature at 6S8 in the hottest month has been 88.7 degrees Fahrenheit (July).

WIND COVERAGE

Wind coverage is important to airfield configuration and utilization. Aircraft ideally takeoff and land into a headwind aligned with the runway orientation. Aircraft are designed and pilots are trained to land aircraft in limited crosswind conditions. Small, light aircraft are most affected by crosswinds. To mitigate the effect of crosswinds, FAA recommends runways be aligned so that excessive crosswind conditions are encountered at most 5 percent of the time. This is known as a "95 percent wind coverage" standard. When this level of coverage is not provided, the FAA recommends development of a secondary (crosswind) runway.

Small Aircraft Crosswind Landing Diagram (faasafety.gov)

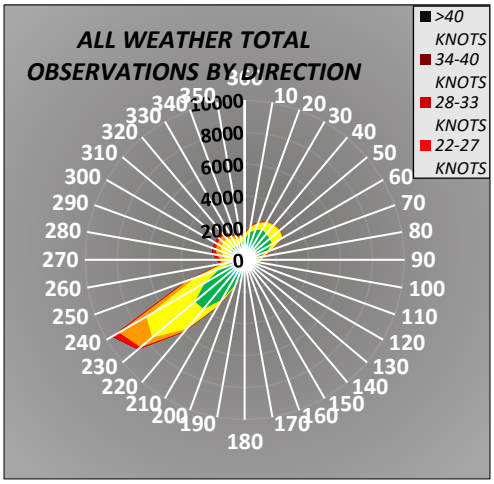
A runway's wind coverage is determined by an aircraft's ability to operate with a "direct" crosswind, which is defined as 90 degrees to the direction of travel. For planning purposes, FAA has defined the maximum direct crosswind for small aircraft as 12 miles per hour (10.5 knots). For increasingly larger aircraft, a 15-mile per hour (13 knot) direct crosswind is used up through 23-mile per hour (20 knots) for the largest aircraft. Aircraft can operate safely in progressively higher wind speeds as the crosswind angle decreases and the wind direction aligns more closely with the direction of flight.

Even when the 95 percent wind coverage standard is achieved for the design airplane or airplane design group, cases arise where certain airplanes with lower crosswind capabilities are unable to utilize the primary runway. The maximum crosswind component for different aircraft sizes and speeds are shown in **Table 2-2 FAA Wind Coverage Standards**.

Table 2-2 – FAA Wind Coverage Standards

AAC-ADG	Maximum Crosswind Component
A-I & B-I	10.5 knots
A-II & B-II	13.0 knots
A-III, B-III & C/D I-III	16.0 knots

Source: FAA AC 150/5300-13B – Airport Design



Prevailing winds, as reported by the BIL ASOS, are from the west-northwest and are generally aligned with the airport's runway configuration. The BIL data is shown in **Table 2-3** for all runways and the BIL data can be seen in **Table 2-4** for the paved runways**.**

Table 2-3 – BIL All-Weather Wind Analysis

Runway	AAC-ADG	Crosswind Component (Wind Speed)		
		10.5 knots	13.0 knots	16.0 knots
4-22	A/B-II	90.39%	93.93%	96.67%
14-32	A/B-I	74.66%	86.12%	
9-27	A/B-I	88.32%		
Combined		99.79%	98.38%	96.67%

Source: KBIL ASOS (2012 -2021, hourly), 87,633 total observations

For all-weather conditions, the A/B-II design aircraft crosswind component (13 knots) is not accommodated with only Runway 4-22 according to the BIL ASOS. Runway 14-32 will be needed to achieve coverage for the 13 knot crosswind (see 98.38% combined all-weather coverage)

Table 2-4 – BIL All-Weather Paved Runway Wind Analysis

Runway	AAC-ADG	Crosswind Component (Wind Speed)		
		10.5 knots	13.0 knots	16.0 knots
4-22	A/B-II	90.39%	93.93%	96.67%
14-32	A/B-I	74.66%	86.12%	
Combined		96.77%	98.38%	96.67%

Source: BIL ASOS (2012-2021; hourly), 87,633 total observations

Wind coverage during IMC is evaluated to determine the ideal alignment for instrument approach to an airport's runway. As shown in **Table 2-5**, the wind data was applied to the runway alignment at 6S8 to evaluate the IMC wind coverage. The 95 percent wind coverage requirement is met for the design aircraft (B-II) with a maximum crosswind component of 13.0 knots, and for the 10.5 knot crosswind component.

Table 2-5 – IMC Wind Analysis

Runway	AAC-ADG	Crosswind Component (Wind Speed)		
		10.5 knots	13.0 knots	16.0 knots
4-22	B-II	97.49%	98.71%	99.36%

Source: BIL ASOS (2012-2021; hourly), 4,347 total observations

Based on true hourly weather data summarized in **Table 2-6**, the airport experiences conditions below the visual weather minimums 4.96 percent of the time. Without an instrument approach that means there are 18.1 days per year when the airport is not usable. With an instrument approach of 300 feet ceiling and 1-mile visibility, the airport is used an additional 3.30% or an additional 12.1 days leaving only 6.0 days unusable.

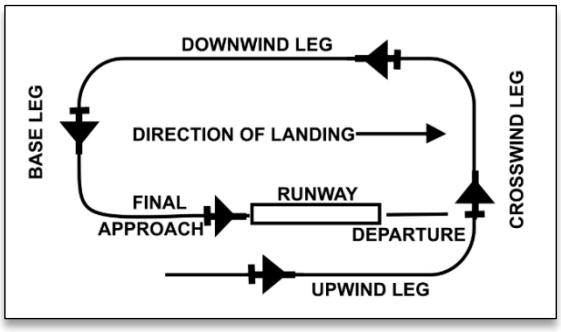
Table 2-6 – Meteorological Analysis

Weather Condition	Percentage	Days per Year	Hours per Year
VMC	95.04%	346.9	8,325
Usable IMC	3.30%	12.1	289
Below Weather Minimums	1.66%	6.0	145
Total	***100.00%***	***365.0***	***8,760***

Source: KBIL ASOS (2012-2021, hourly) from National Climatic Data Center, 87,633 total observations

APPROACH/DEPARTURE PROCEDURES

Aircraft operate under either Visual Flight Rules (VFR) or Instrument Flight Rules (IFR) depending on weather conditions and/or operational standards.



Standard VFR Airport Traffic Pattern (Source: FAA)

Visual Approach/Departure Procedures

Under VFR, pilots are advised to utilize a standard rectangular traffic pattern around the runway to approach or depart an airport. Standard traffic pattern legs include upwind, crosswind, downwind, base, and final. Departures are typically straight-out from a departing runway, a 90-degree crosswind, or 180-degree downwind. Arrivals typically enter a traffic pattern 45 degrees to a downwind leg for landing.

Instrument Approach Procedures

Pilots operating under IFR intending to land at an airport must navigate aircraft on published Instrument Approach Procedures (IAP). 6S8 IAPs (see **Table 2-7**) are available for Runways 4 and 22 with either ground-based or satellite-based NAVAIDS. Instrument approach weather minimums are a result of the approach type, airport infrastructure, and any prevailing airspace obstructions.

Table 2-7 – Instrument Approach Procedures

Approach Procedure	Approach Type	Lowest Cloud Ceiling Minimum (HAT)	Lowest Visibility Minimum (n.m.)
RNAV (GPS) RWY 4	Non-Precision Approach with Vertical Guidance	LPV: 300 feet LNAV/VNAV: 500 feet LNAV MDA: 500 feet	LPV: 1 mile LNAV/VNAV:1 ¾ mile LNAV MDA A, B Aircraft: 1 mile C, D Aircraft: 1 ⅜ mile
RNAV (GPS) RWY 22	Non-Precision Approach with Vertical Guidance	LPV: 300 feet LNAV/VNAV: 500 feet LNAV MDA: 500 feet	LPV: 1 mile LNAV/VNAV: 1 ⅝ mile LNAV MDA A, B Aircraft: 1 mile C, D Aircraft: 1 ⅝ mile
VOR RWY 22	VOR	S-22: 900 feet Circling: 900 feet Circling C Aircraft 1000 Circling D Aircraft 1100	A, B Aircraft: 1 ¼ mile C Aircraft: 2 ¾ mile D Aircraft: 3 mile
VOR RWY 22 FINRO Fix	VOR with FINRO Fix	S-22: 700 feet Circling: 700 feet Circling C Aircraft: 1000 Circling D Aircraft: 1100	A, B Aircraft: 1 mile C Aircraft: 2 mile D Aircraft: 2 ¼ mile Circling C Aircraft: 2 ¾ mile Circling D Aircraft 3 mile

Source: AirNav

Note: HAT = Height Above Touchdown, n.m. = nautical miles (reported), LPV = Localizer Performance with Vertical Guidance, LNAV = Lateral Navigation, VNAV = Vertical Navigation, DA = Descent Altitude, MDA = Minimum Decent Altitude, VOR = Very High Frequency Omni-Directional Range

IFR/Obstacle Departure Procedures

Special procedures are published at airports to provide aircraft with adequate obstacle clearance. Examples include increased aircraft climb rates or recommended turns. For 6S8 there are the options of using the Billings Five Departure or other published departure procedures applicable to Runways 4 and 22.

Runways

There are currently three runways at Laurel with two paved runways and one turf. These are Runway 4-22, 14-32 and 9-27. The details of these runways are as follows.

RUNWAY 4-22

Runway 4-22 runs Southwest to Northeast and is the primary asphalt runway that is 5,199 feet long by 75 feet wide with a weight bearing capacity to accommodate up to single wheel 12,500 pounds. There is a non-precision approach with one mile visibility and two light Precision Approach Path Indicator (PAPI) for both runway ends and medium intensity runway lights (MIRL). The runway 22 End has a Very High Frequency Omnidirectional Range Station (VOR) approach, see **Appendix A: Glossary of Terms** for more information on VOR. The Runway Design Code (RDC) for this runway is B-II. See **Appendix B: General Aviation Airports 101** for additional information on RDCs.

RUNWAY 14-32

This is an asphalt runway sitting off the end of Runway 4 running North-Northwest to South-Southeast. It is 3,002 feet long by 60 feet wide asphalt runway with a weight bearing capacity to accommodate up to single wheel aircraft 12,500 pounds. The runway has a two light PAPI on both ends and MIRL.

RUNWAY 9-27

Runway 9-27 is the only turf runway at 6S8 and sits between the two asphalt runways north of the Runway 4 End running West to East. The runway is 1,100 feet long by 60 feet wide.

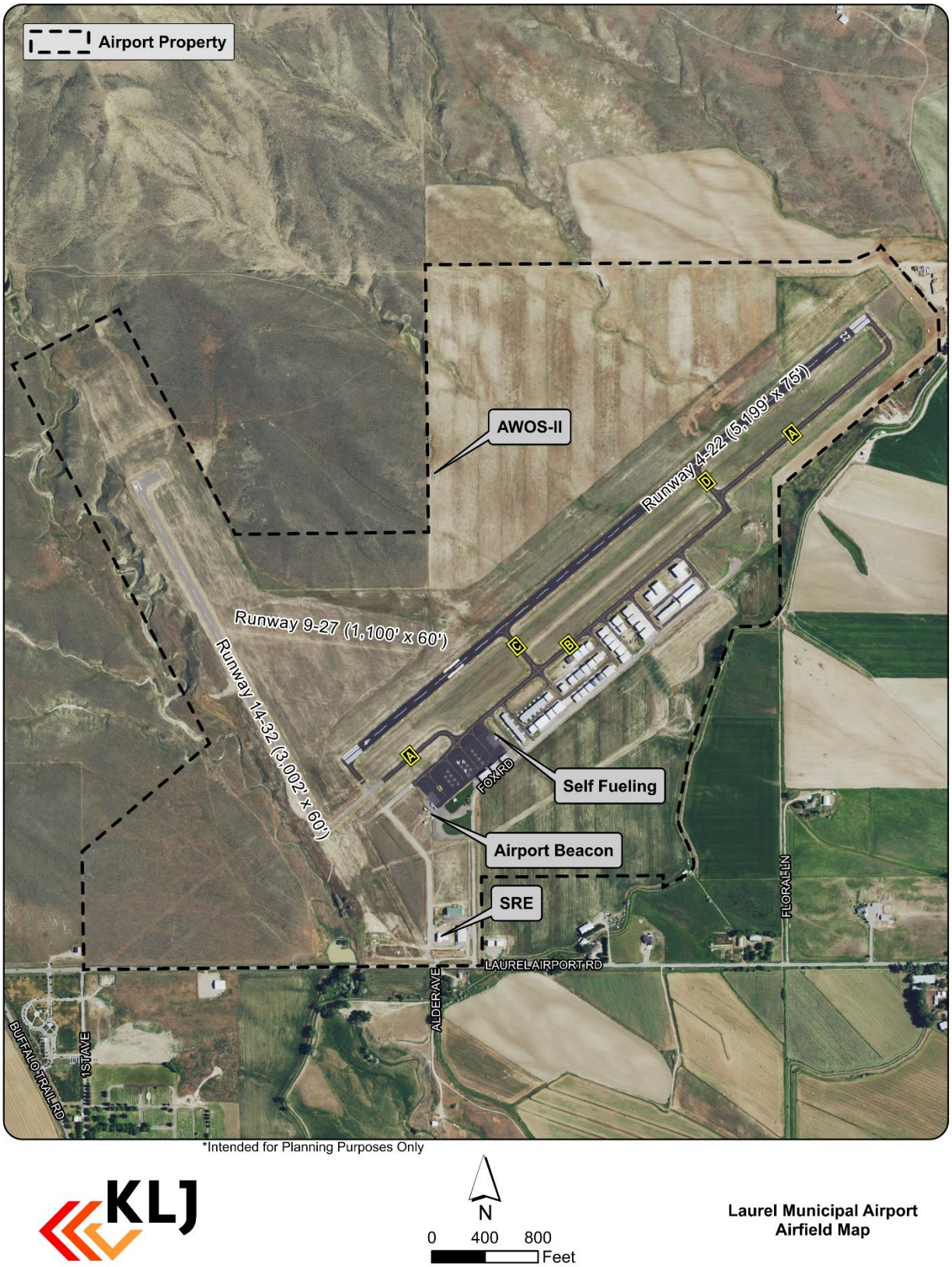
Runway facilities are summarized in **Table 2-8**.

Table 2-8 – Runway Facility Summary

Component	Runway 4-22	Runway 14-32	Runway 9-27
Runway Length (feet)	5,199	3,002	1,100
Runway Width (feet)	75	60	60
Runway Surface Material	Asphalt	Asphalt	Turf
Runway Surface Treatment	None	None	None
Single Wheel Pavement Strength	12.5	12.5	-
Runway Design Code	A/B-II	A/B-I	A/B-I

Source: KLJ Analysis

Figure 2-1 – Airfield Facilities Map



RUNWAY DESIGN CODE

The Runway Design Code (RDC) is a code that provides the design standards for the specific runway based on design aircraft and instrument approach minimums. Further information about Runway Design Codes can be found in **Appendix B: General Aviation Airports 101**.

Runway 4-22: The existing RDC is B-II (Small)-5000 for both runway ends.

Runway 14-32: The existing RDC is B-I (Small)-VIS for both runway ends.

Runway 9-27: The existing RDC is B-I(Small)-VIS for both runway ends.

RUNWAY REFERENCE CODES

Runway Reference Codes (RRCs) indicate current operational capabilities where no special operations procedures are necessary, and without consideration of the actual runway length. The existing operational capabilities of the runway are derived based on a taxiway separation distance.

Runway 4-22: Existing Approach Reference Codes (APRCs) for Runway 4 and 22 are B-II-2400 and D-II-4000. The existing Departure Reference Codes (DPRCs) are B-III and D-II

Runways 14-32 and 9-27: Each of these runways do not have parallel taxiways and therefore the runways do not have either approach reference codes or departure reference codes.

DESIGN STANDARDS

Basic Safety Standards

One primary purpose of this master plan is to review and achieve compliance with all FAA safety and design standards. The design standards vary based on the RDC and RRC as established by the design aircraft. Some of the safety standards include:

- Runway Safety Area (RSA)
- Runway Object Free Area (ROFA)
- Runway Obstacle Free Zone (ROFZ)
- Runway Visibility Zone (RVZ)

Other basic design standards include runway width, runway surface gradient, runway shoulder width, blast pad, and required separation distances to markings, objects, and other infrastructure for safety. Critical areas associated with navigational aids as well as airspace requirements are described further in this chapter. More information on RSA, ROFZ and ROFZ can be found in **Appendix B: General Aviation Airports 101**.

The existing RSA, ROFA and ROFZ standards for all runways meet existing airport design standards. The basic safety standards dimensional requirements for all runways are summarized in **Table 2-9**.

An RVZ exists when two runways intersect. It is a visibility triangle to allow aircraft operating on each runway to see each other with sufficient time to react. Currently at 6S8 there are no intersecting runways, so there is not an existing RVZ at this time.

Table 2-9 – Runway Safety Design Standards

Standard	Runway 4-22	Runway 14-32	Runway 9-27
Runway Safety Area (RSA)	5,800’ x 150’	3,480’ x 120’	1,580’ x 120’
Runway Object Free Area (ROFA)	5,800’ x 500’	3,480’ x 400’	1,580’ x 250’
Runway Obstacle Free Zone (ROFZ)	5,600’ x 400’	3,400’ x 400’	1,300’ x 250’

Source: KLJ Analysis

Runway Protection Zone

The Runway Protection Zone (RPZ) is a trapezoidal land use area at ground level prior to the landing threshold or beyond the runway end. The RPZ’s function is to enhance the protection of people and property on the ground. The RPZ size varies based on the runway’s RDC.

Airport owners should, at a minimum, maintain the RPZ clear of incompatible activities, such as residences, areas of public assembly, and roads. Protection of the RPZ is achieved through airport control over RPZs including fee title ownership or avigation easement.

There are no current incompatible uses inside the RPZs at 6S8. There is however a ranch operation inside the RPZ for Runway 22 which is primarily forage and equipment storage. This is a compatible use inside the RPZ, but it has the potential for penetrating approach surfaces. The issue of protecting approach surfaces will be addressed later in this chapter.

RUNWAY LENGTH

Runway 4-22 has a length of 5,199 feet. FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design* is the current guidance for determining runway lengths at airports. In addition, the Airport Cooperative Research Program (ACRP) recently released guidance in the Small Aircraft Runway Length Analysis Tool (SARLAT) which is used to look at runway length. The detailed runway length analysis for 6S8 is in **Appendix D: Runway Length Analysis**.

Small Airplanes Up to 12,500 Pounds

The FAA design approach to determine recommended runway length in small aircraft is identified in Chapter 2 of FAA AC 150/5325-4B. The method requires several steps to be performed including identifying percentage of fleet and using airport data to calculate runway length based on curves. Calculations for 6S8 are identified in **Table 2-10**. The current runway length of 5,199 feet meets the FAAs recommended length for most small aircraft up to 12,500 lbs. It is recommended the airport achieve the maximum available runway length possible for the future condition. If achievable, **6,600 feet would meet the needs of the most demanding aircraft** either based at the airport or currently serving the airport which is the Cessna 310.

Table 2-10 – Runway Length Requirements (< 12,500 lbs.)

Airport and Runway Data		
Airport Elevation	3,542.59 feet	
Mean Daily Maximum Temperature of Hottest Month	88.7°F	
Aircraft Classification	**Recommended Runway Length**	
Small Airplanes 12,500 Pounds or less		
Less than 10 passenger seats at 100 percent of fleet[1]	**5,290 feet**	
Less than 10 passenger seats at 95 percent of fleet	4,825 feet	
Small Aircraft Runway Length Analysis Tool	**Dry**	**Wet**
Beechcraft Baron 55	4,711 feet	**5,418 feet**
Beechcraft Baron 58	4,533 feet	**5,213 feet**
Cessna 310	**5,669 feet**	**6,519 feet**
Cessna 340	4,989 feet	**5,737 feet**
Cessna 402B	4,567 feet	**5,262 feet**
Beechcraft B200	4,274 feet	4,915 feet
Pilatus PC12	4,464 feet	5,134 feet
Cessna CJ1 (90% load)	**5,775 feet**	**6,641 feet**
Cessna Citation Jet 3	5,102 feet	**5,867 feet**

Source: FAA AC 150/5325-4B, Small Aircraft Runway Length Analysis Tool (ACRP) with 0.5% gradient, KLJ Analysis
Note 1: With airport elevation greater than 3,000' MSL, Table 2-1 at 100% fleet is used.

RUNWAY WIDTH

Runway width is driven by the RDC and approach visibility minimums for each runway as identified in FAA AC 150/5300-13B. The current width of 75 feet meets the design standards for A/B-II (small) design aircraft. Based on the existing and recommended future design standards, no changes are recommended to the existing runway width.

RUNWAY DESIGNATION

Runway designation is determined by the magnetic bearing (azimuth) of the runway centerline which is relative to the location of the magnetic north pole. The runway designator number is the whole number nearest the one-tenth of the magnetic azimuth along the runway centerline.

The 2022 magnetic declination at 6S8 is 10.28° east, changing 0.05° west per year as the location of the magnetic north pole moves over time. The runways are currently designated within the range of the magnetic declination and there is no need to change the designations. See **Table 2-11** for details.

Table 2-11 – Runway Designation Requirements

Runway Designation	Existing Magnetic Bearing (2022)
4-22	39.97°/219.97°
14-32	142.12°/322.12°
9-27	86.97°/266.97°

Source: National Oceanic and Atmospheric Association (NOAA), KLJ Analysis

TAXIWAYS

A system of taxiways facilitates the movement of aircraft from the runway environment to other airport facilities including hangars and parking aprons. Locations and identifiers are depicted in **Figure 2-1**. 6S8 has two taxiways that are both parallel to and serve Runway 4-22.

- **Taxiway A** is a partial parallel taxiway for Runway 4-22 connected to Taxiway A1 leading to Runway 4 and 32 Ends while Taxiway A4 leads to Runway 22 End. The taxiway has a separation from the centerline of Runway 4-22 of 300 feet. This taxiway is asphalt and 35 feet wide.
- **Taxiway B** is a partial parallel taxiway for Runway 4-22 in the middle portion of the runway with connections to the runway by Taxiway A2 and A3. The taxiway has a separation from the centerline of Runway 4-22 of 427 feet. This taxiway is asphalt and 35 feet wide.
- **Taxiway Connectors** exist from Taxiways A and B which connect to Runway 4-22. These taxiways are designated as Taxiway C and D. These connector taxiways are each 35 feet wide and are placed at approximately a one-third point along Runway 4-22. Taxiway D is to the east and Taxiway C is to the west.

In addition to the taxiways there is currently one turnaround on the airport on the Runway 14 End. It is 80 feet wide 45 feet deep. A turf taxiway extending from the end of Runway 9 to Runway 14-32 and from the end of Runway 27 to Runway 4-22 are used to access the turf Runway 9-27.

PAVEMENT CONDITION

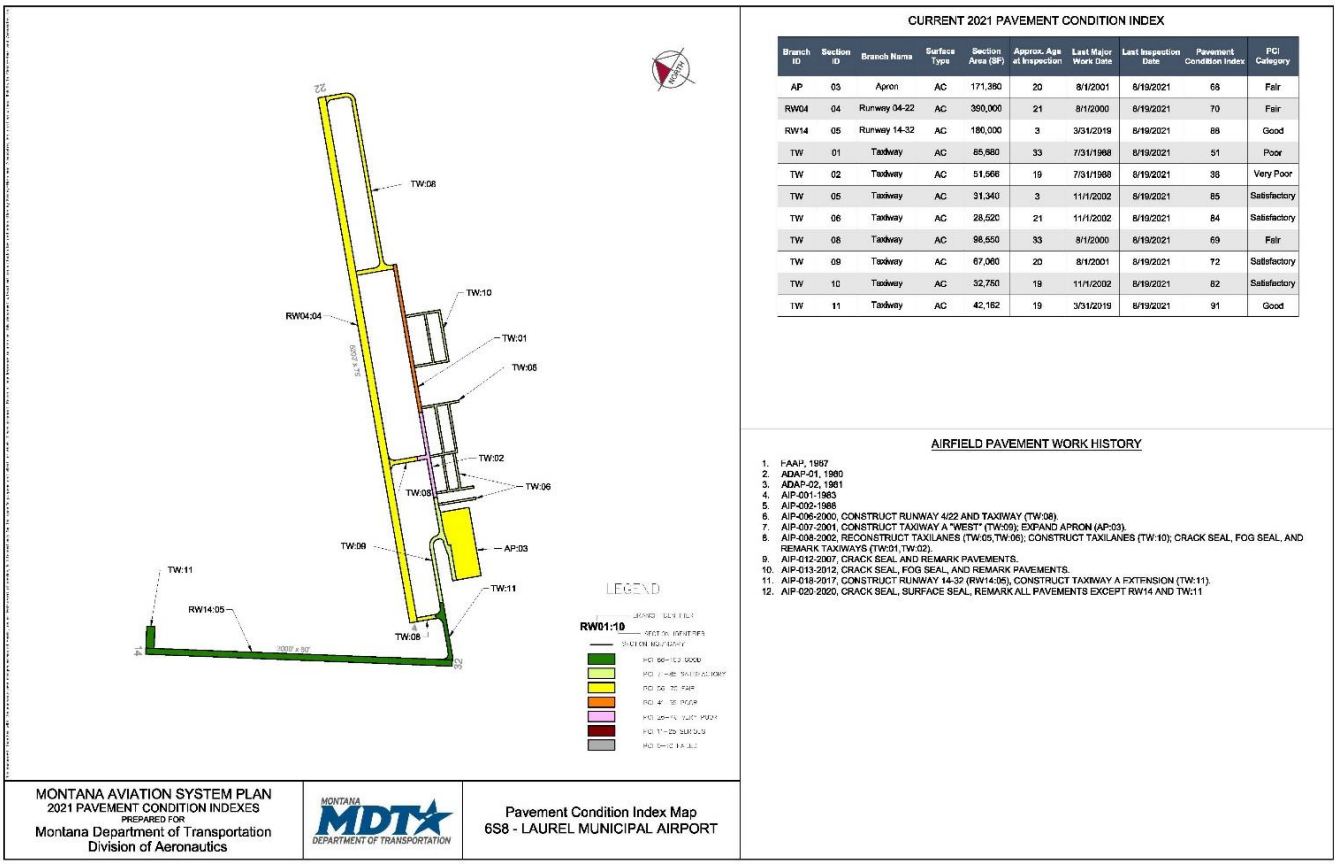
Airport pavements are basic infrastructure components at airports. Airfield pavements need to be maintained in a safe and operable condition for aircraft operations. Pavement condition is comprehensively evaluated by the State every three years and measured on a 0 to 100 scale known as the Pavement Condition Index rating. Pavement evaluation includes runway, taxiway, and apron pavements. A summary of the latest PCI rating for the runway and selected other airfield pavements is tabulated in **Table 2-12**.

Table 2-12 – Pavement Condition Summary (2021)

Component	Surface Type(s)	LCD	PCI Range
Runway 4-22	AC	2000	70
Runway 14-32	AC	2019	88
Partial Parallel A	AC	2000	69-91
Partial Parallel B	AC	1988	38-51

Source: MDT (2021) & KLJ Analysis
PCI = Pavement Condition Index rating (0-100), LCD = Last Major Construction Date, AC = Asphalt Concrete, APC = Asphalt Overlay over PCC, PCC = Portland Cement Concrete

Figure 2-2 – Pavement Condition Map



Source: MDT (2021) & KLJ Analysis

All surfaces except for Runway 14-32 and the connecting taxiways need to be resurfaced or reconstructed. It is recommended any PCI rating of 55 or lower should be considered for pavement maintenance or replacement.

FACILITY REQUIREMENTS – RUNWAYS & TAXIWAYS

The following summarizes the recommendations for runways and taxiways. Instrument approach capabilities will be evaluated further in the Airspace section. Please refer to **Table 2-17 – Runway 4-22, Table 2-18 – Runway 14-32** and **Table 2-19 – Turf Runway** for the respective Design Standard Matrix later in the chapter for detailed design requirements for the existing and future conditions.

- Extend runway 4-22 to 6,600 feet.
- Maintain the 75-foot runway width.
- Increase Runway 14-32 to a 75-foot width for A/B-II standards.
- Maintain the pavement strength up to 12,500 lbs.
- Establish and maintain a turf runway parallel to the primary runway 4-22.
- Extend Taxiway A to replace Taxiway B and establish one continuous parallel taxiway at a 300-foot centerline separation from the runway. Identify as Taxiway A with connectors as A1, A2 etc.

Navigational Aids & Airspace

Navigational aids (NAVAIDs) provide visual and electronic guidance to pilots enabling the airport to accommodate safely, efficiently, and effectively arriving and departing flights. Airspace is a resource that is necessary to allow flights to safely operate and maneuver in the airport environment. **Figure 2-1** identifies visual navigational aids and weather facilities on the airport.

VISUAL NAVIGATION AIDS

Visual aids are installed to provide airport usability during periods of darkness and/or low visibility. Pavement markings and lighting systems available at the airport are summarized in the following sections.

Identification Lighting

6S8 has a clear and green rotating beacon, which is a two-sided light that assists pilots in the visual identification of a civilian airport. The clear and green beacon indicates a lighted land airport. The airport beacon is located on the southwest edge of the apron and operates sunset to sunrise.

Pavement Edge Lighting

Pavement edge lighting fixtures are installed off the edges of runway and taxiway pavements to help pilots identify the edges and ends of pavement and facilitate safe operations in darkness and/or low visibility environments. Runway edge lights are white (bi-directional), except for the final 3,000 feet of the runway where the lights change color to yellow to warn pilots approaching the end of the runway for instrument runways. The runway end threshold lights (bi-directional) are green when viewing down the runway at the start of takeoff roll and red when approaching the end of the runway. Taxiway edge lights are blue and omni-directional.

The airport has Medium Intensity Runway Lighting (MIRL) which are activated using pilot-controlled lighting on the Common Traffic Advisory Frequency (CTAF). The MIRL lighting is on Runways 4-22 and 14-32. Runway 9-27 has cones but no lighting. Taxiways A, B, C, D, and the apron have Medium Intensity Taxiway Lighting (MITL).

Visual Approach Lighting

Visual approach lighting (or visual approach aids) provide vertical descent guidance to pilots for a specific runway end. These approach aids enable the pilot to acquire and maintain the correct glide path for landing. Precision Approach Path Indicator Lights (PAPI) are the current FAA standard equipment installed for this purpose.

The PAPI has red and white lights that are used by the pilot to indicate whether they are too high, too low, or on the appropriate glidepath. PAPIs project light along a standard 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 defined glide path. Laurel has two box PAPIs on both ends of Runway 4-22 and 14-32. The PAPIs are set at a 3.00 degree angle except for Runway 14 which is set at a 4.00 degree angle.

Pilot-Controlled Lighting

Airfield lighting systems allow for pilots to control the complexity and intensity of lights. The lights for the Runways and Taxiways, including the PAPIs are all controlled with the pilot-controlled lighting system activated through the CTAF.

Pavement Markings

Pavement markings provide visual guidance to aircraft to critical areas on the runway and taxiway surface. Runway markings vary in complexity depending on the type of approach. Runway 4-22 is marked with non-precision markings and Runway 14-32 is marked with visual markings.

Airfield Guidance Signs

Guidance signs provide location, direction, and guidance information to pilots on the ground to enhance awareness. Signs are placed around the airfield to identify runway and taxiway intersections, runway hold positions, and other guidance. Mandatory signs are red and identify an intersection with a runway or critical safety zone. Other types of signs include location, direction, destination, and distance remaining signs.

Laurel has all the required lighted mandatory signs for the runways and directional signs for all the taxiways.

ELECTRONIC NAVIGATION AIDS

Electronic navigational aids are installed to provide critical guidance information when operating in the airport environment. These navigational aids often provide horizontal and/or vertical guidance in conjunction with published navigation procedures. Electronic navigation aids available at the airport are summarized below:

Very High Frequency Omni-Directional Range (VOR)

This ground-based navigational aid projects an omni-directional signal that allows equipped aircraft to navigate to and from the station. The FAA has maintained a system of VOR's for decades but is in the process of decommissioning many of these facilities as the GPS based navigation system begins to fulfill the en-route and approach capabilities needed for the National Airspace System. The FAA is planning to maintain a Minimum Operational Network (MON) and the Billings VOR is one facility currently in the FAA MON.

The Billings VOR is located 7.8 nautical miles northeast of 6S8 and supports a non-precision instrument approach for Runway 22.

Global Positioning System (GPS)

GPS is a satellite-based navigation system that allows location to be triangulated from space-based satellites. Equipped aircraft can navigate between user-defined or FAA waypoints with lateral and vertical guidance. With ground-based transmitters known as Wide Area Augmentation System (WAAS) the system can provide accuracy down to a few feet. GPS is widely becoming the preferred aircraft navigation system and FAA is establishing en-route and approach procedures using this satellite-based technology.

6S8 has two non-precision instrument approaches which use GPS and are noted as RNAV (GSP) RWY 4 and RNAV (GPS) RWY 22.

METEOROLOGICAL FACILITIES

Metrological facilities provide users with up-to-date weather information at the airport to aid in pilot decision making for safe flight operations.

Wind Indicator(s)

Wind direction indicators provide an immediate visual indication of the wind direction and velocity. A segmented circle provides a visual indication of the wind direction and velocity together with runway alignment and/or traffic pattern information.

The primary wind cone at 6S8 is at south of the apron area. There are lighted supplemental wind cones located near the threshold of Runway 14, Runway 32, and Runway 4, and near the northeast end of Taxiway B.

Weather Reporting

There are two types of weather reporting systems on an airport. The Automated Surface Observing System (ASOS) program was a joint effort between the Federal Aviation Administration and the National Weather Service (NWS) to deploy a network of high-grade weather monitoring stations across the United States. ASOS serves as a primary climatological observing network in the United States and have equipment that provides weather observations every minute. A second-tier Automated Weather Observation System (AWOS) has varying sets of equipment packages to provide local weather observations.

6S8 has an AWOS II which does not include ceiling or visibility. Since the unit does not have ceiling or visibility, the information is made available with current conditions, but it is not reported through the National Airspace Data Interchange Network (NADIN) and there is no historic information collected. Both the Laurel AWOS and Billings ASOS are available by radio for current weather information.

COMMUNICATION FACILITIES

Communication facilities allow aircraft to transmit and receive clearances to air traffic control to navigate the national airspace system safely and effectively. For 6S8, pilots use the Unicom at 123.05

mHz as the CTAF and can contact Billings Tracon for Approach and Departure at 119.2 or 120.5 from the ground.

AIRSPACE & SURVEILLANCE

Airspace Classification

Airspace is segregated into controlled, uncontrolled, special use or other airspace. Each airspace class has different operating rules.

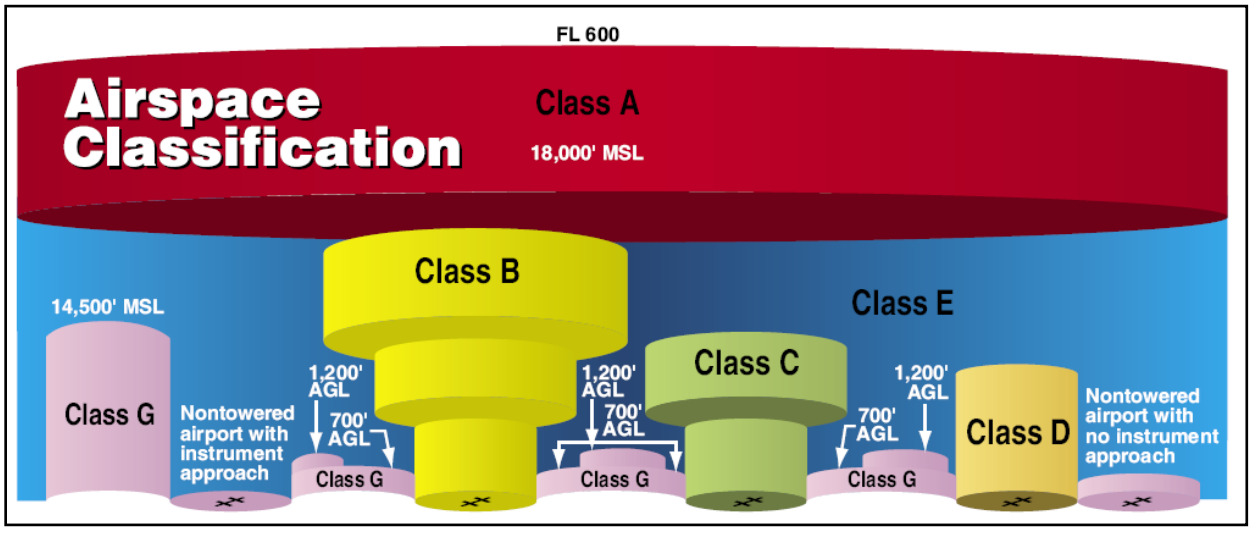
Class C Airspace is what surrounds Billings Airport and is adjacent to 6S8. Class C Airspace has a 5 nautical mile inner ring and a 10 nautical mile outer ring. The inner ring extends from ground level up to 4,000 feet above ground level (AGL). The outer ring starts at 1,200 feet AGL and extends to 4,000 feet AGL. Aircraft operating within Class C airspace must be equipped with ADS-B.

6S8 is within Class E Airspace but it is important to note that aircraft departing to the east immediately enter into the Billings Class C Airspace at 1,200 feet AGL. Class E Airspace is controlled airspace that is not otherwise classified as Class A, B, C or D. See Figure below.

Ground Radar

Radar relies on direct line-of-sight, therefore the further the target is away from a radar site the higher altitude is required. Long range radar coverage for aircraft flying in and out of 6S8 is available when an aircraft is 1500 feet above ground level. There is radar coverage from an Airport Surveillance Radar from Billings TRACON to see aircraft on the ground at 6S8.

Figure 2-3 – FAA Airspace Classifications



Source: FAA Pilot's handbook of Aeronautical Knowledge, Chapter 15: Airspace

Automatic Dependent Surveillance-Broadcast (ADS-B)

ADS-B is a satellite-based surveillance technology in which aircraft transmit GPS position information to other aircraft and to ATC facilities. ADS-B will supplement primary ground-based radar. FAA has required all aircraft operating within airspace requiring a transponder to have ADS-B transmitting equipment installed by the year 2020 as part of the Next Generation Air Transportation System (NextGen) initiative.

Various ground stations have been located nationwide to provide ADS-B coverage. **Table 2-13** provides a summary of navigational aids available at the airport.

Table 2-13 – Navigational Aid Summary

Component	Runway 4-22	Runway 14-32	Runway 9-27
Runway Dimensions	5,199' x 75'	3,002' x 60'	1,100' x 60'
Pavement Markings	Non-Precision	Visual	(Turf)
Runway Lighting	MIRL	MIRL	Marker Cones
Taxiway Lighting	MITL	MITL	-
Approach Lighting	2-Box PAPI	2-Box PAPI	-
Instrument Approach Procedures	Non-Precision	None	None
Navigational Aids	Rotating Beacon, VOR		
Meteorological Facilities	AWOS-II		

Source: KLJ Analysis

AIRSPACE OBSTRUCTIONS

Airspace is a key resource around airports that is very important for safe flight operations. There are established standards to identify airspace obstructions around airports. Title 14 CFR (Code of Federal Regulations): Part 77 *Safe, Efficient Use, and Preservation of the Navigable Airspace* establishes various airspace surfaces near airports. Part 77 is used to determine if an object is an obstruction that penetrates an "imaginary" three-dimensional surface. Surfaces include the primary, approach, transitional, horizontal, and conical surfaces each with different standards.

When evaluating objects, the FAA determines whether an obstruction is a **hazard** to air navigation. FAA subsequently evaluates the obstruction using more in-depth minimum airspace standards. These include FAA Approach/Departure Surfaces from FAA AC 150/5300-13B, *Airport Design* or instrument procedure surfaces identified in FAA Order 8260.3B, *U.S. Standard for Terminal Instrument Procedures (TERPS)*. Corrective action is then recommended. Examples of corrective action include removing, lowering, or obstruction lighting an object. A general diagram of the Part 77 surfaces is found in **Appendix B: General Aviation Airports 101**.

Clear airspace is necessary for the safe and efficient use of aircraft arriving and departing an airport. The most demanding approach to a runway defines the Part 77 airspace standards for that runway. There are three main approach types:

- **Precision**: A runway having an existing instrument approach procedure utilizing an existing or planned Instrument Landing System (ILS) with horizontal and vertical guidance. Visibility minimums are less than ¾ mile.
- **Non-Precision**: A runway having an existing instrument approach procedure utilizing air navigation facilities with horizontal guidance, or area type navigation equipment, for which a straight-in non-precision instrument approach procedure has been approved or planned. Approaches with vertical guidance are considered non-precision. Visibility minimums are typically 1 mile but as low as ¾ mile.
- **Visual**: A runway intended solely for the operation of aircraft using visual approach procedures, with no straight-in instrument approach procedure published or planned.

There are two runway classifications:

- **Utility**: A runway that is constructed for and intended to be used by propeller driven aircraft of 12,500 pounds' maximum gross weight and less.
- **Other-Than-Utility**: A runway that is constructed for and intended to be used by aircraft greater than 12,500 pounds' maximum gross weight.

The combination of the approach type and the runway classification defines the dimensional criteria for each approach. The Part 77 airspace dimensional criteria for the airport is identified in **Table 2-14**. A detailed obstruction identification and mitigation disposition is identified in the Airport Layout Plan (ALP), developed at the end of this planning study. **Table 2-16** depicts the future approach airspace surfaces for 6S8.

Table 2-14 – Existing Part 77 Approach Airspace Standards

Runway End	Approach Standards	Distance From Runway End	Inner Width*	Outer Width	Length	Slope
4, 22	Non-Precision Utility	200'	500'	2,000'	5,000'	20:1
14, 32, 9, 27	Visual Utility	200'	250'	1,250'	5,000'	20:1

Source: 14 CFR Part 77, FAA Airport Master Record. **Inner width is also the Primary Surface width driven by the most demanding approach to a runway.*

Table 2-15 – Critical Part 77 Airspace Obstacles

Runway End	Surface	Object Type, Height Above End	Distance From End	Location from Centerline	Penetration	Slope to Clear (Required)
22	Approach	Fence, 7'	400'	Center	2.9' below *(No Penetration)*	28:1 (20:1)

Source: KLJ Analysis. Notes: Penetration value estimated based. ***RED*** *indicates does not meet current standards.*

Table 2-16 – Part 77 Approach Airspace Requirements

Runway End	Approach Standards	Part 77 Code	Inner Width*	Outer Width	Length	Slope
4,22	Non-Precision Utility	B(NP)	500'	2,000	5,000'	20:1
14, 32 & Turf	Visual	A(Visual)	250'	1,250'	5,000'	20:1

*Source: Title 14 CFR Part 77, KLJ Analysis *Inner width is also the Primary Surface width driven by the most demanding approach to a runway.* ***Bold*** *indicates change from existing standard.*

Table 2-17 – Runway 4/22 Design Standard Matrix

Design Standard	Actual Condition	Facility Requirement or Recommendation	
		Existing	Ultimate
Runway Identification	4-22	4-22	4-22
Runway Design Code (RDC)	A/B-II (Small) -5000	A/B-II (Small) -5000	A/B-II (Small) -5000
Approach Reference Code (APRC)			
Pavement Strength (Wheel Loading)	12,500 (DW)	12,500 (DW)	12,500 (DW)
Pavement Surface Type	Asphalt	Paved	Paved
Runway Length	5,199’	5,199’	6,600’
Runway Width	75’	75’	75’
Runway Safety Area (RSA) Width	150’	150’	150’
RSA Length Past Departure End	300’	300’	300’
RSA Length Prior to Threshold	300’	300’	300’
Runway Lighting Type	MIRL	MIRL	MIRL
Approach RPZ Start from Runway	No Incompatible Uses	200’	200’
Approach RPZ Length		1,000’ (Both)	1,000’ (Both)
Approach RPZ Inner Width		250’ (Both)	250’ (Both)
Approach RPZ Outer Width		450’ (Both)	450’ (Both)
Runway Marking Type	Non-Precision	Non-Precision	Non-Precision
14 CFR Part 77 Approach Category	20:1 (Both)	20:1 (Both)	20:1 (Both)
Approach Type	NPI (Both)	NPI (Both)	NPI (Both)
Visibility Minimums	1 mile (Both)	1 mile (Both)	1 mile (Both)
ROFA Width	500’	500’	500’
ROFA Length Past Departure End	300’	300’	300’
ROFA Length Prior to Threshold	300’	300’	300’
ROFZ Length Past Runway	200’	200’	200’
ROFZ Width	250’	250’	250’
Threshold Siting Surface (TSS)* Type	5	5	5
TSS Start from Runway End	200’	200’	200’
TSS Length	10,000’	10,000’	10,000’
TSS Inner Width	400’	400’	400’
TSS Outer Width	3,400’	3,400’	3,400’
TSS Slope	20:1	20:1	20:1
Visual and Instrument NAVAIDs	PAPI	PAPI	PAPI
Runway and Taxiway Separation	300’ to 430’	240’	240’
Runway and Parking Separation	362’	-	-
Runway and Hold Line Separation	200’	200’	200’

*Note: RED indicates a known deficiency to existing minimum design standards; * Paragraph 3.6 of AC 150/5300-13B*
Source: FAA AC 150/5300-13B, KLJ Analysis

Table 2-18 – Runway 14/32 Design Standard Matrix

Design Standard	Actual Condition	Facility Requirement or Recommendation	
		Existing	Ultimate
Runway Identification	14-32	14-32	14-32
Runway Design Code (RDC)	A/B-I (Small) -Visual	A/B-I (Small) -Visual	A/B-II (Small) -Visual
Approach Reference Code (APRC)			
Pavement Strength (Wheel Loading)	12,500 (DW)	12,500 (DW)	12,500 (DW)
Pavement Surface Type	Asphalt	Paved	Paved
Runway Length	3,000’	3,000’	3,000’
Runway Width	60’	60’	75’
Runway Safety Area (RSA) Width	120’	120’	150’
RSA Length Past Departure End	240’	240’	300’
RSA Length Prior to Threshold	240’	240’	300’
Runway Lighting Type	MIRL	MIRL	MIRL
Approach RPZ Start from Runway	No Incompatible Uses	200’	200’
Approach RPZ Length		1,000’ (Both)	1,000’ (Both)
Approach RPZ Inner Width		250’ (Both)	250’ (Both)
Approach RPZ Outer Width		450’ (Both)	450’ (Both)
Runway Marking Type	Visual	Visual	Visual
14 CFR Part 77 Approach Category	20:1 (Both)	20:1 (Both)	20:1 (Both)
Approach Type	Visual	Visual	Visual
Visibility Minimums	Visual	Visual	Visual
ROFA Width	250’	250’	500’
ROFA Length Past Departure End	240’	240’	300’
ROFA Length Prior to Threshold	240’	240’	300’
ROFZ Length Past Runway	200’	200’	200’
ROFZ Width	250’	250’	250’
Threshold Siting Surface (TSS)* Type	2	2	2
TSS Start from Runway End	0’	0’	0’
TSS Length	5,000’	5,000’	5,000’
TSS Inner Width	250’	250’	250’
TSS Outer Width	700’	700’	700’
TSS Slope	20:1	20:1	20:1
Visual and Instrument NAVAIDs	PAPI	PAPI	PAPI
Runway and Taxiway Separation	150’	150’	240’
Runway and Hold Line Separation	125’	125’	125’

*Note: RED indicates a known deficiency to existing minimum design standards; * Paragraph 3.6 of AC 150/5300-13B*
Source: FAA AC 150/5300-13B, KLJ Analysis

Table 2-19 – Turf Runway Design Standard Matrix

Design Standard	Actual Condition	Facility Requirement or Recommendation	
		Existing	Ultimate
Runway Identification	9-27		
Runway Design Code (RDC)	A/B-I (Small) -Visual	A/B-I (Small) -Visual	A/B-I (Small) -Visual
Approach Reference Code (APRC)			
Pavement Strength (Wheel Loading)	12,500 (DW)	12,500 (DW)	12,500 (DW)
Pavement Surface Type	Turf	Turf	Turf
Runway Length	1,100’	2,000’ to 3,000’	2,000’ to 3,000’
Runway Width	60’	100’	100’
Runway Safety Area (RSA) Width	120’	120’	120’
RSA Length Past Departure End	240’	240’	240’
RSA Length Prior to Threshold	240’	240’	240’
Runway Lighting Type	Cones	Cones	Cones
Approach RPZ Start from Runway	Hangars in East RPZ	200’	200’
Approach RPZ Length		1,000’ (Both)	1,000’ (Both)
Approach RPZ Inner Width		250’ (Both)	250’ (Both)
Approach RPZ Outer Width		450’ (Both)	450’ (Both)
Runway Marking Type	NA	NA	NA
14 CFR Part 77 Approach Category	20:1 (Both)	20:1 (Both)	20:1 (Both)
Approach Type	Visual (Both)	Visual (Both)	Visual (Both)
Visibility Minimums	Visual (Both)	Visual (Both)	Visual (Both)
ROFA Width	250’	250’	250’
ROFA Length Past Departure End	240’	240’	240’
ROFA Length Prior to Threshold	240’	240’	240’
ROFZ Length Past Runway	200’	200’	200’
ROFZ Width	250’	250’	250’
Threshold Siting Surface (TSS)* Type	2	2	2
TSS Start from Runway End	0’	0’	0’
TSS Length	5,000’	5,000’	5,000’
TSS Inner Width	250’	250’	250’
TSS Outer Width	700’	700’	700’
TSS Slope	20:1	20:1	20:1
Visual and Instrument NAVAIDs			
Runway and Taxiway Separation	150’	150’	150’
Runway and Hold Line Separation	125’	125’	125’

*Note: RED indicates a known deficiency to existing minimum design standards; * Paragraph 3.6 of AC 150/5300-13B*
Source: FAA AC 150/5300-13B, KLJ Analysis

Summary

The following summarizes the facility recommendations:

Airside Facilities

- Runway 4-22 (Primary Runway)
    - A/B-II(small)
    - 1-mile visibility non-precision approach
    - Extend to 6,200 feet
    - Full-parallel taxiway at 300 foot centerline separation
- Runway 14-32 (Crosswind)
    - A/B-II(small)
    - Visual Approach
    - Ultimate 75 foot wide
- Existing Turf Runway
    - Close Runway 9-27
- New Parallel Turf Runway
    - 4-22 with 300 foot centerline separation on the north side
    - 3,600 foot length
    - Turf taxiways connecting to paved Runway 4-22 at 4 end and Taxiway D

Alternatives Evaluation Process

A wide range of alternatives are evaluated to determine the best solution for the airport to meet facility needs. In many cases the process is iterative to react to new information and input. Please refer to the alternative analysis process in Chapter 1 for details on the factors considered.

A range of alternatives were prepared for consideration and those initial alternatives were reviewed by the Planning Advisory Committee to create a narrower slate of alternatives for further review. In the end a preferred alternative was selected and portrayed at the end of this chapter.

Alternatives

The recommended development identified in this chapter includes the following:

- Extend Runway 4-22.
- Reduce Runway/Taxiway Separation distance.
- Widen Runway 14-32 to 75 feet wide.
- Turf Runway.

RUNWAY 4-22

The length of Runway 4-22 is currently 5,199' and the Airport Authority wishes to include on the Airport Layout Plan the maximum amount of runway length that could foreseeably be needed at the airport. An extension of the 4 end to 6,200' and 6,600' were evaluated in comparison to a 'no change' scenario. See **Figure 2-4** and **Table 2-20 – Runway 4-22 Extension Options Summary**.

No Change: Runway length remains at 5,199' with no extension shown. This would not require any capital improvements or a need to change runway lighting or markings. This does continue to pose the problem of not meeting runway length needs and does not protect land development or air space in the event an extension would be needed in the future.

6,200' Runway: Runway 4-22 is extended from 5,199' to 6,200' with the extension to the Runway 4 End by 1,000 feet. This does meet the runway length required for aircraft like the Cessna 310, 340, CJ1 and CJ3 which each periodically operate at 6S8.

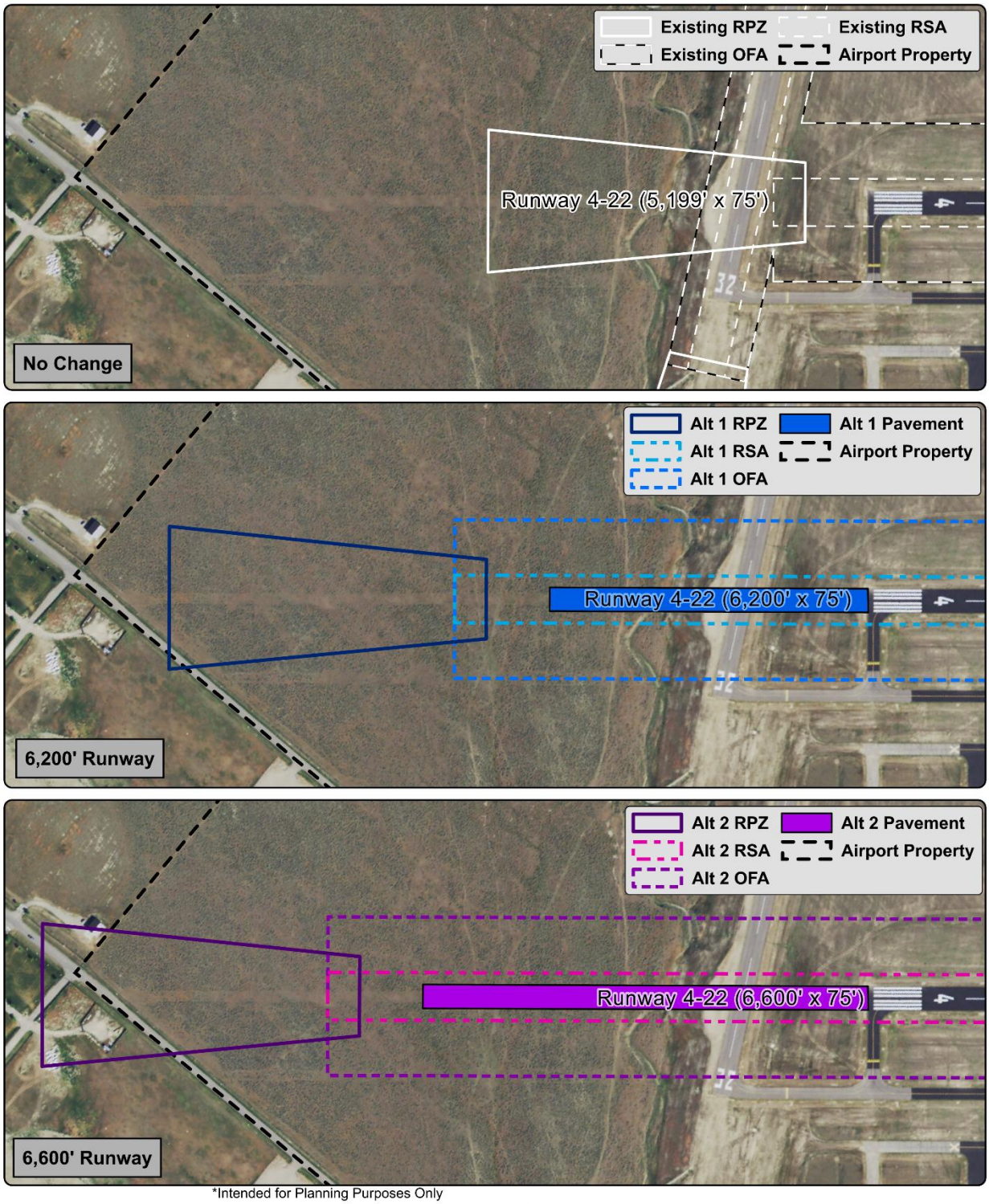
6,600' Runway: Runway 4-22 is extended from 5,199' to 6,600' with the extension to the Runway 4 End by 1,400 feet. This would meet the runway length requirements for wet runway conditions for the Cessna 310 and CJ1 which periodically operate from 6S8.

Table 2-20 – Runway 4-22 Alternatives

Factor	No Change	6,200 Foot	6,600 Foot
Proposed Action	Maintain 5,199' x 75' Runway	Extend Runway 4 end to 6,200' x 75'	Extend Runway 4 End To 6,600' x 75'
Operational Performance	Meets needs per AC 150/5325-4B for 100% of Fleet of <10 Pax Aircraft (A chart based on decades old data that has not been updated)	Specific Aircraft Needs (Cessna 310 and CJ1 dry conditions; Cessna 340 and CJ3 wet conditions)	Specific Aircraft Needs (Cessna 301 and CJ1 wet conditions)
Safety & Standards	No Impact	No Impact but Runway 4-22 and Runway 14-32 pavements will intersect	No Impact but Runway 4-22 and Runway 14-32 pavements will intersect
Other Planning Tenets	No space preserved, no airspace protected	Preserves adequate space for most foreseeable need	Preserves more space for least foreseeable need
Environmental	No Impact	None Identified	None Identified
Fiscal	No Cost	$2.29 m	$3.27 m

Source: KLJ Analysis

Figure 2-4 – Runway 4-22 Extension



REDUCE PRIMARY RUNWAY PARALLEL TAXIWAY SEPARATION

Taxiway A has a current taxiway separation of 300 feet from the centerline of Runway 4-22 and Taxiway B has a current taxiway separation of 427 feet from the centerline of Runway 4-22. Taxiway B is generally the central portion of the parallel taxiway where the hangars are located and this portion of taxiway has a PCI ranging from 38 to 51 needing reconstruction in the near term. See **Table 2-21 Parallel Taxiway Separation Alternatives** and **Figure 2-5 Parallel Taxiway**.

No Change: Staggered taxiway separation would continue at 300 feet and 427 feet. The taxiway separation limits the instrument approach capabilities and with a portion at 300 foot separation, the limitation is already in place. For 4-22 the limitation for a 300 foot centerline separation will allow for a A/B-II approach less than ¾ mile and will allow for a C/D-II approach for no less than ¾ mile.

300 Foot Separation: Reconstruct the center portion of the parallel taxiway to Runway 4-22 in the Taxiway A alignment and remove Taxiway B. The realignment of the parallel taxiway will open up 127 feet of depth between the existing hangars and new taxiway which equates to approximately 6.4 acres of additional hangar space in a space constrained airport.

Table 2-21 – Parallel Taxiway Separation Alternatives

Factor	No Change	300 Foot
Proposed Action	Maintain Staggered Separation of 300 feet and 427 feet	Extend Taxiway A and remove Taxiway B for only 300 foot separation
Operational Performance	Runway 4-22 is already limited to 300 foot standards	No Change
Safety & Standards	No Impact	No Impact
Other Planning Tenets	Limits Hangar Development	Opens 6.4 acres of land for hangar development
Environmental	No Impact	None Identified

Source: KLJ Analysis

Also note when Taxiway A is aligned and Taxiway B is removed, the connector taxiways should be relabeled in a standard naming convention with A1, A2 etc.. associated with the respective parallel taxiway

Figure 2-5 – Parallel Taxiway

*Intended for Planning Purposes Only

KLJ

0 400 800 Feet

Laurel Municipal Airport
Parallel Taxiway Alternative

RUNWAY 14-32 WIDENING TO 75 FEET

Runway 14-32 was constructed in 2017 at 3,002' x 60' for A/B-I aircraft. The wind coverage from the master plan indicate that Runway 4-22 does not provide 95% coverage for A/B-I or A/B-II aircraft and that the crosswind Runway 14-32 is required in combination to meet the 95% coverage needs. The combination of Runway 4-22 and 14-32 can meet the standards for A/B-II but Runway 14-32 would also need to be widened from 60 feet to 75 feet to meet the design standards. It is important to note that there is 95% coverage for IFR operations on Runway 4-22 so it is not necessary for Runway 14-32 to also have instrument approach capabilities. **Table 2-22** summarizes the alternatives.

No Change: Runway 14-32 width stays at 60 feet wide. This does not meet the design standards for a runway needing to serve up to A/B-II aircraft.

75 foot wide Runway 14-32: Runway 4-22 is extended from 5,199' to 6,200' with the extension to the Runway 4 End by 1,000 feet. This does meet the runway length required for aircraft like the Cessna 310, 340, CJ1 and CJ3 which each periodically operate at 6S8.

Table 2-22 – Runway 14-32 Widening Alternatives

Factor	No Change	75 Foot Wide
Proposed Action	Maintain 3,002' x 60' Runway	Widen Runway 14-32 to 3,002' x 75'
Operational Performance	Works for A/B-I	Works for A/B-II
Safety & Standards	Does not meet FAA Design Standards for A/B-II	Meets FAA Design Standards for A/B-II
Environmental	No Impact	None Identified

Source: KLJ Analysis

TURF RUNWAY

There is currently a crosswind Runway 9-27 and an unpublished turf area south of Runway 4-22 that are each used as a turf runway at 6S8. The master plan identified the desire for a turf runway for based aircraft and training purposes. The turf runway needs to be approximately 3,000 foot and alternatives were examined. See **Table 2-23 Turf Runway Alternatives** and **Figure 2-6 Turf Runway Alternatives**.

Runway 9-27 (No Change): Runway 9-27 remains as a 1,100 foot runway. This runway has a problem with FAA design standards, because the runway safety area and runway object free area for this turf runway extend on to Runway 14-32 rendering Runway 14-32 unusable when Runway 9-27 is in use.

Turf 4-22 South in RSA: The existing unpublished turf runway is south of Runway 4-22 and is 1,700 feet long between taxiways C and D. The turf runway inside a paved runway RSA is acceptable per AC 150/5300-13B Paragraph 2.10. When the turf runway that is inside the RSA is in use, the paved runway is not usable and vice versa.

Turf 4-22 North in RSA: The turf runway would be on the north side of Runway 4-22 in the RSA and would be 3,460 feet long extending from the threshold of Runway 4 to Taxiway D. The turf runway inside a paved runway RSA is acceptable per AC 150/5300-13B Paragraph 2.10. When the turf runway that is inside the RSA is in use, the paved runway is not usable and vice versa.

Turf 4-22 North at 300 foot Centerline: The turf runway would be on the north side of Runway 4-22 at 3,460 feet long extending from the threshold of Runway 4 to Taxiway D. The centerline separation between the turf and paved runway would be 300 feet based on AC 150/5300-13B Paragraph 3.9.2.2. The 300 foot separation allows for a turf runway to be simultaneously used with a parallel paved runway in VFR conditions.

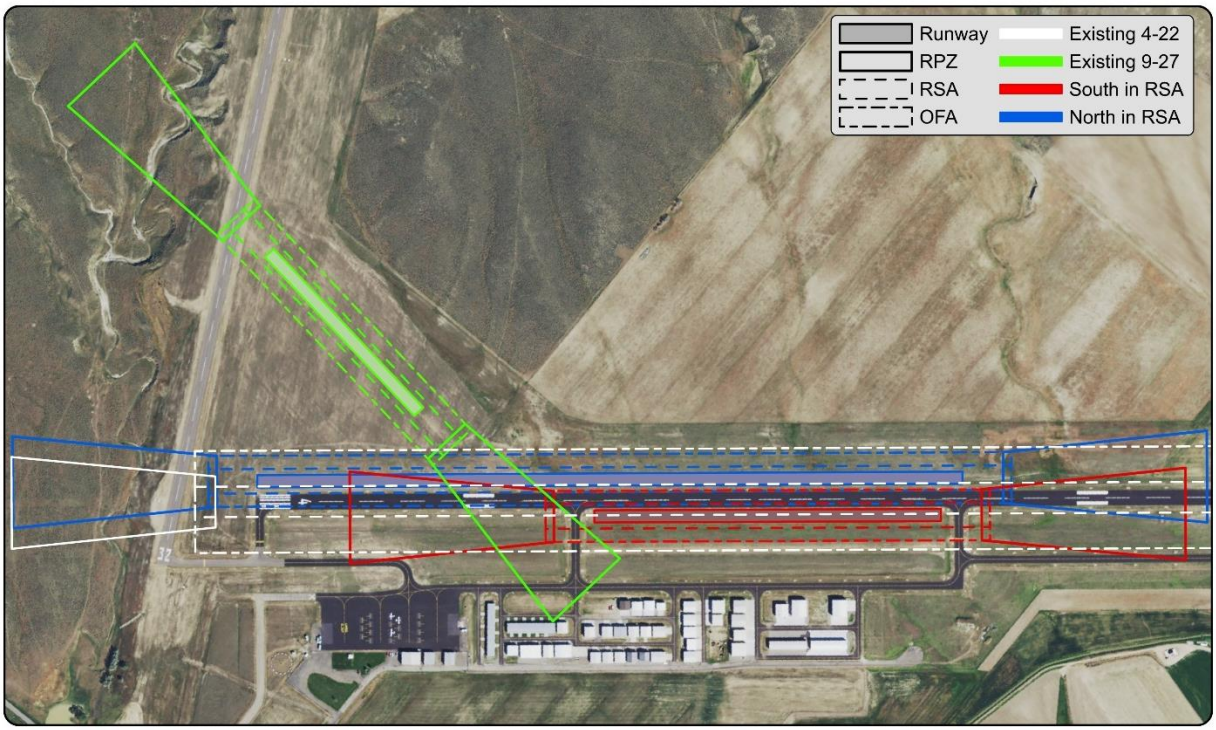
Turf 4-22 North at 700 foot Centerline: The turf runway would be on the north side of Runway 4-22 at 3,400 feet long extending from near the threshold of Runway 4 to Taxiway D. The centerline separation between the turf and paved runway would be 700 feet based on AC 150/5300-13B Paragraph 3.9.2.1. The 700 foot separation is for parallel paved runways to be used simultaneously in VFR conditions.

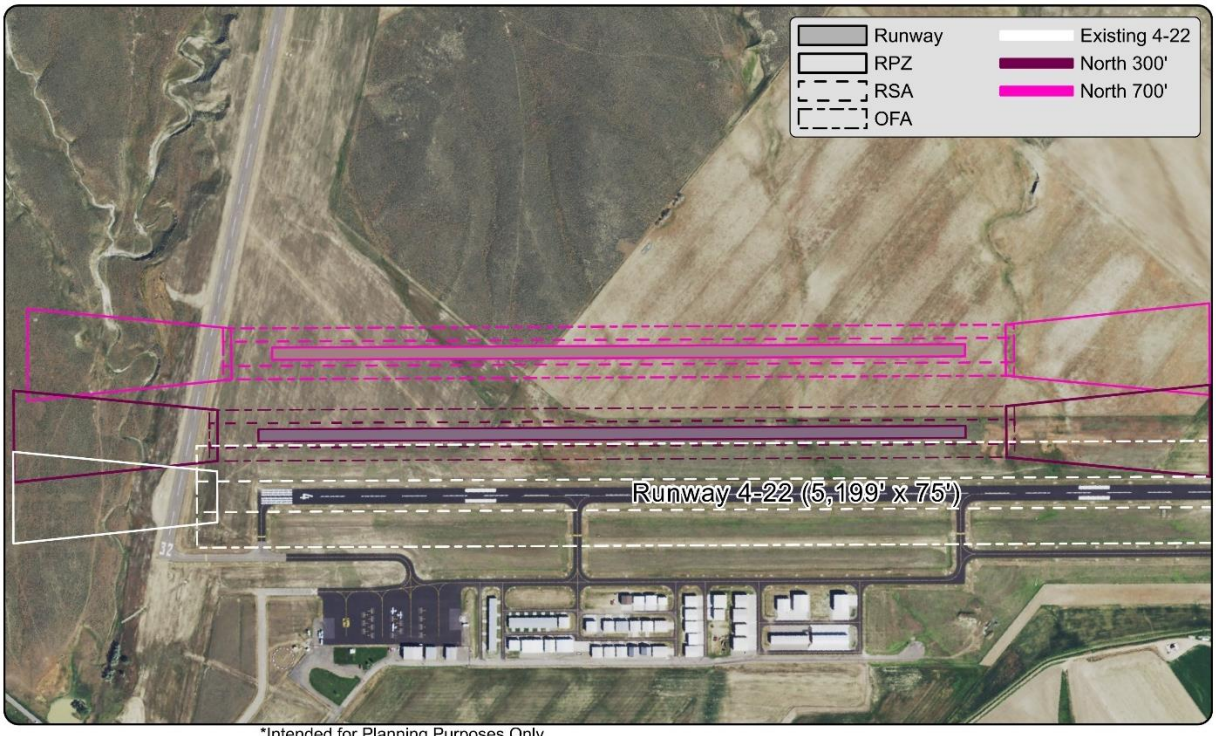
Table 2-23 – Turf Runway Alternatives

Factor	9-27 No Change	4-22 RSA South	4-22 RSA North	4-22 300 Foot	4-22 700 Foot
Proposed Action	Maintain 1,100 foot Crosswind Turf Runway	1,700 foot Turf Runway in Paved 4-22 RSA	3,460 foot Turf Runway in Paved 4-22 RSA	3,460 foot Turf Runway (300 foot separation)	3,400 foot Turf Runway (700 foot separation)
Operational Performance	Too Short	Too Short	Right Length	Right Length	Right Length
Safety & Standards	RSA and ROFA extend on to Runway 14-32	Meets Standards	Meets Standards	Meets Standards	Meets Standards
Other Planning Tenets	Runway 27 approach limits Hangars	Restricts Paved Use when Turf in Use	Restricts Paved Use when Turf in Use	Turf Use does not limit VFR Paved Use (Lose 2.7 acres of farm land)	Separation sufficient if both runways were Paved (Lose 26 acres of farm land)
Environmental	No Impact	None Identified	None Identified	None Identified	None Identified

Source: KLJ Analysis

Figure 2-6 – Turf Runway Alternatives





*Intended for Planning Purposes Only

0 1,000 2,000 Feet

Laurel Municipal Airport
Turf Runways Alternative

Preferred Development Strategy

For the alternatives evaluated, the preferred alternatives were selected as follows:

- Plan for 6,200 foot Runway 4-22
- Align Full Parallel Taxiway at 300 foot centerline separation and relabel the taxiway connectors as A1, A2, A3 and A4 respectively.
- Preserve space for widening Runway 14-32 but not in ALP at this time
- Establish a Turf Runway parallel to 4-22 and to the north with a centerline separation of 300 feet. The runways would be designated as Runway 4R-22L (Paved) and Runway 4L-22R (Turf)

The preferred development strategy identified in **Table 2-24 Preferred Airfield Development Strategy** below outlines the overall development sequence for the preferred alternatives based on airport sponsor priorities. These elements are shown graphically in **Figure 2-7 Preferred Airfield Development.** The implementation plan in **Chapter 4** will identify a realistic project sequencing based on available funding.

Table 2-24 – Preferred Airfield Development Strategy

	Near-Term 0-5 Years PAL 1	Mid-Term 6-10 Years PAL 2	Long-Term 11-20 Years PAL 3 & 4
Runway 4-22	• Construct Taxiway A in the center portion of the runway and remove Taxiway B (Relabel connectors) • Renumber as Runway 4R-22L	• Maintain	• Extend 1,001 feet to 6,200 feet
Runway 14-32	• Maintain	• Maintain	• Preserve space to Widen to 75 feet if needed in the future
Runway Turf	• Construct Runway 4L-22R turf	• Maintain	• Maintain

Source: KLJ Analysis
NOTE: Scope and timing of airport improvements depends on available funding and demand thresholds being met.

Figure 2-7 – Preferred Airfield Development