

CHAPTER 5: ALTERNATIVES ANALYSIS

Summary

The recommended development alternatives identified in this chapter include the following:

- To meet runway length needs for larger aircraft, plan to extend Runway 16-34 to the north by 300 feet for a total length of 5,100 feet. A runway extension to the north has significantly fewer impacts to the north than to the south.
- Enhance airport accessibility by implementing a not lower than ¾ mile approach procedure to the Runway 16 end. The principal benefits include enhancing airport utility while avoiding FAA land use conflicts.
- Replace the current SuperAWOS with an AWOS II. Replacement will occur in the same location as the current system.
- Accommodate new hangar and apron development in the current airport envelope.
- Ultimately accommodate a plan to extend Runway 16-34 by an additional 400 feet to the north (5,500 feet total length), shift the runway by 60 feet to the east to allow for a 300 foot separation from the existing taxiway and continue to implement a nonprecision instrument approach (¾ mile visibility).

Introduction

This chapter of the Airport Master Plan discusses airport development alternatives considered in the planning process for the Ronan Airport (7S0). The objective of this chapter is to clearly document the recommended airport development that meets the needs of airport users as well as the strategic vision for the Airport. Alternatives evaluated for this study are based on demand factors and facility needs identified in previous study chapters. Alternatives to accommodate airport demands are identified and evaluated for impacts. Alternatives presented in this chapter also have flexibility to react to unforeseen future conditions. Key evaluation criteria are used to analyze potential impacts of each alternative in order to aid the airport in selecting a preferred alternative(s).

Primary alternatives are the main functional facility elements that are analyzed first. Primary elements in the study include development of Runway 16-34 & the parallel taxiway and the construction of the AWOS-II.

A Preferred Development Strategy based on the selected alternative(s) is summarized at the conclusion of the analysis. This preliminary plan provides a guideline for implementation based on identified needs and priorities. The recommended plan to implement the proposed development is outlined in Chapter 6: Implementation Plan.

Background

The overall guiding principle is to plan an airport facility that adequately serves aviation users; community needs: and is flexible to industry changes. Airport development at S70 is primarily driven by the need to accommodate existing aircraft operations based on current the runway lengths derived using advisory circular 150-5325-4B, "Runway Length Requirements for Airport Design" as well as the ability for the airport to accommodate future forecasted aircraft. Associated facility needs include additional hangar development space for future based aircraft. Alternatives must meet FAA design criteria and be implementable with the existing infrastructure and environment.



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Each functional area of the airport has specific needs and constraints that affect the formulation of realistic, implementable development options. The most significant facility planning needs and assumptions are summarized in the following table based on Planning Activity Levels (PAL).

Table 5-1 – Facility Needs & Assumptions

Facility Element	Planning Needs & Assumptions			
	Non-precision instrument approach (¾ mile visibility) by PAL 1			
	Runway length of 5,100 feet by PAL 1			
Primary Runway	Ultimate runway length of 5,600 feet with precision instrument approach			
& Taxiway Design	(½ mile visibility) to one runway end (PAL IV)			
	Vertically guided approach (1 mile visibility) to opposite runway end			
	ARC B-II/Large Aircraft FAA design standards by PAL 1			
Runway Protection Zone (RPZ)	Acquire land within the RPZ			
	Avoid introducing incompatible land uses into RPZs (i.e. roads, structures)			
FAA Airspace Standards	Clear FAR Part 77 Primary and Approach surfaces			
	Mitigate remaining FAR Part 77 airspace obstructions			
	Avoid new airspace obstructions to FAA Departure Surface (40:1 slope)			
Terminal/Apron/Hangar Area	ADG-II, TDG-2 FAA design standards for most demanding aircraft			
	New aircraft tie-downs based on demand			
	New based/transient aircraft storage space based on demand			
Support/Landside Facilities	Provide automobile parking spaces based on demand			
	Construct agricultural spray pad			
	Provide space for alternative fuels			
	Construct perimeter wildlife fence			

Source: KLJ Analysis

Alternatives Process

Steps

A wide range of alternatives was evaluated to determine the best solution for the airport to meet facility needs. In many cases the process is an iterative one, which reacts to new information and input. FAA Advisory Circular (AC) 150/5070-6B, Airport Master Plans (AC 150/5070-6B) identifies an alternatives analysis process to progressively screen alternatives to identify a recommended development plan. The process includes these steps:

- 1. Identify the functional airport elements that will be analyzed as primary and secondary elements. Primary elements require large land areas whereas secondary elements can fill-in around primary elements. Identify a comprehensive set of primary (then secondary) alternative concepts that appear to meet basic objectives such as technical feasibility, economic and fiscal soundness and aeronautical utility. Include a "no action" alternative for comparative purposes.
- 2. Evaluate each alternative in an initial screening process to determine the ability for each to meet basic objectives. Utilize subjective criteria to analyze and document any alternatives that are dismissed. Refine the remaining short-list of alternatives as needed and perform a more detailed quantitative impact analysis. Criteria used to evaluate alternatives include operational performance, best planning tenets, environmental, and fiscal factors. No quantitative weighting factors are used for evaluation as they could skew the final results.
- 3. Select preferred alternative(s) that best meet the needs of the airport based on the benefits and impacts. The primary alternative should be selected first, which becomes the basis for the secondary alternative evaluation. Both the primary and secondary preferred alternatives are combined into a single recommended alternative with refinements made as needed.

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This report will discuss the alternatives evaluation process for 7SO. The preferred alternative(s) are called out at the end of each section. All costs are planning-level non-engineering estimates in 2016 dollars.

Review & Approval

The alternatives evaluation process is the most collaborative portion of the master plan study. The alternatives were reviewed and refined through meetings with agency representatives and the study's Master Plan Advisory Group (MPAG). The preferred alternatives were presented to the general public for review and comment at a public open house held in March 2017. The recommended alternative was presented and approved by the Airport Board at their April 2017 meeting.

Evaluation Criteria

Evaluation criteria are developed to determine the relative strength and weaknesses of the alternatives. AC 150/5070-6B identifies criteria that would be examined in any alternatives evaluation. Using this guidance and local considerations, airport-specific criteria have been formulated. The alternative evaluation criteria utilized for this study are as follows:

Operational Performance

This criterion evaluates how well the airport operates as a functional system. Specific factors include:

- Capacity to meet forecasted activity demands within and beyond the planning horizon;
- Capability to meet FAA design standards to safely accommodate the critical design aircraft;
 and
- Efficiency to accommodate alternative elements as a combined airport system.

Best Planning Tenets and Other Factors

This criterion involves determining the relative strengths and weaknesses of the alternatives. The following tenets are typically reviewed:

- Conformance to industry best practices for safety and security;
- Conforms with FAA design standards and other guidelines;
- Provides for the highest and best on- and off-airport land use;
- Allows for forecast growth and growth beyond the planning horizon;
- Provides flexibility to react to unforeseen changes;
- Technically feasible, constructible and implementable;
- Socially and politically feasible; and
- Satisfies airport user needs.

Environmental Factors

The potential effects of the alternatives upon the natural and built environment are an important consideration. Environmental factors are evaluated early in the process to determine whether alternatives are likely to trigger impacts that would need to comply with the National Environmental Policy Act (NEPA), or if additional alternatives need to be considered. The following environmental resource categories applicable to this study include:

- Compatible Land Use,
- Section 4(f),
- Fish, Wildlife and Plants,
- Floodplains,



- Historical and Cultural Resources,
- Light Emissions and Visual Effects,
- Noise,
- Socioeconomic,
- Wetlands, and
- Fiscal Factors.

A fiscal analysis is necessary to determine if an alternative fits within the financial resources of the airport. Preparing rough planning-level development cost estimates is an effective way to compare alternatives. Evaluating the ability for the airport sponsor to finance each alternative is also important, as it will provide an indication of the feasibility of proposed development.

Primary Runway 16-34 & Taxiway

Alternatives

To meet current user needs the airport requires a 5,100-foot long runway based on the guidelines presented in AC 150/5325-4B. Future requirements identified in the facility requirements chapter also show a need in the planning period to accommodate a runway to taxiway separation of 300 feet with an ultimate runway length of 5,500 feet with a width of 100 feet. The following initial Alternatives have been formulated:

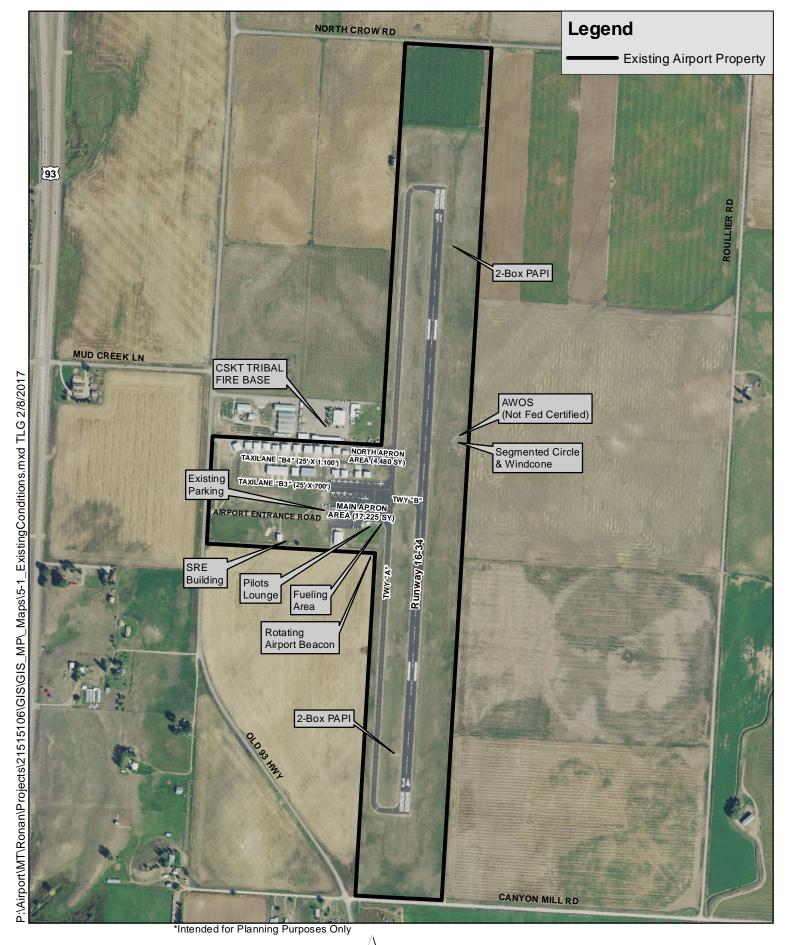
- No Build No change;
- Extend Existing Runway to meet current needs by extending Runway 16-34 to 5,100 feet;
- Relocate Runway 60 feet to the east for a Runway to Taxiway separation of 300 feet and Extend Runway 16-34 to 5,100 feet to meet current needs;
- Relocate Runway 300 feet to the east for a Runway to Taxiway separation of 300 feet and Extend Runway 16-34 to 5,100 feet to meet current needs; and
- Ultimately extend the runway to 5,500 feet and widen to 100 feet to meet projected needs and FAA design criteria.

All alternatives considered lower approach minimums to the Runway End 16 to take advantage of the new on-site AWOS II altimeter (down to ¾ mile from 1 ¼ mile). It is important to note that all alternatives looked to extend the runway to the north as there is a homestead directly to the south of the existing runway, which currently has easements for tree trimming; moving the runway to the south would exacerbate this situation and further impact the home.

Existing airfield baseline conditions are shown in Figure 5-1.

NO BUILD

The "No Build" alternative would keep Runway 16-34 and the parallel taxiway in its existing configuration. The runway dimensions would remain at 4,800' x 75' with a 35' wide parallel taxiway with a runway to taxiway separation of 240 feet. This configuration would continue to meet ARC B-II Aircraft standards with aircraft weights up to 20,000 pounds. The approaches would remain non-precision instrument with visibility minimums as low as 1 ¼ mile. Also, none of the additional airside needs would be met.



N 1,000

500

2,000

Feet

Ronan Airport
Exhibit 5-1:
Existing Conditions Airfield



TARGETED IMPROVEMENTS

The following targeted improvements are recommended to enhance the runway-taxiway configuration and meet FAA runway and taxiway design standards regardless of the runway development alternative:

- Upgrade Runway 16-34 Visual Glide Slope Indicator (VGSI) from 2 box PAPI to a four box system and
- Install retro-reflective taxiway markers.

Targeted improvements are recommended when existing facilities reach the end of their useful life.

Specific development alternatives include:

1. EXTEND EXISTING RUNWAY TO MEET CURRENT NEEDS BY EXTENDING RUNWAY 16-34 TO 5,100 FEET.

This alternative, as shown in **Exhibit 5-2**, explores extending Runway 16-34 to 5,100 feet to accommodate existing aircraft while lowering visibility minimums to as low as ¾ mile. Proposed actions include:

- Lengthen runway 16-34 by 300 feet to the north;
- Widen the FAR Part 77 approach airspace surface and plan to clear a 34:1 approach slope; and
- Expand the FAA Runway 16 End RPZs to 1,000 feet in width at its inner point, 1,700 feet long, and 1,510 feet wide at its outer point.

2. RELOCATE RUNWAY 16-34 TO THE EAST 60 FEET AND EXTEND RUNWAY 16-34 TO 5,100 FEET TO MEET CURRENT NEEDS.

This alternative, as shown in **Exhibit 5-3**, explores building a new Runway 16-34 60 feet to the east of the existing runway at a length of 5,100 feet. This would allow the airport to meet taxiway to runway separation distances required for larger aircraft (C-II and above)¹. Proposed actions include:

- Relocate Runway 16-34 to the east of the current location by 60 feet;
- Lengthen Runway 16-34 by 300 feet to the north;
- Widen the FAR Part 77 approach airspace surface and plan to clear a 34:1 approach slope; and
- Expand the FAA Runway 16 End RPZ to be 1,000 feet wide at its inner point, 1,700 feet long, and 1,510 feet wide at its outer point.

3. RELOCATE RUNWAY 16-34 TO THE EAST 300 FEET AND EXTEND RUNWAY 16-34 TO 5,100 FEET TO MEET CURRENT NEEDS.

This alternative, as shown in **Exhibit 5-4**, explores building a new Runway 16-34 300 feet to the east of the existing runway with 5,100 feet in length. This would allow the airport to meet taxiway to runway separation distances required for larger aircraft (C-II and above). Proposed actions include:

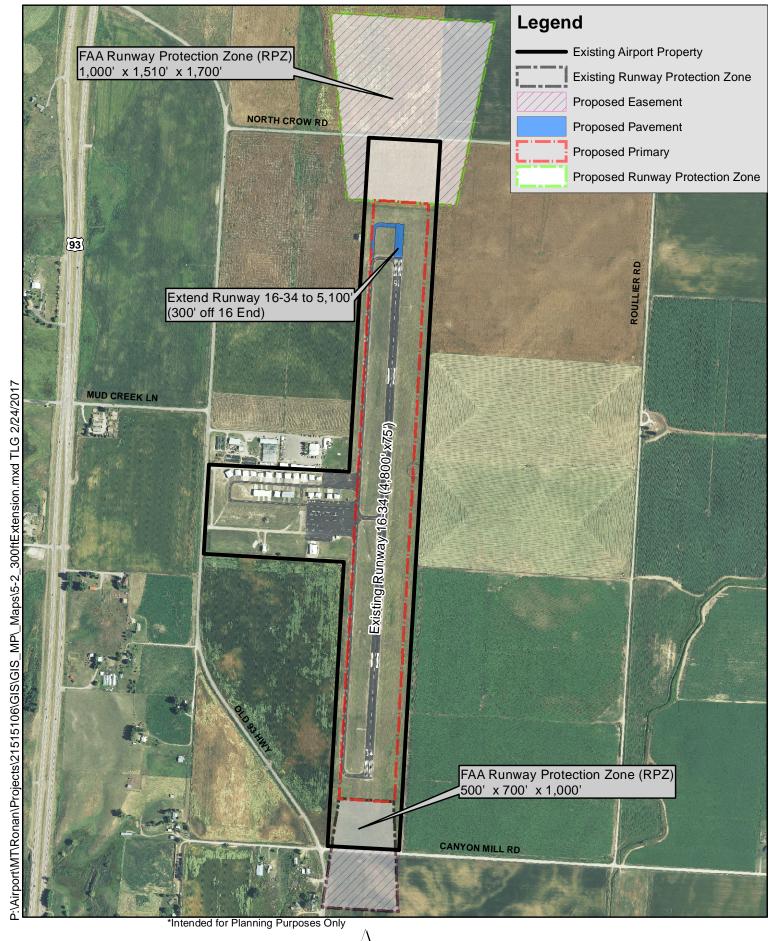
- Relocate Runway 16-34 to the east of the current location by 300 feet;
- Lengthen runway 16-34 by 300 feet to the north;
- Acquisition of 28 acres of land (fee);
- Widen the FAR Part 77 approach airspace surface and plan to clear a 34:1 approach slope; and
- Expand the FAA Runway 16 End RPZ to 1,000 feet wide at its inner point, 1,700 feet long, and 1,510 feet wide at its outer point.

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¹ C-II standards are not anticipated to be needed until later in the planning period (15-20 years)



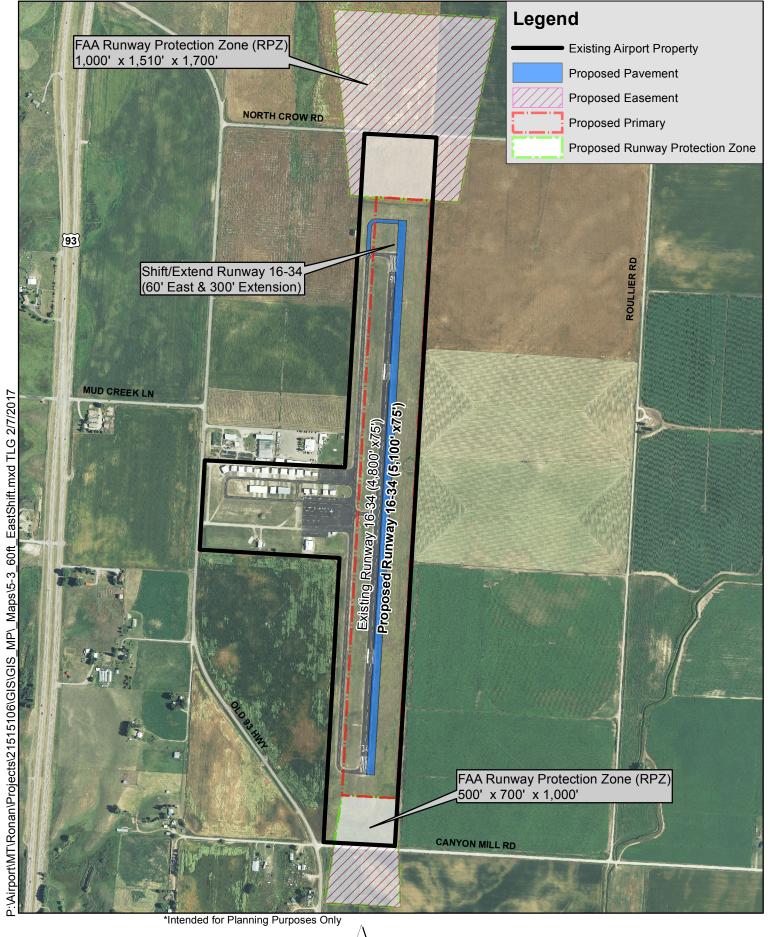
Each Alternative is shown on the following pages while Table 5-2 identifies the key strengths and weaknesses of each alternative.







Ronan Airport Exhibit 5-2: Runway Extension



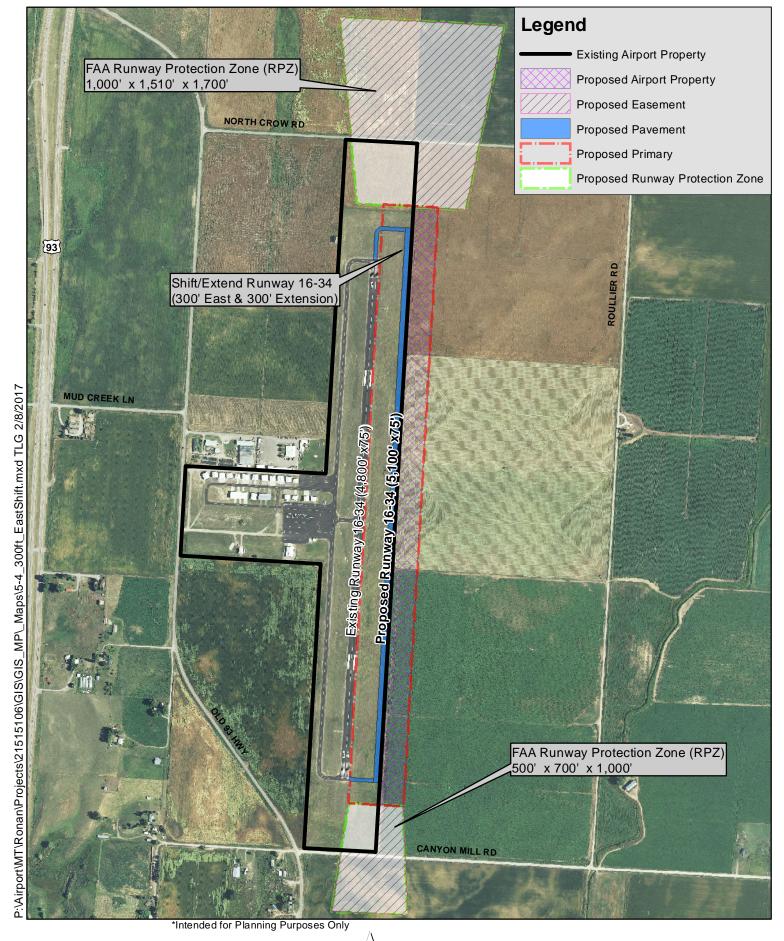




Feet

500

Ronan Airport Exhibit 5-3: Shift Runway 16-34 60' East





N 1,000

2,000

Feet

500

Ronan Airport Exhibit 5-4: Shift Runway 16-34 300' East

Table 5-2 – Runway 16-34 Alternatives Analysis

Category	No Build - Existing	Alternative 1	Alternative 2	Alternative 3			
Key Alternative Features							
Runway Development Code (RDC)	B-II-5000	B-II-4000	B-II-4000	B-II-4000			
Runway Dimensions	4,800' x 75'	5,100' x 75'	5,100' x 75'	5,100 x 75			
Runway Shift	None	None	60 feet	300 feet			
Design Aircraft Type(s)	Turboprop	Turboprop	Turboprop	Turboprop			
Runway 16 Approach Capability	Non-Precision (1 & ¼ mile visibility)	Non-Precision (3/4 mile visibility)	Non-Precision (3/4 mile visibility)	Non-Precision (3/4 mile visibility)			
Runway 34 Approach Capability	Non-Precision (1 mile visibility)	Non-Precision (1 mile visibility)	Non-Precision (1 mile visibility)	Non-Precision (1 mile visibility)			
Operational Performance (Capacity, Capability, Effic							
Capacity to Meet Forecasted Demands (10 Years)	Yes	Yes	Yes	?			
Capability to Meet FAA Design Standards	No	Requires FAA RPZ Study	Requires FAA RPZ Study	Requires FAA RPZ Study			
Efficiency to Accommodate Other Airport Plans	No New Issues	No New Issues	No New Issues	Will require relocation of the AWOS-II			
Best Planning Tenets and Other Factors							
Airfield Configuration Efficiency & Safety	No New Issues	No New Issues	No New Issues	No New Issues			
FAA RPZ Land Use Compatibility	Clear RPZs	Introduces North Crow Road into RPZ	Introduces North Crow Road into RPZ	Introduces North Crow Road into RPZ			
Clear FAA Part 77 Approach Surface Airspace	Yes	Yes	Yes	Yes			
Long-Term Development Flexibility	Limits Future Development	Limits Future Development	No	No			
Socially and Politically Feasible	Challenging to Limit Growth	Likely	Yes	?			
Environmental							
Noise	No New Significant Impacts	No New Significant Impacts	No New Significant Impacts	?			
Compatible Land Use	Existing Roads in RPZ	Existing Roads in RPZ	Existing Roads in RPZ	Existing Roads in RPZ			
Wetland Impacts	None	None	None	None			
Floodplain Impacts	No New Impacts	No New Impacts	No New Impacts	No New Impacts			
Fish, Wildlife, Plant Impacts	None	None	None	None			
Historical & Cultural Resource Impacts	None	None	None	None			
Section 4(f) Property Impacts	No New Significant Impacts	No New Impacts	No New Impacts	No New Impacts			
Light Emissions & Visual Effect Impacts	No New Significant Impacts	No New Significant Impacts	No New Significant Impacts	No New Significant Impacts			
Land Acquisition	No	Yes-minor in RPZ	Yes-minor in RPZ	Yes-major in RPZ and OFA			
Fiscal Factors							
Cost	No cost ¹	\$1.0 million ²	\$5.4 million	\$5.8 million			
Relative Project Cost Rank (1=Low, 5= High)	1	3	3	5			
Ability to Receive FAA and/or State Funding	No Change	Project Justified & May Compete	Project Justified & May Compete	Project Justified & May Compete			
Ability for Sponsor to Fund Local Share	Feasible	Feasible	Feasible	Not feasible			
Recommendation							
Preferred Alternative	NO	NO	YES	NO			
Source: KLJ Analysis							

² Existing 16-34 will require full reconstruction in the next few years. This reconstruction will cost \$4.5 million.



Preferred Alternative

TO BE COMPLETED LATER

AWOS Location

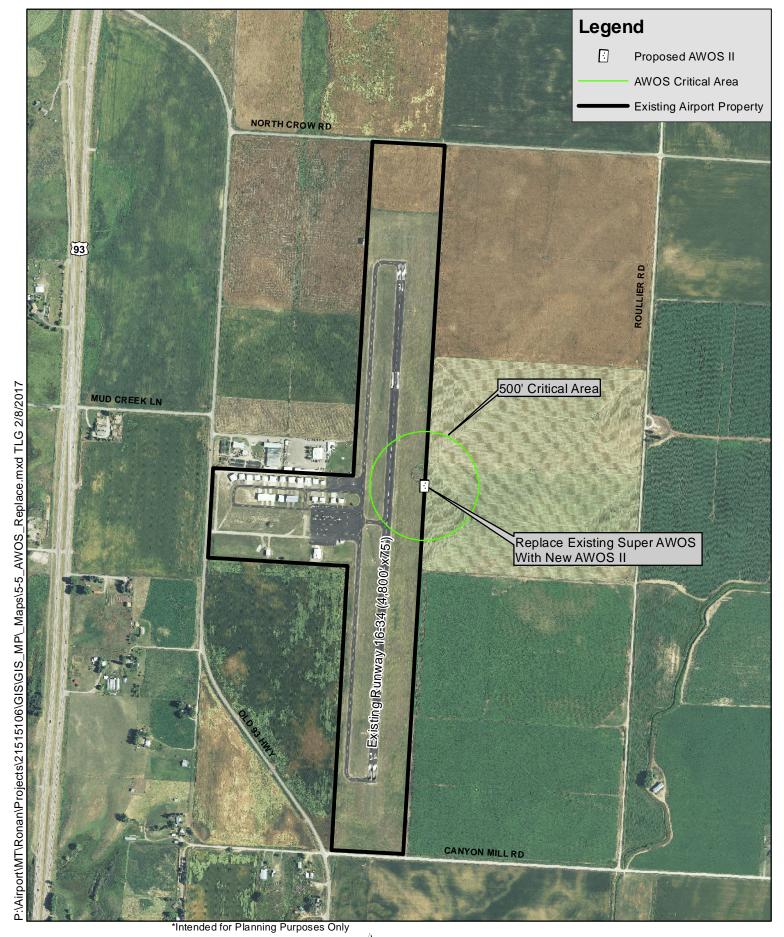
Initial Concepts

Location of the AWOS was the next critical improvement to the overall airport development to be determined once the location of the runway was decided.

Three initial AWOS siting concepts were developed:

- East side of airport -on airport property -Exhibit 5-5;
- West side of airport- on airport property -Exhibit 5-6; and
- Off airport property -Exhibit 5-7.

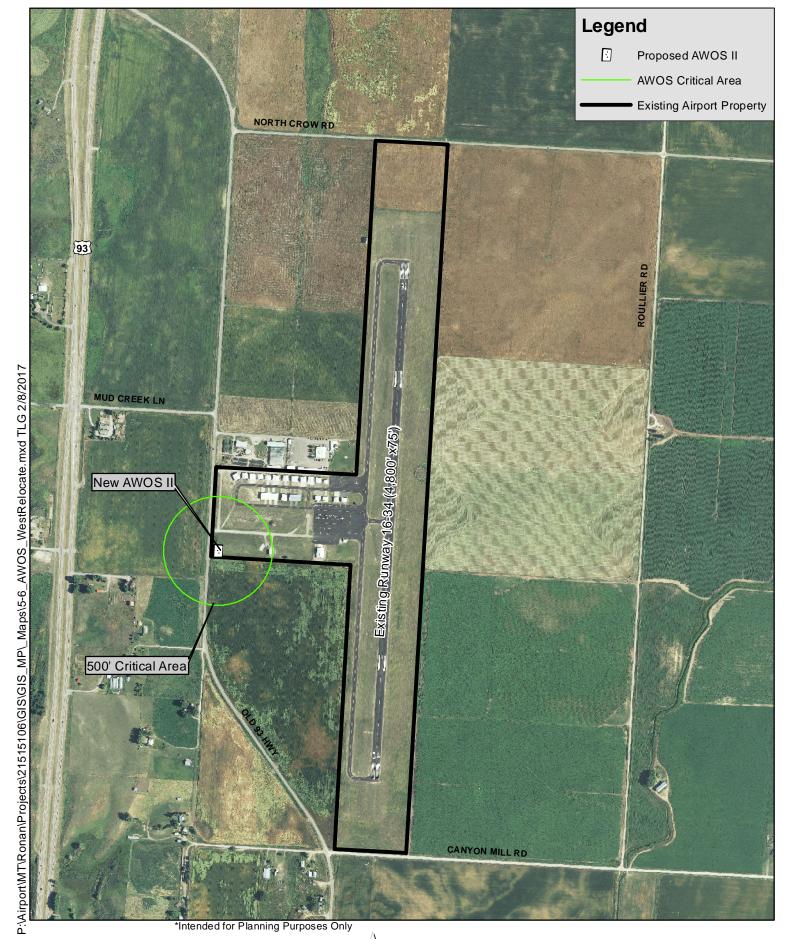
These concepts were refined and are shown in **Exhibits 5-5**, **5-6** and **5-7** based on discussions with the Airport Board and the FAA. The major decision points revolved around whether or not the airport should consider buying property on either the east or west side of the airport to site the AWOS or stay on airport land. After several meetings it was decided that the AWOS should stay on existing airport land. Costs for each alternative were developed with both on-airport sites being roughly the same cost at \$250,000 whereas the off-site location was estimated to cost \$460,000. Discussions were held with the FAA Helena Airports District Office (HLN-ADO) and the Airport to determine the best location for the AWOS. After conferring with FAA NAVAIDS personnel it was determined the location on the east side of the airport would be the best site; Exhibit 5-5 shows this location.





N 500 1,000 2,000 Feet

Ronan Airport Exhibit 5-5: New AWOS II



 $\bigcap_{\mathbf{N}}$

500

1,000 2,000 Feet

Ronan Airport Exhibit 5-6: New AWOS II (West of Runway 16-34)



 $\bigcap_{\mathbf{N}}$

0 500 1,000 2,000 Feet Ronan Airport Exhibit 5-7: New AWOS II Off Airport



Hangar Area and Apron

Initial Concepts

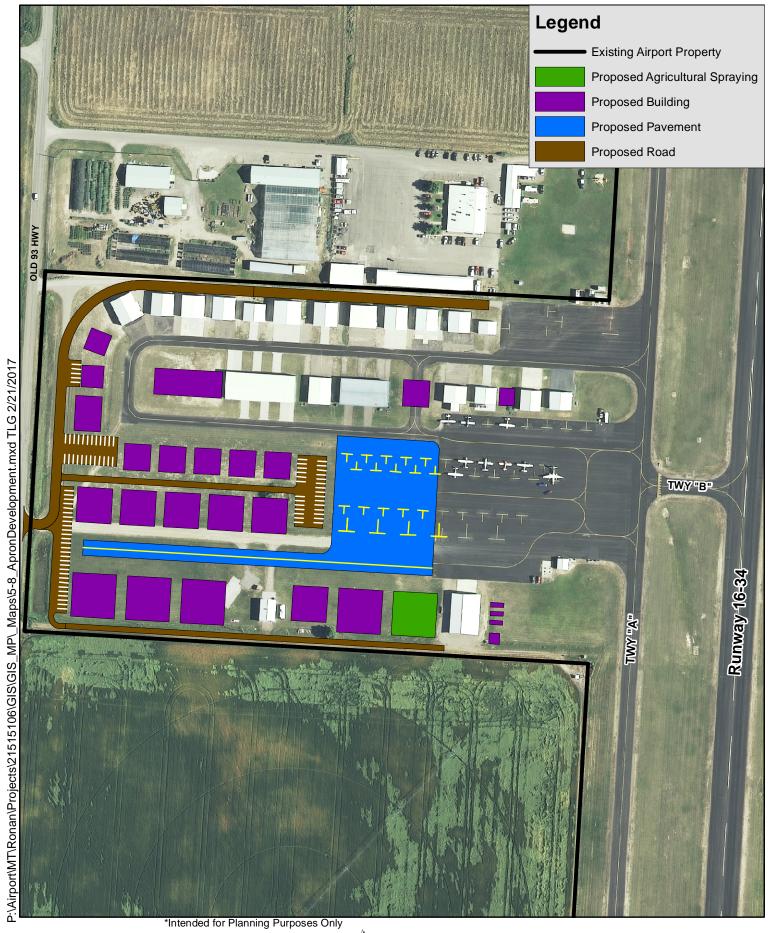
There are small pockets of developable space available on existing airport property, however demand for hangar or apron space development does not currently exist. Therefore one alternative was developed to show the future hangar building layout.

The following areas were developed based on conversations with airport management and by reviewing existing aircraft needs:

- Aircraft Parking Apron (i.e. Aircraft Parking Positions and Maneuvering Space);
- Aircraft Storage Hangars (i.e. Commercial, Box and T-Hangars);
- Landside Development (i.e. Access Roads, Automobile Parking; and
- Support Facilities (i.e. Mechanical Equipment Storage and Fuel Facility).

Figure 5-8 depicts the existing conditions of the hangar area with the infill that could take place . The following restrictions were part of the development plan:

- Requirement to stay on airport property;
- Requirement to not impact any existing building;
- Build new development to TDG II standards; and
- Utilizing the existing Airport Layout Plan as a baseline for evaluation.



 $\frac{1}{N}$

125 250 500 Feet Ronan Airport Exhibit 5-8: Hangar and Apron Development Map



Exhibit 5-8 depicts the hangar and apron development for the planning period.

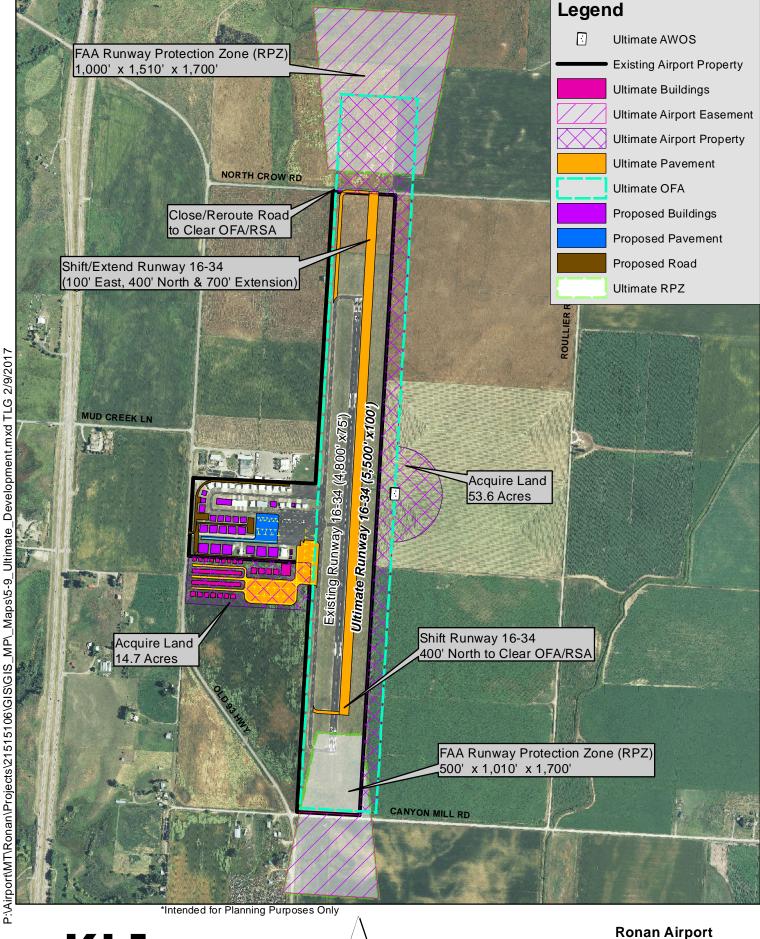
Ultimate Development

The Airport Board requested a plan for development of the ultimate airfield. While the current operations do not warrant a runway that meets C-II standards the ultimate configuration shows what would happen if this change should occur. The ultimate development plan does show a need for the airport to acquire land in order to to meet hangar and apron needs that could arise in the years following the planning period.

In the ultimate airfield layout the following changes would occur:

- Runway 16-34 extended to 5,500 feet;
- Runway 16-34 widened to 100 feet;
- Runway safety area widened and lengthened to 500 feet in width by 1,000 feet in length;
- Runway 16-34 RPZs remain the same size;
- Runway object free area widened and lengthened to 800 feet wide and 1,000 feet long;
- Apron space and taxiway/taxilane designed to TDG II standards; and
- Acquisition of property to the south of existing property line for hangar and apron expansion.

Exhibit 5-9 shows the ultimate development of the airport at a cost of \$10.5 million.





2,000 Feet

500

Exhibit 5-9:
Ultimate Runway Extension
Apron Expansion



Preferred Development Strategy

Table 5-3 shows the preferred Airport development strategy. The recommended plan to implement the proposed development is outlined in **Chapter 6: Implementation Plan**.

Table 5-3- Preferred Development Strategy

	Near-Term 0-5 Years PAL 1	Future 6-10 Years PAL 2	Long-Term 11-20 Years PAL 3 & 4	Ultimate 20+ Years Beyond PAL 4
Runway 16-34 & Taxiway	 Relocate Runway 16-34 by 60 feet to the east (300 foot separation), Taxiway Pavements Extend Runway 16-34 to 5,100' Extend Parallel Taxiway A Upgrade Runway 16 Approach to ¾ mile Acquire Land for ¾ mile Approach RPZ 	Runway 16-34, Taxiway Pavement Maintenance	Reconstruct Runway 16- 34, Taxiway	 Extend/Widen Runway 16-34 to 5,500' x 100' Extend Parallel Taxiway A Acquire Land for Runway/Taxiway expansion Upgrade Approach to Runway 34 (3/4 mile)
Terminal & Hangar Area	Taxilane Pavement Maintenance Construct Conventional and T- Hangars as demand warrants	 Taxilane Pavement Maintenance Construct Conventional and T- Hangars as demand warrants 	 Taxilane Pavement Maintenance Construct Conventional and T-Hangars as demand warrants 	Taxilane Pavement Maintenance Construct Conventional and T-Hangars as demand warrants
Landside	Pave Access Road & Parking Lot	Expand Parking Lot as demand warrants	Expand Parking Lot as demand warrants	Expand Parking Lot as demand warrants
Support & Other	Replace AWOS Construct Perimeter Construct Wildlife Fence			

Source: KLJ Analysis

NOTE: Scope and timing of airport improvements depends on demand threshold being met.