CHAPTER 5: ALTERNATIVE ANALYSIS

Introduction

This chapter of the Airport Master Plan discusses airport development alternatives considered in the planning process for the Minot International Airport (MOT). Alternatives evaluated for this study are based on comparing existing conditions with facility requirements reviewed in detail in the previous chapters. Potential impacts of each alternative considered are discussed and used to help the airport select a preferred alternative(s) to be shown on the Airport Layout Plan. Alternatives outlined are split into the following functional facility areas:

- Airfield
- Landside
- Passenger Terminal Area
- General Aviation & Other

A Preferred Development Strategy based on the preferred alternative(s) is identified after the analysis. This preliminary plan provides a guideline for implementation based on airport needs and priorities. The detailed plan to sequence, finance and implement the preferred alternative(s) is evaluated in **Chapter 6: Implementation Plan**.

Evaluation Process

The overall guiding principle is to provide an airport facility that adequately serves the community's vision and needs and is flexible to industry changes. Alternatives must meet FAA design criteria and be implementable with the existing infrastructure and environment. A wide range of alternatives were evaluated to determine the best solution for the airport to meet anticipated needs identified by Planning Activity Level (PAL), which were described in **Chapter 4: Facility Requirements**.

Steps

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. FAA Advisory Circular (AC) 150/5070-6B, *Airport Master Plans* 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. 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. Criteria used to evaluate alternatives include operational performance, best planning tenets, environmental and fiscal factors. No weighting factors were used through the evaluation process because weighting factors by their nature create a bias, and impedes the ability to truly consider the complexities of planning decisions.

3. **Select** preferred alternative(s) that best meet the needs of the airport based on the benefits and impacts. Preferred alternatives are combined into a single recommended alternative with refinements made as needed.

This report will discuss the alternatives evaluation process for MOT.

Review & Approval

Preliminary alternatives were developed and presented to airport management on June 29, 2016. Airport management evaluated nine preliminary alternatives in a working session with KLJ staff in which development options were considered for the airfield plus each functional area of the airport. The airport staff provided direction as to the airfield and a refined set of four development alternatives were presented to the Technical Advisory Committee (TAC) on August 31, 2016 for consideration. These refined alternatives were also provided to stakeholders in a series of focus group meetings on September 16, 2016 for feedback. The airport then narrowed the list of alternatives based on input from a public open house held on October 19, 2016. A meeting was held on October 26, 2016 to brief the FAA and State Aeronautics staff on the alternatives analysis. Preferred alternatives were selected on June 19, 2017 by airport staff.

Development Considerations

Each functional area of the airport has specific needs and constraints that affect the formulation of realistic, implementable development alternatives. Examples include cost, environmental impacts, FAA design standards, and existing utilities or infrastructure. These are discussed in detail within this Chapter.

Evaluation Criteria Overview

Evaluation criteria for this report are broken into four broad categories: Operational Performance, Safety & Standards, Best Planning Tenets & Other Factors, Environmental Factors, and Fiscal Factors.

OPERATIONAL PERFORMANCE

Operational performance evaluates how well the airport operates as a system, generally from the perspectives of capacity, capability, and efficiency. Capacity and capability primarily refer to both the airport facilities' ability to handle the volume and size of aircraft forecast to serve MOT through the planning period. Efficiency includes the layout of facilities to enable tenants to conduct their business and serve customers in the most efficient manner possible. For instance, an FBO providing fuel service and in/out services must be able to readily get to their customers' hangars to provide these services. Those customers located on the other side of an airfield cannot be well-served by the FBO who must drive a fuel truck around a perimeter road to provide services.

SAFETY & STANDARDS

Safety and Standards are important elements considered based on FAA standards as well as general industry practices for safety and security. The following items are considered:

- Conformance to best practices for safety and security
- Conforms to the intent of FAA design standards and other guidelines
- Technically feasible

OTHER PLANNING TENETS

Planning tenets and other factors considered include the following examples:

- Allows for forecast growth and growth beyond the planning horizon
- Provides flexibility to adjust to unforeseen changes
- Conforms to airport sponsor's strategic vision
- Socially and politically feasible
- Satisfies user needs

ENVIRONMENTAL FACTORS

It is important to consider potential environmental effects of alternatives early in the process to determine whether alternatives are viable, trigger impacts to comply with the National Environmental Policy Act (NEPA), or if additional alternatives need to be considered. Examples include impacts to wetlands and surrounding land use, noise, and light pollution, stormwater runoff, wildlife habitats, and potential disproportionate effects on disadvantaged populations. **Chapter 7 - Environmental Review** provides an overview regarding environmental issues affecting MOT. Key environmental elements affecting specific areas of the airport are identified in this chapter as the alternatives in that area are analyzed.

FISCAL FACTORS

Preparing planning-level cost estimates is an effective way to compare alternatives. The cost estimates also provide an indication of the feasibility of proposed development. The critical element for MOT is the cost of the core public infrastructure; taxiways/taxilanes, aprons, roadway network, utilities, and other development infrastructure. The cost of building development is primarily expected to be borne by the private sector, but in some cases the airport may choose to provide funding for these revenue-generating facilitates. All costs are planning-level estimates in 2016 dollars.

Airfield Development Alternatives

The Airfield Development Alternatives reviewed include the following infrastructure elements. For this analysis the airfield areas includes the runway and taxiway system. All other movement areas, including taxilanes and aprons, are addressed in the landside development because of the interrelationship between the buildings and taxilane/aprons.

- Runways
- Taxiway System

Needs Summary

The airfield is vital to the airport's core infrastructure for accommodating aircraft operations. The following section summarizes key airfield facility requirement findings:

- **Runway 13/31:**
  - Existing runway length sufficient. Reserve space for ultimate extension from 7,700' to 8,500' to accommodate a CRJ-900 aircraft to Atlanta.
  - Upgrade Runway 13 approach to achieve lower visibility minimums (3/4 mile)
- **Runway 8/26:**
  - Needed to meet FAA wind coverage for ARC C-III aircraft; plan to maintain 6,347' x 100' runway and maintain compatible land use on Runway 8 approach
- **Taxiway System:**
  - Taxiway design standards change from TDG-4 to TDG-3; 50' wide taxiways needed for largest airplanes but TDG-4 Fillet design is recommended for major taxi routes
  - Reconfigure various other taxiways to meet FAA design standards and/or capacity demands
  - Some taxiways do not have sufficient strength for their existing/future demand such as Taxiway C3 west of Taxiway B and Taxiway E.

Runways

An evaluation of development alternatives to accommodate the airfield facility requirements elements for the MOT runways is described in the following section:

RUNWAY 13-31 LENGTH

The length of Runway 13-31 is currently 7,700' and per the Facility Requirements is recommended to be extended to 8,500' in the future. As noted in the Facility Requirements, 7,700' meets the current design aircraft needs. An 800' extension would be needed to meet anticipated future facility requirements; any lesser extension would still have operational limitations for identified future needs. Therefore, an 800' extension to each end was examined in comparison to a 'no change' scenario. See **Exhibit 5-1 Runway 13-31 Extension Options** and **Table 5-1 - Runway 13-31 Extension Options Summary**.

Extension to 8,700' (Dismissed): The 2012 ALP was the most current as this master plan process was undertaken. This 2012 ALP depicts a runway extension to 8,700 feet to meet the complete needs of business jets at 100% of fleet and 90% useful load. This category of aircraft is not anticipated to regularly operate at 90% useful load at MOT in the future. An extension to the southeast at this length would also introduce industrial buildings into the RPZ, which may trigger relocation. For these reasons, a future runway length of 8,700' was dismissed in the preliminary analysis.

No Change: Runway length remains at 7,700' and no extension shown on the Airport Layout Plan.

Advantages:

- No new capital improvement costs
- No need to relocate any runway lighting or change any runway markings
- No need to relocate any ILS components
- No need for new instrument approach procedures

Disadvantages:

- Does not accommodate future facility requirements
- Runway length does not meet long range capabilities of certain airline aircraft
- Does not protect for potential runway extension in the future

Option 1 - Extension to Runway 31 End: Runway 13-31 is extended from 7,700' to 8,500' with the extension on the Runway 31 end (southeast). The work will require relocation of the Glide Slope antenna and approach lighting system (MALSR), extension of Taxiway C and runway safety area improvements impacting an area currently identified as jurisdictional wetlands.

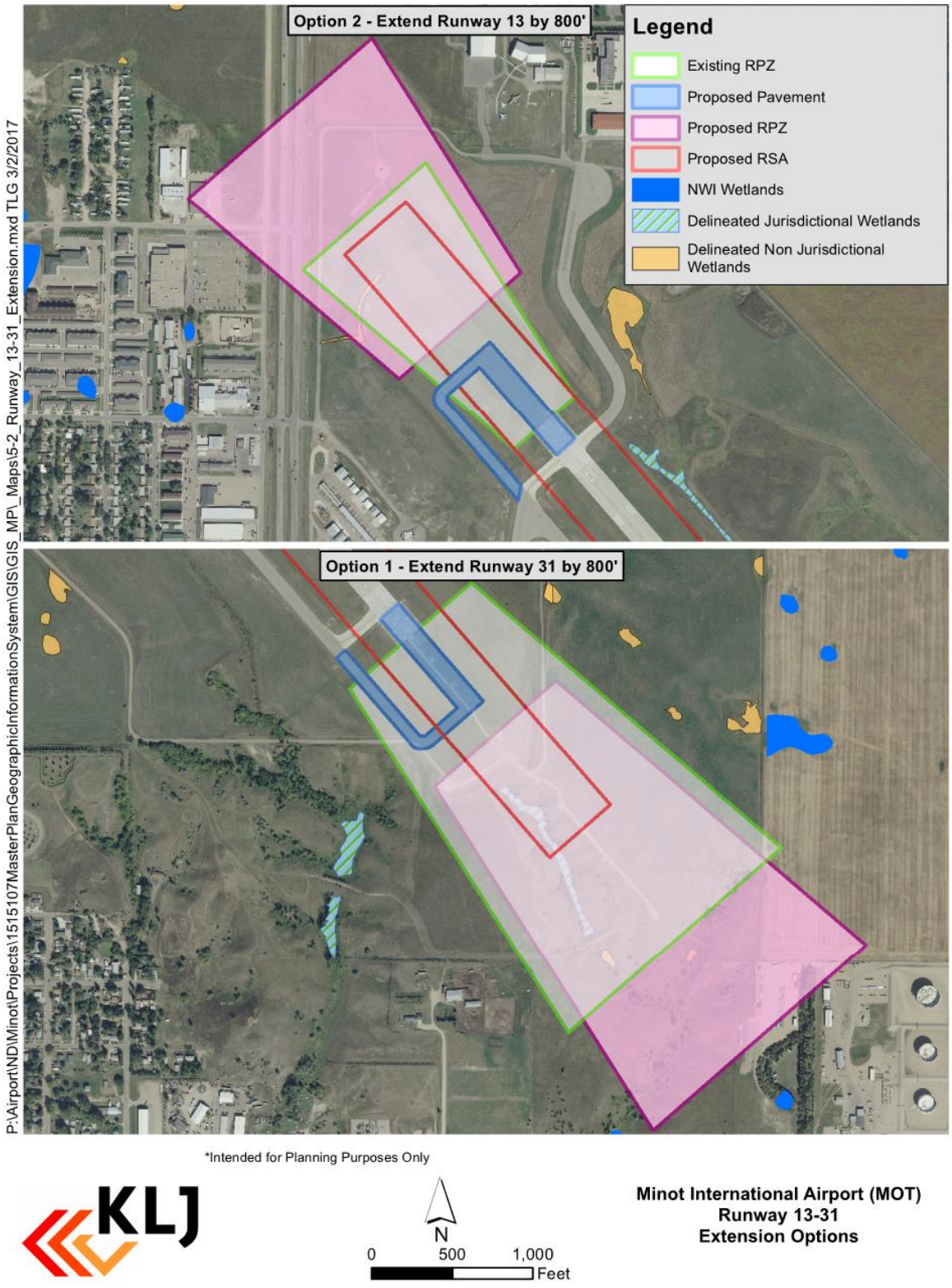
Advantages:

- No incompatible uses inside the new Runway 31 RPZ
- Runway extension meets long range capabilities of certain airline aircraft

Disadvantages:

- Required relocation of Glide Slope antenna and MALSR
- Extension of Runway Safety Area impacts 0.9 acres of jurisdictional wetlands
- Fill material required to meet Runway Safety Area grades (up to +/- 40' in ground elevation difference)
- May require an RPZ Analysis for potential incompatible land uses

Exhibit 5-1 - Runway 13-31 Extension Options



Option 2 - Extension to Runway 13 End: Runway 13-31 is extended from 7,700' to 8,500' with the extension on the Runway 13 end (northwest). The work would require the extension of Taxiway C. Also, the RPZ would extend over U.S. Highway 83 and a single-story office building.

Advantages:

- No need to relocate the Runway 31 Glide Slope antenna, MALSR or Localizer equipment
- Runway extension meets long range capabilities of certain airline aircraft
- Minimal fill material required to meet Runway Safety Area grades

Disadvantages:

- 2,200 linear feet of U.S. Highway 83 and 1,300 linear feet of other roads would be inside the RPZ
- A single-story office building would be inside the RPZ (potential incompatible land use that may need to be removed)
- Penetrations for the GQS surface and FAR Part 77 34:1 surface with existing short street lights along U.S. 83 and various poles west of U.S. 83

Table 5-1 – Runway 13-31 Extension Options Summary

Factor	No Change	Option 1	Option 2
Proposed Action	Runway Length Remains at 7,700'	Extend Runway Length by 800' on Runway 31 End	Extend Runway Length by 800' on Runway 13 End
Operational Performance	Suitable for A320 to Orlando/Sanford	Suitable for CRJ-900 to Atlanta	Suitable for CRJ-900 to Atlanta
Safety & Standards	4 acres of Runway 31 RPZ currently outside of airport property	Glide Slope Antenna and MALSR relocated; New approach procedures; 28 acres of RPZ outside of existing airport property	3,500 linear feet of roads, and one single-story office building inside the RPZ; Increases safety risk to public; New approach procedures; 10 acres of RPZ outside of existing airport property; GQS surface would be penetrated by existing short street lights on U.S. 83
Other Planning Tenets	No flexibility for any runway expandability as industry evolves	Does not significantly change surrounding land use standards	Restricts opportunity to utilize property west of U.S. 83 for approved non-aeronautical uses
Environmental	None	0.9 acres of Jurisdictional Wetlands* in Runway Safety Area	Commercial Building Acquisition/Tenant Relocation
Fiscal**	No Cost	$12.6 Million	$10.4 Million
Preferred Alternative	NO	**YES**	NO

** Jurisdictional wetlands will require further environmental review.*
*** All improvements can be completed on existing airport property. The cost does Include acquisition of properties in the RPZ and the building in the Runway 13 RPZ.*
Source: KLJ Analysis

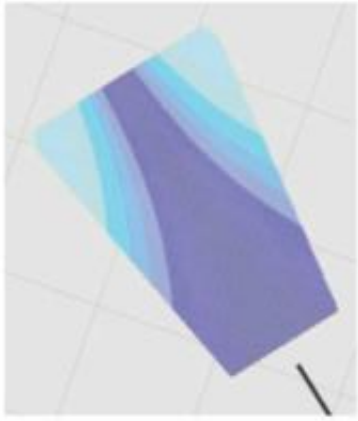
Recommendation - After reviewing the options for the extension to Runway 13-31 there is no immediate need to extend the runway. The extension to the northwest results in additional roadway and a building introduced into the RPZ. Acquisition and relocation of the office building may be needed. Option 1 will require runway safety area improvements into a 0.9-acre wetland area. Despite the additional cost, Option 1 has no incompatible uses in the RPZ and maintains the current level of safety. **The 800' extension to the Runway 31 end is recommended as an ultimate configuration primarily due to the fact that this option avoids several problems in Option 2 including incompatible land uses in the Runway 13 RPZ and obstructions penetrating approach surfaces. Reserving space necessary for an 800' extension to Runway 31 is included in the preferred alternative.**

RUNWAY 13 APPROACH

The improvements to the Runway 13 approach were examined to reduce from a 1-mile visibility minimum to a ¾ mile visibility minimum in the future to achieve lower weather minima and increase airport operational utility. The options considered were 1) No Change; 2) Lower Minimums with existing Runway 13 Threshold; and 3) Lower Minimums with a relocated Runway 13 Threshold. See **Exhibit 5-2 Runway 13 Approach Options** and **Table 5-2 – Runway 13 Approach Options**.

No Change – Minimums will remain at 1-mile visibility and do not meet the planning objective.

Option 1 - Lower Minimums with Existing Runway 13 Threshold – Minimums will be reduced from 1-mile visibility to ¾ mile visibility at the existing Runway 13 end. An approach lighting system is not required to achieve ¾ mile.



ACRP Report 168 Case Study

When the Runway 13 visibility minimums are lowered to ¾ mile, the expanded RPZ will extend outside airport property for 1 acre within public right-of-way, with a portion over U.S. Highway 83. The RPZ area over the highway is in the outer corner of the trapezoid. An FAA RPZ Analysis may be needed if this improvement is proposed in the near-term. Based on preliminary review of how an RPZ analysis[1] may be conducted, these outer corners have the least likelihood of accident potential. The results may show marginal additional risk exposure to persons on the ground than already exists with a 1-mile visibility existing approach.

Option 2 - Lower Minimums with Relocated Runway 13 Threshold - The option of relocating the Runway 13 threshold by 360' was examined. This option would result in a total Runway 13 landing distance available of 7,340 feet. This option was discarded because of the loss of landing runway length, and cost to relocate runway pavement and lighting. In-pavement lighting would be required.

Table 5-2 – Runway 13 Approach Options

Factor	No Change	Option 1	Option 2
Proposed Action	Visibility Minimums stay at 1-mile	Lower Minimums from 1-mile to ¾ mile and maintain landing threshold location	Lower Minimums from 1-mile to ¾ mile and relocate landing threshold
Operational Performance	No Change	Improve Accessibility from 359.5 days per year to 361.3 days per year	Improve Accessibility from 359.5 days per year to 361.3 days per year; Reduces Landing Distance Available
Safety & Standards	RPZ within Airport Property	RPZ extends 1 acre off airport affecting 340 linear feet of U.S. Highway 83	RPZ within Airport Property
Other Planning Tenets	-	Maximize Use of Existing Facilities	Increases Complexity of Airfield Geometry
Environmental	No Change	No Significant New Impacts	No Significant New Impacts
Fiscal	No Change	No Airport Costs	$4.4 Million
Preferred Alternative	NO	**YES**	NO

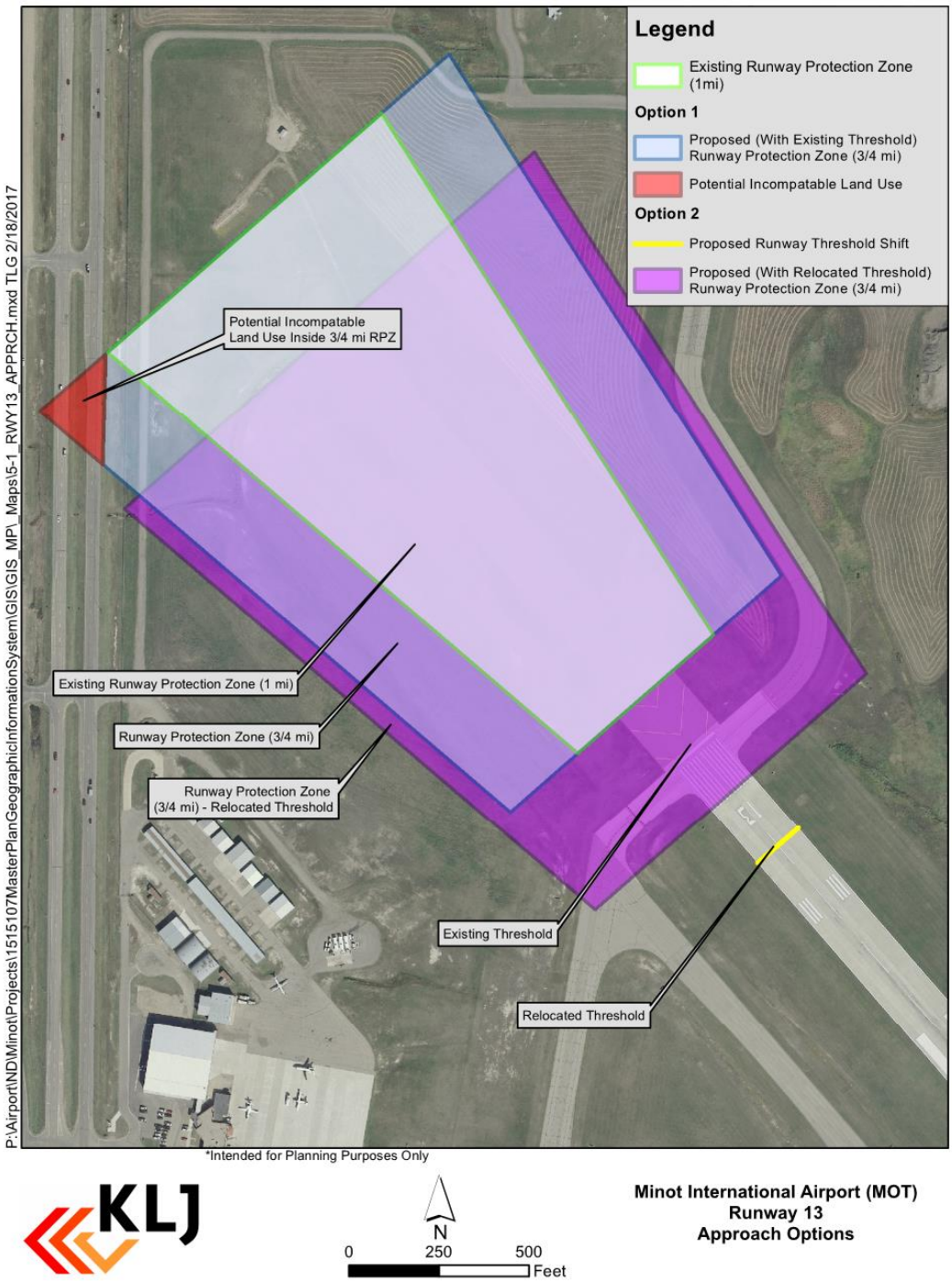
Source: KLJ Analysis

Recommendation - After reviewing the options for the Runway 13 approach the No Change option was dismissed as it did not achieve the planning objective. Option 1 meets the planning objective and appears

[1] ACRP Report 168 Runway Protection Zone Risk Assessment Tool issued in 2016 provides case study information and diagrams demonstrating the accident potential higher along the runway centerline and near the threshold then getting progressively lower further from the centerline and threshold.

to have an acceptable level of risk. Option 2 is dismissed because it reduces Runway 13 landing distance. **The upgrade of the Runway 13 approach to a ¾ mile approach (Option 1) at the current threshold is included in the preferred alternative because it will enhance the accessibility to the airport with minimal cost.** If Option 2 is not approved in a future RPZ analysis, then the airport would maintain 1-mile visibility approach in lieu of reduced runway length.

Exhibit 5-2 – Runway 13 Approach Options



RUNWAY 8-26 ALTERNATIVES

There were several alternatives examined for Runway 8-26 related to the Runway 8 threshold location to address with the incompatible land uses in the RPZ. These alternatives considered modifying the published Runway Design Code (RDC) to B-II-5000 to match its FAA funding eligibility. There is no proposed change to the Runway 26 threshold location through the planning period. The determination of the threshold for Runway 8 which is considered in this section may necessitate changes to Taxiway B. The issues related to Taxiway B will be covered later in the taxiway section. See **Exhibit 5-3 - Runway 8 Threshold Options** and **Table 5-3 - Runway 8 Threshold Options Summary**.

No Change: This would leave the Runway 8 threshold as it exists today (6,347' with 389' displaced threshold on Runway 8 end) while maintaining the C-III RDC. Taxiway B would remain it is current alignment with an aligned taxiway to the departure threshold of Runway 8 (see Taxiway System analysis for alternatives).

Advantages:

- No cost to realign Taxiway B
- No cost to relocate the REILs or PAPIs
- No cost to relocate the threshold lights or change the runway edge lighting or pavement markings
- Maximizes total runway length as compared to alternatives

Disadvantages:

- Up to 16 acres of the approach and departure RPZs continue to include incompatible land uses consisting of approximately 16 residences, a gas station, two restaurants and other businesses
- Landing distance for Runway 8 remains at 5,958' (use of declared distances)
- FAR Part 77 approach surface to Runway 8 does not meet standards (26:1 clear vs. 34:1 required)
- Maintaining existing runway to RDC C-III standards may not be eligible for FAA funding
- Maintains non-standard airfield geometry based on FAA standards

Option 1 – 6,200' Runway: RDC changes from C-III to B-II. The runway end is relocated so that the smaller B-II Runway 8 RPZ is completely within airport property. This action reduces the total runway length to 6,200'. The displaced threshold is removed allowing full-length use of the runway for arrivals and departures. Taxiway B would be realigned to connect to the new Runway 8 threshold location.

Advantages:

- Landing Distance available for Runway 8 increased by 242'
- No incompatible land uses in the RPZ and RPZ owned completely by the Airport

Disadvantages:

- Taxiway B would require realignment on the north and south to connect with the new Runway 8 end
- REILs, PAPIs and threshold lights for Runway 8 would need to be relocated
- Runway edge lights and pavement markings would need reconfigured
- Total runway length reduced by 147'
- Obstruction removal to clear Part 77 Runway 8 approach surface (28:1 clear vs. 34:1 required)

Option 2 – 6,310' Runway: RDC changes from C-III to B-II. The runway end is relocated so the smaller B-II Runway 8 RPZ contains no incompatible land uses. This action reduces the total runway length to 6,310'. The displaced threshold is removed allowing full-length use of the runway for arrivals and departures. Taxiway B is realigned to connect to the new Runway 8 threshold location.

Advantages:

- Landing Distance available for Runway 8 increased by 352'
- No incompatible land uses in the RPZ

Disadvantages:

- Taxiway B realignment required on the north and south to connect with the new Runway 8 end
- REILs, PAPIs and threshold lights for Runway 8 would need to be relocated
- Runway edge lights and pavement markings would need reconfigured
- Total runway length reduced by 37'
- Obstruction removal to clear Part 77 Runway 8 approach surface (26:1 clear vs. 34:1 required)

Option 3 – RDC Change Only: This option would leave the Runway 8 threshold exactly as it exists today with a 6,347' runway length, 389' displaced threshold to Runway 8, and changing the RPZ from a C-III to a B-II RDC.

Advantages:

- Because runway end location does not change, may not trigger immediate need to realign Taxiway B until pavement reconstruction
- No cost to relocate the REILs or PAPIs
- No cost to relocate the threshold lights or change the runway edge lighting or pavement markings

Disadvantages:

- Approximately 700 linear feet of the north bound lanes of U.S. 83 (North Broadway) remain inside the Runway 26 Departure RPZ
- Runway improvements to maintain larger C-III standards may not be eligible for FAA funding
- Obstruction removal to clear Part 77 Runway 8 approach surface (26:1 clear vs. 34:1 required)

Option 4 – 6,310' Runway (RDC remains C-III): The runway end is relocated for a total runway length of 6,310'. This is a reduction in the total runway length and slightly shifts the RPZ closer to the airport. Taxiway B is realigned to connect to the new Runway 8 threshold. RDC change from C-III to C-II.

Advantages:

- Landing Distance available for Runway 8 increased by 352'
- FAA is not requiring an RPZ analysis since runway end location shifts slightly toward the airport

Disadvantages:

- Taxiway B realignment required on the north and south to connect with the new Runway 8 end
- Approximately 700 linear feet of the north bound lanes of U.S. 83 (North Broadway) remain inside the RPZ
- REILs, PAPIs and threshold lights for Runway 8 would need to be relocated
- Runway edge lights and pavement markings would need reconfigured
- Total runway length reduced by 37'
- Obstruction removal to clear Part 77 Runway 8 approach surface (26:1 clear vs. 34:1 required)

Exhibit 5-3 - Runway 8 Threshold Options

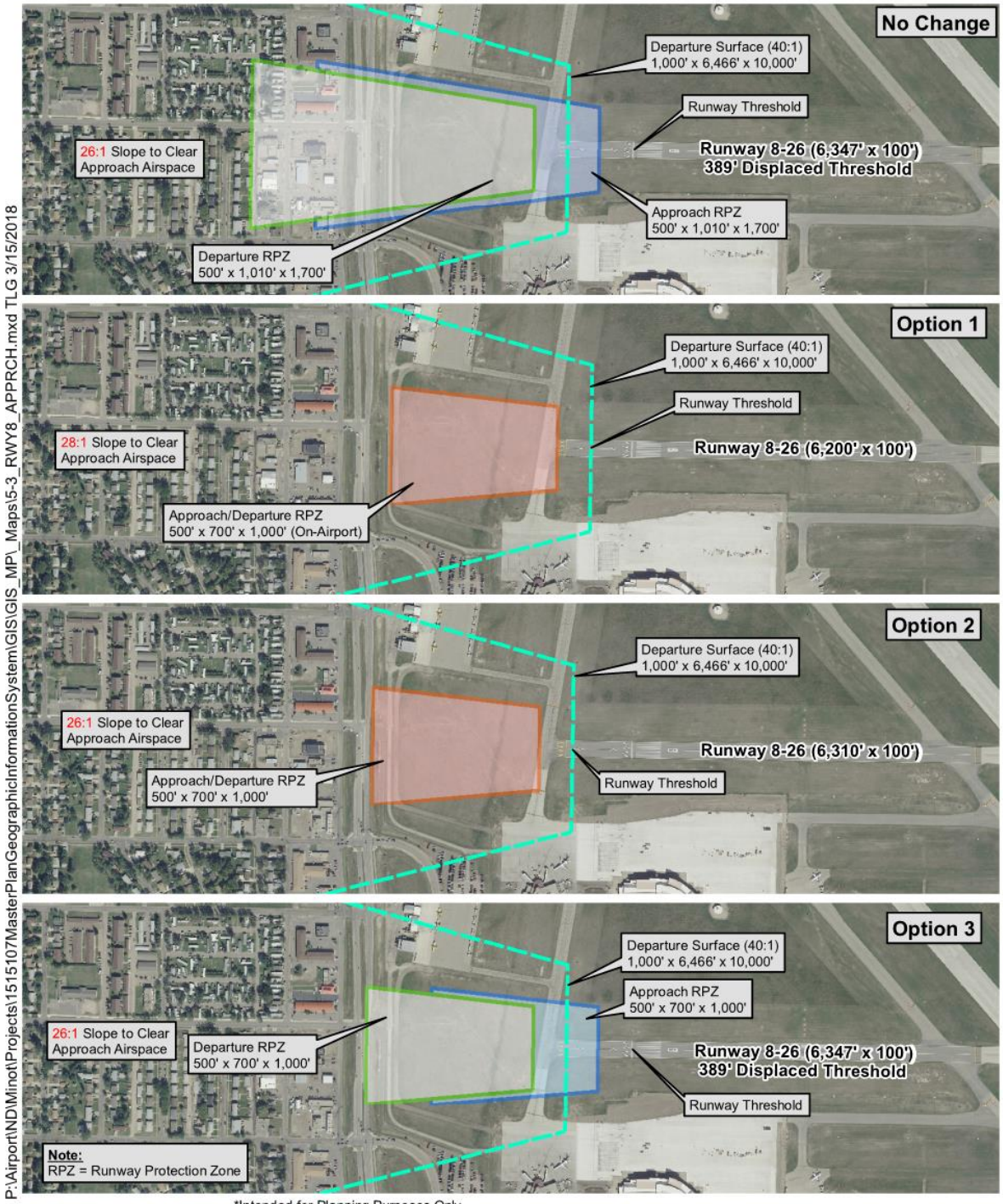


Exhibit 5-3r - Runway 8 Threshold Options (Refined) with Option 4

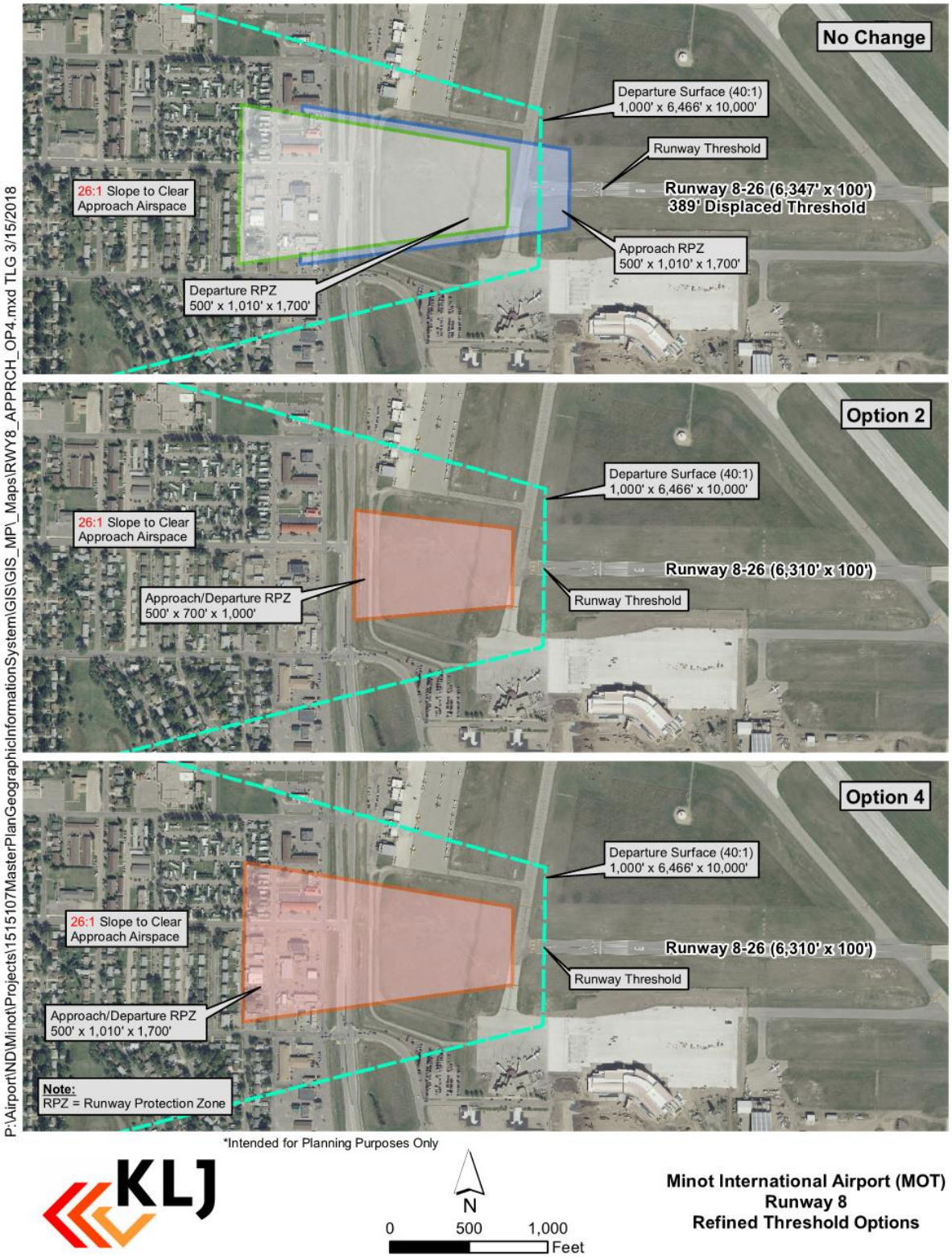


Table 5-3 – Runway 8 Threshold Options Summary

Factor	No Change	Option 1	Option 2	Option 3
Proposed Action	Runway 8 Threshold & Displacement at current location for RDC C-III	Relocate Runway 8 Threshold for 6,200' length for RDC B-II	Relocate Runway 8 Threshold for 6,310' length for RDC B-II	Runway 8 Threshold & Displacement at current location for RDC B-II
Operational Performance (Runway 8)	TORA,[2] TODA[3] & ASDA[4] = 6347' LDA[5] = 5958' RDC C-III	TORA, TODA, ASDA & LDA = 6200' RDC B-II	TORA, TODA, ASDA & LDA = 6310' RDC B-II	TORA, TODA & ASDA = 6347' LDA = 5958' RDC B-II
Safety & Standards	Incompatible land uses in Approach and Departure RPZ; Taxiway B alignment does not meet standards	RPZ within Airport Property; Taxiway B alignment meets standards	No incompatible land uses in Approach or Departure RPZ; Taxiway B alignment meets standards	700' linear feet of U.S. 83 remain in the RPZ; No other incompatible land uses in the RPZ; Taxiway B alignment does not meet standards
Other Planning Tenets	Does not accomplish objective	-	-	Utilization of existing facilities
Environmental	Residences remain inside the RPZ	RPZ no longer extends over residences	RPZ no longer extends over residences	RPZ no longer extends over residences
Fiscal	No Cost	$1.2 Million	$1.1 Million	No Cost
Preferred Alternative	NO	NO	NO	**YES - FUTURE[6]**

Source: KLJ Analysis

Table 5-3r – Runway 8 Threshold Options (Refined) with Option 4

Factor	No Change	Option 2	Option 4
Proposed Action	Runway 8 Threshold & Displacement at current location for RDC C-III	Relocate Runway 8 Threshold for 6,310' length for RDC B-II	Relocate Runway 8 Threshold for 6,310' length for RDC C-III
Operational Performance (Runway 8)	TORA, TODA & ASDA = 6347' LDA = 5958' RDC C-III	TORA, TODA, ASDA & LDA = 6310' RDC B-II	TORA, TODA, ASDA & LDA = 6310' RDC C-III
Safety & Standards	Incompatible land uses in Approach and Departure RPZ; Taxiway B alignment does not meet standards	No incompatible land uses in Approach or Departure RPZ; Taxiway B alignment meets standards	Incompatible land uses in Approach and Departure RPZ
Other Planning Tenets	Does not accomplish objective	-	-
Environmental	Residences remain inside the RPZ	RPZ no longer extends over residences	Residences remain inside the RPZ
Fiscal	No Cost	$1.1 Million	$1.1 Million
Preferred Alternative	NO	NO	**YES - ULTIMATE**

Source: KLJ Analysis

[2] Takeoff Runway Available (TORA): the runway length declared available and suitable for the ground run of an airplane taking off.
[3] Takeoff Distance Available (TODA): the TORA plus the length of any remaining runway/clearway beyond the far end of the TORA.
[4] Accelerate-Stop Distance Available (ASDA): the runway plus stopway length declared available for the acceleration and deceleration of an aircraft aborting a takeoff.
[5] Landing Distance Available (LDA): the runway length declared available and suitable for landing.
[6] Option 3 chosen for future but would maintain a C-III RDC rather than changing to B-II

SRM Meeting - A Safety Risk Management (SRM) Meeting was conducted and facilitated by the FAA during the process of completing the Master Plan. The results of that meeting identified that the configuration of Taxiway B as it intersects with Runway 8 creates a short in-line taxiway which is not in accordance with FAA standards. The airport determined the Runway 8 threshold and Taxiway B intersection preferred alternative based on feedback from the SRM meeting and a review of the issues.

Recommendation - After reviewing the options, No Change was dismissed because if an RDC C-III is maintained then several incompatible land uses would remain in the RPZ and the objective would not be achieved. Option 1 would achieve the objective and place the RPZ completely within airport property. Option 2 also achieves the objective but maintains the maximum length for landing and takeoff by placing the RPZ just on the edge of the north bound lanes of Broadway. Option 3 maintains the current threshold and displacement, but reduces the RDC from C-III to B-II leaves a portion of the RPZ over the north bound lanes of Broadway. Modifications to Taxiway B would occur once the pavement has reached the end of the useful life. Option 4 was brought forward from discussions between the FAA and the airport staff in March 2018. Both the FAA and the airport staff agreed that Option 4 would be acceptable with a layout identical to Option 2 but use an RPZ for C-III RDC.

The Future Period preferred alternative was chosen as Option 3 because there was no cost and it addresses the RPZ issue. Option 4 was chosen for the Ultimate Period preferred alternative because it maximized the potential runway length and removed declared distances for the runway Since the RPZ is not changing other than becoming slightly closer to the airport, the FAA is not requiring an RPZ analysis.

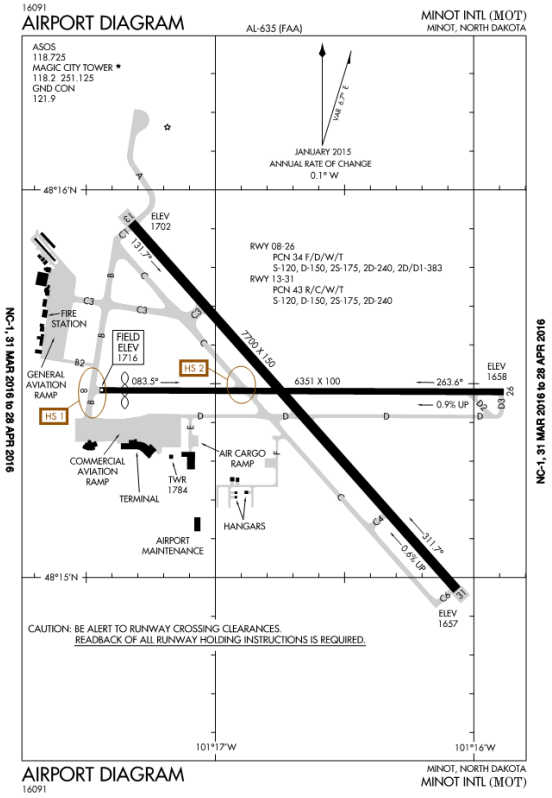
Table 5-4 –Runway Recommendations

Runway(s)	Improvement
13-31	Extend Runway 31 end by 800’ to 8,500’
13	Implement ¾ mile Approach Visibility Minimums
8-26	Future- Option 3 but maintain RDC C-III and retain current Runway 8 Threshold Ultimate – Option 4 Relocate Runway 8 threshold for 6,310’ total runway length.

Taxiway System

An evaluation of development alternatives for the MOT taxiway system is described below.

- Taxiway design standards remain at 50' wide but are reduced from TDG-4 to TDG-3 for Fillet Design[7]: 50' wide taxiways are needed for most critical airplanes
- Assess Taxiway B alignment with threshold of Runway 8 to address FAA design standard issues from April 5, 2017 SRM Meeting.
- Reconfigure Taxiway F intersection with Taxiway C
- Align Taxiway D along the commercial apron to create greater depth between the airline terminal and taxiway.



TAXIWAY C

Taxiway C is the full-length parallel taxiway for Runway 13-31. There were no alternatives examined for the taxiway. The only improvements that are recommended for consideration are to plan to construct holding bays at both the 13 and 31 ends of the runway to allow for aircraft to hold outside of the taxiway object free area while others depart. Any future runway extension would require a corresponding extension of Taxiway C.

There are no recommended changes for Taxiway C3, but it is recommended that the portion of C3 west of Taxiway B should be strengthened from its current 30,000 lb Single Wheel capability to 100,000 lb Single Wheel like the remainder of C3.

The Airport Diagram identifies a 'Hot Spot' at the intersection of Taxiway C and Runway 8-26 due to the acute angle and resulting limitations on visibility. Runway Guard Lights are recommended to enhance pilot awareness at this intersection.

TAXIWAYS A & E

There were no alternatives needed for Taxiway A which extends to the north from Runway 13. Taxiway E remains but should be reconstructed and strengthened for regular use of air cargo aircraft to TDG 3 standards.

TAXIWAY B

Taxiway B provides access for the west general aviation area and currently serves as a connection between Runway 13 and the commercial apron. From a capacity and movement standpoint, Taxiway C and D provide access between the commercial apron and Runway 13-31. However, due to limited space on the commercial ramp for multiple aircraft to simultaneously push back and line up for deicing, Taxiway B serves as a crucial access taxiway for unimpeded commercial airline access to Runway 13-31.

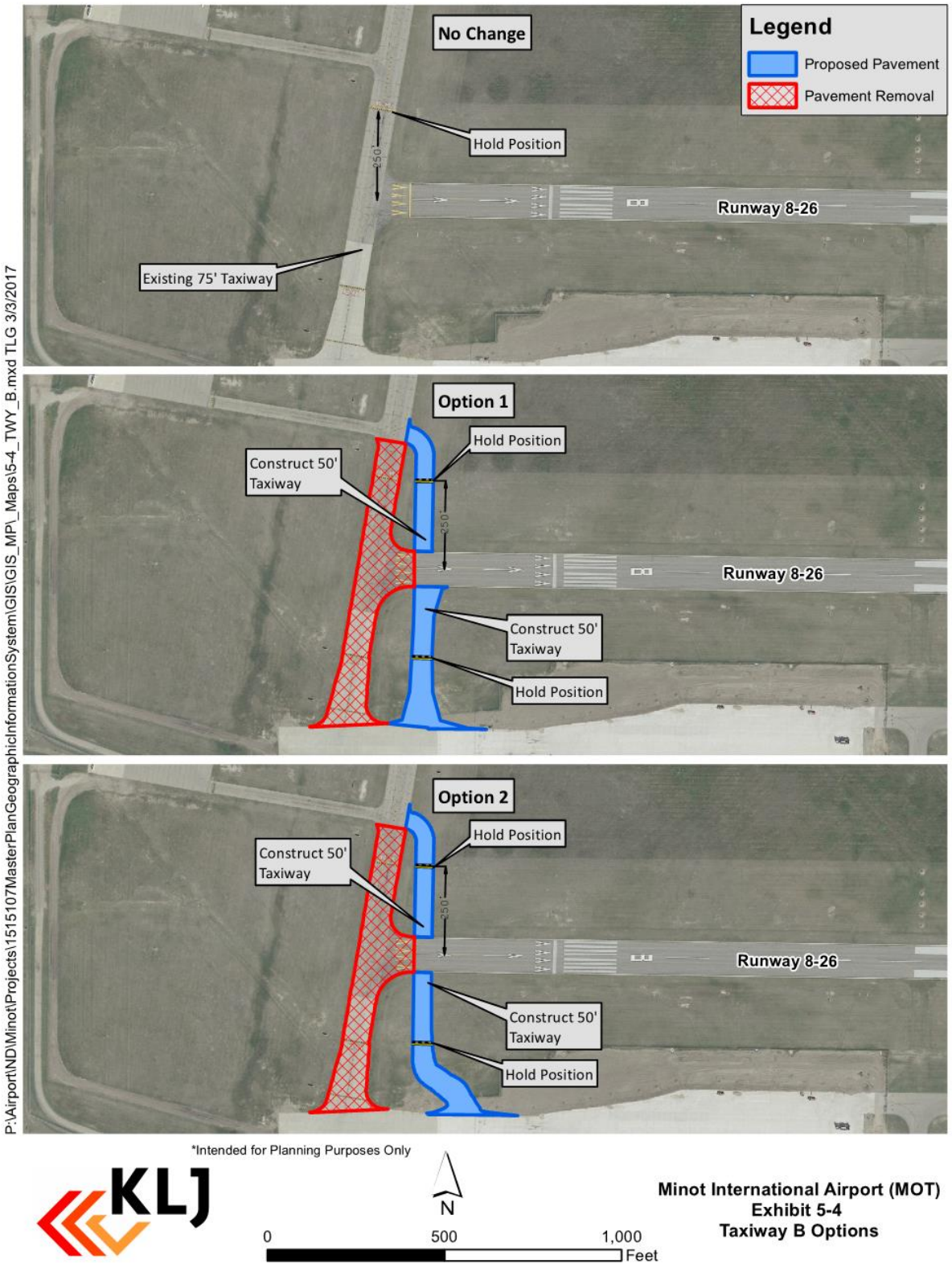
Taxiway B at the Runway 8 approach is also identified as one of two Hot Spots on the current Airport Diagram. Since many movements on Taxiway B are not necessarily to/from Runway 8-26, Runway Guard

[7] Since Minot continues to have TDG-4 aircraft on a periodic basis (MD-83, Boeing 757 and B-52), the airport should consider maintaining the TDG-4 fillet design on major taxi routes.

Lights are recommended at Runway 8 and Taxiway B regardless of the alignment option chosen. This will enhance pilot awareness of this intersection in the short-term until any reconfiguration is implemented.

Access options to the Runway 8 threshold have been evaluated to meet the preferred Runway 8 threshold option and FAA taxiway design standards. Please note that the exhibits are based on the current Runway 8 threshold. The different threshold options only have slight differences in runway length and therefore using the current threshold to portray Taxiway B options was determined to sufficiently represent the options. The triggering event for the work on Taxiway B will be the new threshold for Runway 8. See **Exhibit 5-4 - Taxiway B Alignment Options** and **Table 5-5 - Taxiway B Alignment Options Summary**.

Exhibit 5-4 - Taxiway B Alignment Options



No Change: Taxiway B would remain in its current alignment. Runway Guard Lights would be added on Taxiway B north and south of Runway 8.

Advantages:

- Minimal cost
- Taxiway B is maintained at 75' wide

Disadvantages:

- Taxiway connects to Runway 8 with an 80' aligned taxiway which does not meet FAA standards[8]
- Portion of Taxiway B is in the departure surface to Runway 26
- Full taxiway width may not be eligible for FAA funding
- The layout does not meet airfield geometry standards as established by the FAA

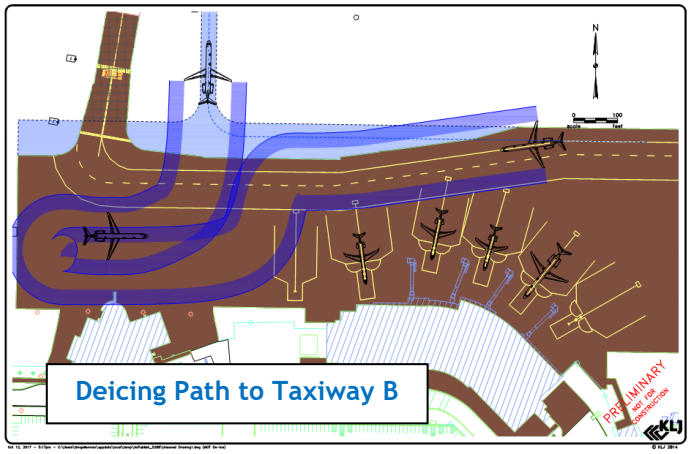
Option 1 – Reconstruct Taxiway B directly to Threshold of Runway 8: Taxiway B would be realigned to connect to the Runway 8 end on the north and the south side of the runway. Runway Guard Lights would be added on Taxiway B north and south of Runway 8. See inset diagrams using PathPlanner showing aircraft movements from the terminal apron onto taxiway B.

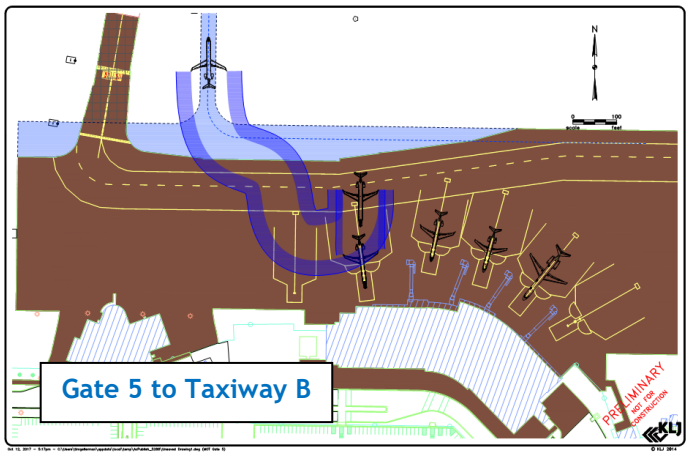
Advantages:

- Removes aligned taxiway configuration
- Eliminates taxiway inside the Runway 26 departure surface
- The direct alignment of the taxiway with the runway end is expected to eliminate the hot spot at this location
- Includes the required 90 degree turn for aircraft moving from the apron onto taxiway B per FAA design guidance

Disadvantages:

- Construction cost for paving and lighting
- Taxiway width reduced to 50'





Option 2 – Reconstruct Taxiway B directly to Threshold of Runway 8 with a Bend on south end: Taxiway B would be realigned to connect to the Runway 8 end from the north directly and would connect to the Runway 8 threshold from the south with a bend in the taxiway.

This 'bend' is an extra turn based on guidance from FAA AC 150/5300-13A Paragraph 401 (b)(5)(g) regarding 'Indirect Access'. The AC states *"Do not design taxiways to lead directly from an apron to a runway without requiring a turn."* Even though the AC makes this note for planners to consider in airport design, the circumstances at Taxiway B at MOT are not the same. An aircraft is required to proceed onto Taxiway D headed west before turning north on Taxiway B to operate from any of the 6 gates at the MOT

[8] FAA Advisory Circular 150/5300-13A, *Airport Design*, Paragraph 416.

terminal. Since no aircraft can depart a gate directly into Taxiway B, there is already a turn required and thus the extra turn in Taxiway B would be unnecessary.

Runway Guard Lights would also be added on Taxiway B north and south of Runway 8.

Advantages:

- Requires three turns before entering Runway 8
- The direct alignment of the taxiway with the runway end is expected to eliminate the hot spot at this location

Disadvantages:

- Extra construction cost for paving and lighting
- Because of tightly spaced turns, extra fillet margins will be required
- Increases taxiway geometry complexity for pilots
- Snow removal with the tight turns will be difficult
- Taxiway width reduced to 50'
- Exceeds FAA guidance standards by requiring three 90 degree turns to enter the north section of taxiway B

Table 5-5 – Taxiway B Taxiway Alignment Options Summary

Factor	No Change	Option 1	Option 2
Proposed Action	Taxiway B stays in current alignment	Taxiway B realigned to Runway 8 Threshold	Taxiway B realigned to Runway 8 Threshold with extra bend on south end
Operational Performance	Largest taxiway width	One 90-degree turn required per FAA requirements to access Runway 8	Three 90-degree turns which is beyond FAA requirements
Safety & Standards	Aligned Taxiway remains; Connection to approach rather than threshold leaves potential for Hot Spot	Meets standards with a 90° turn required from Taxiway D to Taxiway B; direct connection to threshold minimizes Hot Spot	Exceeds safety standards to the point the configuration is impractical; direct connection to threshold minimizes Hot Spot
Other Planning Tenets	-	-	-
Environmental	None	No Significant Impacts	No Significant Impacts
Fiscal	None	$0.8 Million	$0.9 Million
Preferred Alternative	NO	**YES**	NO

Source: KLJ Analysis

SRM Meeting - As noted above in the Runway 8 section, a Safety Risk Management (SRM) Meeting was conducted and facilitated by the FAA to review Runway 8 and the Taxiway B intersection. One notable element from the SRM Meeting was a PathPlanner analysis of aircraft movement from the airline terminal to Taxiway B which is shown with Option 1 above. With all aircraft movements examined, including from each gate and with deicing, each of these movements require a turn to get onto Taxiway B. There were no instances where an aircraft could be taxied by a pilot 'heads-down' and accidently enter the runway. The airport used the findings from the meeting to make a final determination regarding Taxiway B.

Recommendation - After reviewing the options for the Taxiway B, **Option 1 to realign Taxiway B directly from the terminal apron to Runway 8 was chosen to be included in the preferred alternative because it met the FAA design requirements and was the most functional configuration**. The reconfiguration of Taxiway B would be accomplished once existing Taxiway B is due for reconstruction.

TAXIWAY D

Taxiway D is the full-length parallel taxiway for Runway 8-26, and also provides access to the commercial apron. There were no alternatives needed for Taxiway D east of Runway 13-31. Please note however that the existing Taxiway D2 and D3 were constructed as an old 'jug-handle'-style turnaround loop prior to the full parallel taxiway. Taxiway D2, when reconstructed, should be 90 degrees to Runway 26.

West of Runway 13-31, alternatives were examined to realign the taxiway closer to Runway 8-26 and thus expand the commercial apron further north. This would provide greater depth between parked aircraft at the airline terminal and Taxiway D. Currently parking positions at gates 3, 4, 5 and 6 are limited in depth because of the associated taxiway object free area (TOFA). The short depth of these gate positions restricts the size of aircraft that can be on gate 5 and limits the movement of ground support equipment around the rear of aircraft parked in positions 4, 5 and 6.

The alignment of Taxiway D was developed because of a once proposed shift to the Runway 8 end. This shift would have placed the runway end 475' east of the existing end to move the RPZ onto airport property. This proposed threshold established a departure surface that defined the north edge of Taxiway D and the terminal apron. Since this change in the Runway 8 threshold is no longer being pursued, it is now possible to explore options for Taxiway D and the terminal apron in this study. The future taxiway should also be 50' wide consistent with new FAA requirements. See **Exhibit 5-5 - Taxiway D/Apron Expansion Options** and **Table 5-6 - Taxiway D/Apron Expansion Options Summary**.

No Change: Taxiway D would remain in its current alignment.

Advantages:

- No cost

Disadvantages:

- Apron depth for Gates 5 and 6 is limited to 220' from the terminal to the Taxiway D TOFA
- Apron depth for Gates 3 and 4 is 240' to 280' from the terminal to the Taxiway D TOFA

Option 1 - Large Apron Expansion: Taxiway D would be realigned and spaced with a Runway 8-26 centerline-centerline separation at 300'.

Advantages:

- Adds 175' of depth in western portion of apron and 95' of depth in eastern portion of apron
- Apron depth for Gates 3, 4, 5 and 6 increased to 380' to 390' from Terminal to Taxiway D TOFA

Disadvantages:

- Costliest option
- Results in multiple taxiway turns
- 300' centerline separation from Runway 8/26 to Taxiway D will allow no more than the following RDC and approaches A/B-II-2400; A/B-III-4000, and C/D/E-II-4000
- Highest construction cost

Option 2 - Small Apron Expansion: Taxiway D would be realigned and spaced with a centerline-centerline separation from Runway 8-26 at 400'. This matches the distance of the existing separation for most of Taxiway D.

Advantages:

- Adds 80 feet of depth equaling the Taxiway to the east
- Apron depth for Gates 3, 4, 5 and 6 increased to 280' to 300' from Terminal to Taxiway D TOFA
- 400' centerline separation from Runway 8/26 to Taxiway D allows ultimate C/D/E-III approaches

Disadvantages:

- Additional depth is only 20-70'

Exhibit 5-5 - Taxiway D/Apron Expansion Options

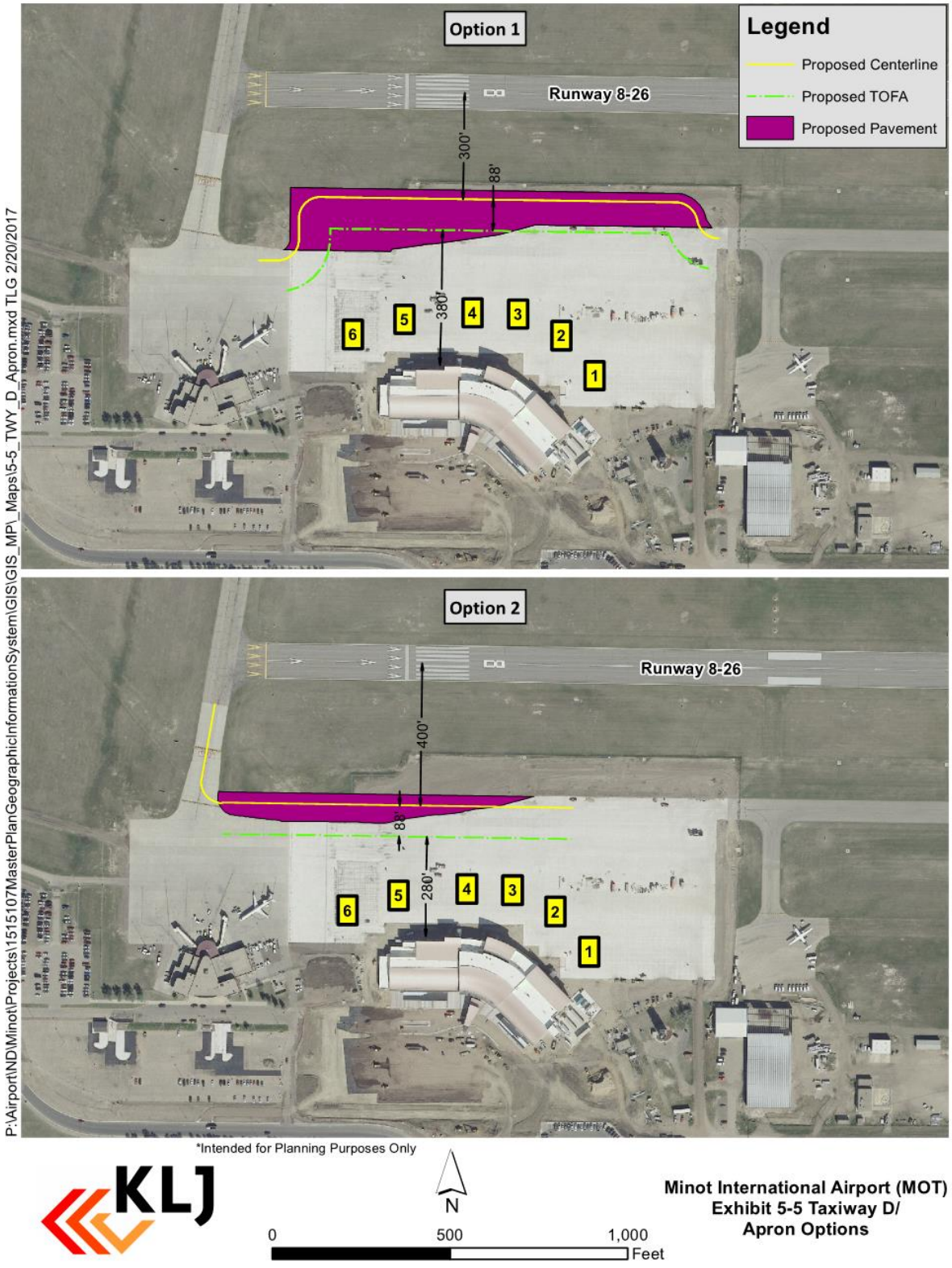


Table 5-6 – Taxiway D/Apron Expansion Options

Factor	No Change	Option 1	Option 2
Proposed Action	Taxiway D stays in current alignment	Taxiway D realigned 100 to 180 feet north on commercial apron	Taxiway D realigned 80 feet north on west end of commercial apron
Gate 3 & 4 Depth	280' & 240'	390' & 380'	300' & 280'
Gate 5 & 6 Depth	220'	400'	290'
Operational Performance	Narrow depth remains for Gates 3, 4, 5 and 6	Deepest Commercial Apron possible	Improves function for gates 3, 4, 5 and 6
Safety & Standards	Meets Standards	Meets Standards	Meets Standards
Rwy 8-26/Twy D Separation (RDC)	400' to 480' (C-III)	300' (C-II)	400' (C-III)
Other Planning Tenets	Limits Aircraft size on Gate 4 to 145' long and Gate 5 to 155' long	Allows aircraft on Gate 4 to 280' long and Gate 5 to 325' long	Allows aircraft on Gate 4 to 185' long and Gate 5 to 225' long
Environmental	None	No Significant Impacts	No Significant Impacts
Fiscal	None	$5.15 Million	$1.98 Million
Preferred Alternative	NO	NO	**YES**

Source: KLJ Analysis

Recommendation - After reviewing the options for the Taxiway D alignment and apron expansion, the no change option continues to limit the depth of aircraft, particularly on existing gates 4 and 5. Option 1 would be expensive and would place the taxiway close to Runway 8-26 potentially limiting future functionality of the runway. Option 2 provides improvement at less cost, yet maintains the functional abilities of Runway 8/26 equal to what currently exists. **Option 2 to expand the apron with a realignment of Taxiway D was chosen to be included in the preferred alternative because it was a cost-effective solution to simplify the apron and add 20 to 70 feet of space behind parking positions without reducing the separation from Taxiway D to Runway 8-26.**

TAXIWAY F

Taxiway F accesses the hangar development south of Runway 8-26 and west of Runway 13-31. When Taxiway D was realigned, a spur of the taxiway was left connecting to Taxiway F creating what is considered now to be a non-standard configuration. Alternatives were identified to realign the Taxiway F connection to Taxiway C and make use of holding areas to avoid head-to-head aircraft taxiing situations. These alternatives are compatible with south hangar development alternatives. See **Exhibit 5-6 - Taxiway F Options** and **Table 5-7 - Taxiway F Options Summary**.

No Change: Taxiway F would remain connected to Taxiway C with a 135° turn followed by a 90° turn within 50' to enter the hangar area.

Advantages:
- No cost

Disadvantages:
- Tight turns and non-standard movements remain
- Aircraft exiting the hangar area have a limited distance to see other aircraft taxiing northwest on Taxiway C

Option 1 - Connector to Self-Fuel Pad (from GA South Alternative 1): Taxiway F would be reconstructed connecting from the northeast corner of the self-fueling pad then directly to Taxiway C at a 90° angle.

Advantages:
- Creates a 90° connection with Taxiway C with a small amount of taxiway that can be constructed while the existing taxiway stays in service
- Self-serve fuel pad can also be used as a holding bay to reduce inbound/outbound conflicts

Disadvantages:
- Taxi route would be unique through an apron area and then turning to get to Taxiway C

Option 2 - Connector to Hangar Taxilane (from GA South Alternative 3): Taxiway F would be reconstructed connecting from the existing hangar taxilane directly to Taxiway C at a 90° angle.

Advantages:
- Creates a 90° connection with Taxiway C with a direct connection that can be constructed while the existing taxiway stays in service

Disadvantages:
- Isolates the self-fuel fuel pad from the standard taxi route making it less convenient to use as a holding bay to mitigate inbound/outbound conflicts

Option 3 - Perpendicular Alignment at Taxiway C-F intersection (from GA South Alternative 4): Taxiway F would be reconstructed in its current location with an intersection to Taxiway C at a 90° angle.

Advantages:
- Creates a 90° connection with Taxiway C with the smallest amount of construction
- Self-serve fuel pad can be used as a hold bay to reduce inbound/outbound conflicts

Disadvantages:
- Reconstructing existing taxiway will require some closure or limits on access during construction
- Limited amount of space between Taxiway C and the turn in Taxiway F

Exhibit 5-6 -Taxiway F Options

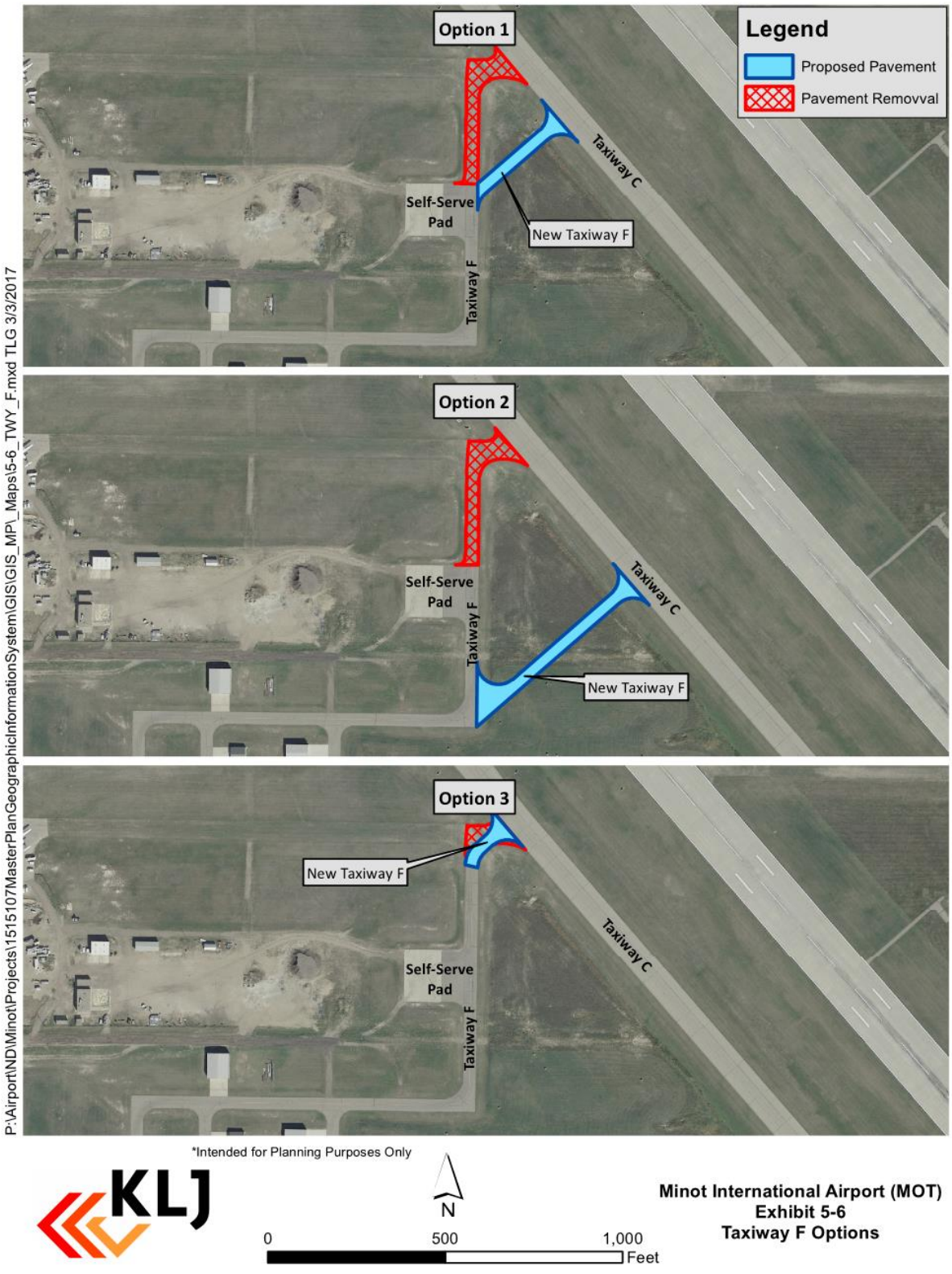


Table 5-7 – Taxiway F Options Summary

Factor	No Change	Option 1	Option 2	Option 3
Proposed Action	-	Taxiway F Connector to Self-Fuel Pad Plus Ultimate Secondary Taxilane	Taxiway F Connector to Hangar Taxilane Plus Ultimate Secondary Taxilane	Reconstruct a Perpendicular Alignment at Existing C-F Intersection Plus Ultimate Secondary Taxilane
Operational Performance	135° Turn to/from C remains	Connects well to C but requires extra taxi movement and turns through apron to get to C	Eliminates need for aircraft to taxi by self-fuel pad, increases risk for head-on conflict	Similar to existing taxiway path but corrects current turning problem from F to/from C
Safety & Standards	Non-Standard Geometry	Meets Standards	Meets Standards	Meets Standards
Other Planning Tenets	-	Utilization of existing pavement areas	Most direct routing but isolates self-fuel pad from an en-route location	Simplest fix considering functionality of self-fuel pad and access to South GA area
Environmental	None	No Significant Impacts	No Significant Impacts	No Significant Impacts
Fiscal	None	$0.32m	$0.44m	$0.22m
Preferred Alternative	NO	**YES**	NO	NO

Source: KLJ Analysis

Recommendation - Because of the tight turning radius and non-standard alignment between Taxiway C and F, the no change option was dismissed. Of the other three options, either option 1 or 3 are recommended because they keep the self-fueling/hold pad in the routing to aid in access to the hangar area. **The Sponsor prefers Option 1 and is included in the preferred alternative because it met design standards and provided the best flow to incorporate the self-fueling apron.**

Table 5-8 – Taxiway Recommendations

Taxiway(s)	Improvement
A	*No Changes*
B	Option 1 to connect directly from Terminal Apron to Runway 8
C	*No Changes*
D	Option 2 to align 400' from Runway 8-26 Centerline along Commercial Apron
E	Reconstruct and Strengthen for Cargo
F	Option 1 to connect directly from self-fuel pad to Taxiway C

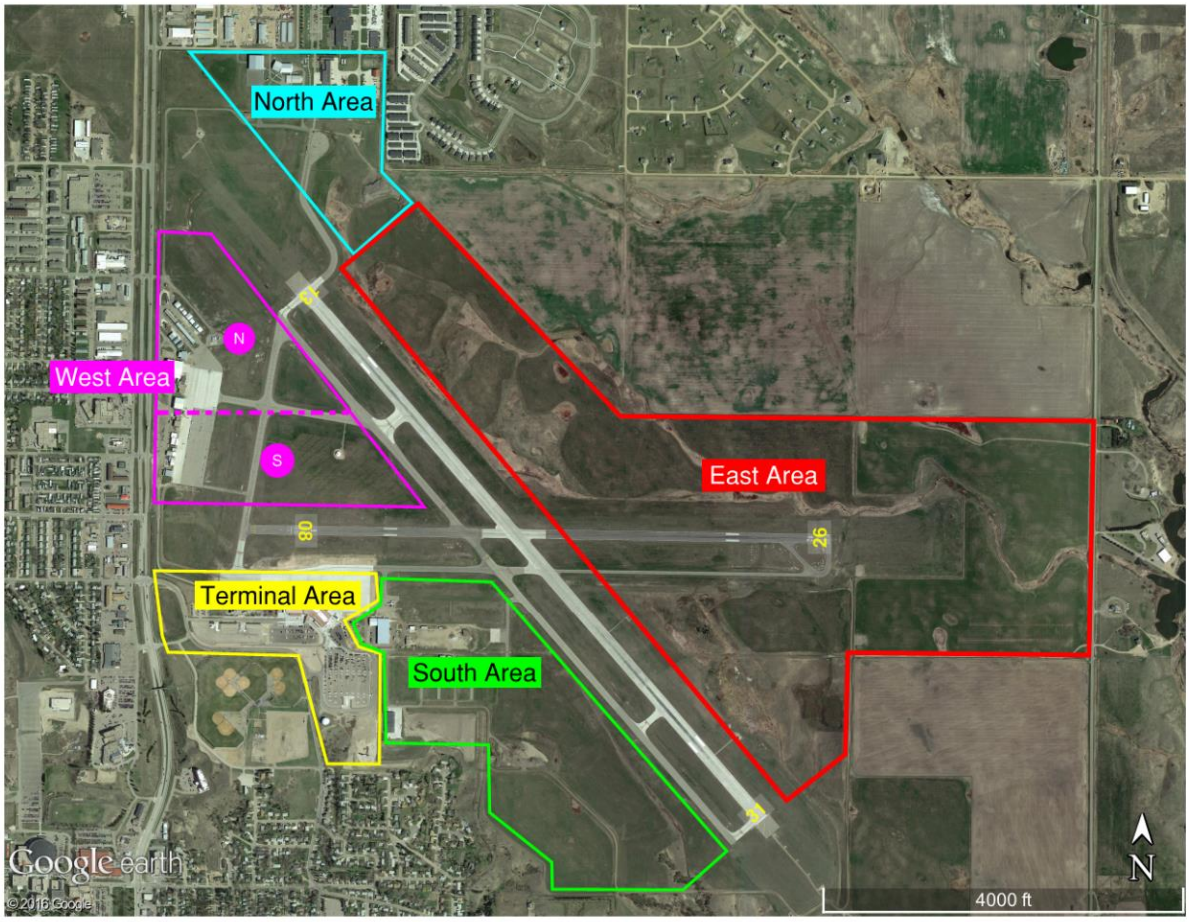
Source: KLJ Analysis

Landside Development Alternatives

The landside area alternatives evaluated potential maximum buildout within aeronautical development areas around MOT airport property. **Exhibit 5-6 - Airport Areas** graphically identifies the areas reviewed in this study:

- Passenger Terminal Area (YELLOW) - Development around the terminal including auto parking, roads, and commercial apron.
- GA South Area (GREEN) – Development south of Runway 8/26 and west of Runway 13/31 excluding the terminal area.
- GA West Area (PURPLE) – Development west of Runway 13/31 and north of Runway 8/26. For discussions, this will be divided into North and South sub-areas at times. The dividing line is the southern edge of the newest portion of concrete apron noted below with the dashed line.
- North Area (BLUE) – Development north of Runway 13 including the National Guard Area and Museum.
- East Area (RED) – Development east of Runway 13/31 excluding the north area.

Exhibit 5-7 - Airport Areas



Passenger Terminal Area

The Passenger Terminal was opened in February 2016 and addressed passenger needs through the 20-year planning period. The Facility Requirements identified only a few items which should be addressed in the planning period. The most notable items are an apron expansion to increase depth, additional rental car parking, and construction of a rental car Quick Turn Around (QTA) facility.

One notable factor the airport considered was the availability and layout of existing parking since much of it had been recently constructed. The goal was to make use of as much of this new parking as possible for both short-term and long-term needs.

During the development of the Master Plan a wide variety of alternatives were developed for the Terminal, West, South, and East areas. Some of these alternatives were reviewed and dismissed by the airport for various reasons, mostly based on potential costs or phase ability concerns. For information purposes, these dismissed alternatives are included in **Appendix R – Alternatives**.

The alternatives brought forward reviewed options to make incremental improvements using existing capacity and configurations while working toward long-term solutions. Options to locate a QTA facility adjacent to the terminal were dismissed because they displace rental car ready/return parking lots further away from the terminal. One of the alternatives includes a replacement Aircraft Rescue and Fire Fighting (ARFF) station, which is a supporting facility need. The two build alternatives carried forward are summarized below.

No Change

The existing public parking configuration would remain as is. No additional parking would be added for employees and the rental cars would continue to use a mixture of parking spaces west of the terminal and designated spaces in the public lot just southwest of the west exit from the terminal. The rental cars would continue to use the various quick turn cleaning facilities on the west side of U.S. 83/Broadway. See **Exhibit 5-8 - Terminal Area – No Change**.

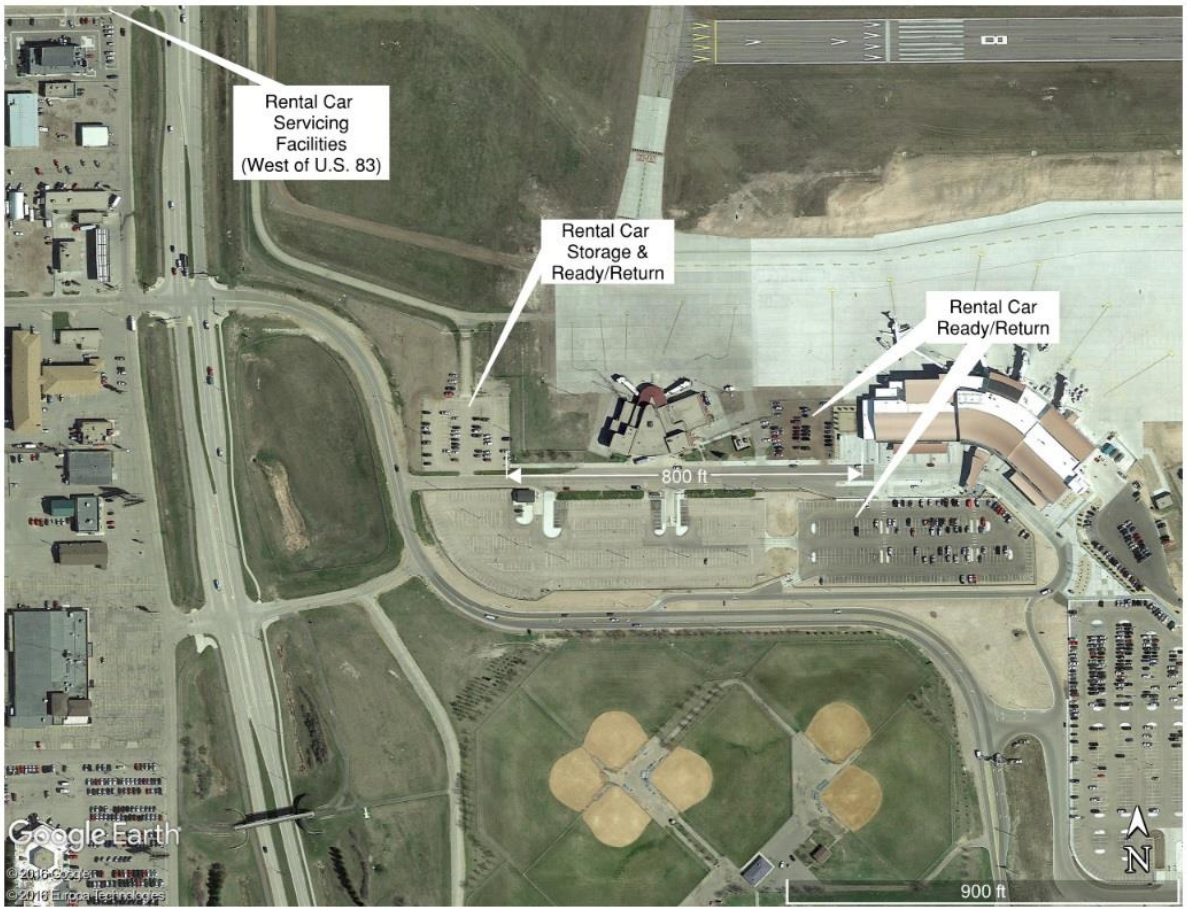
Advantages:

- No additional expense for paving
- There is sufficient public parking now for rental cars and employees to continue to use portions of the public lot without loss of service

Disadvantages:

- Rental car operators continue to operate inefficiently with remote servicing facilities
- Rental car parking areas will be separated with 50 spaces west of terminal, 80 spaces 800’ west of terminal and the remaining using public parking areas
- Use of paid public parking area by rental cars requires extra coordination with parking operator and use of parking operators ticket stock for non-revenue purposes

Exhibit 5-8 - Terminal Area – No Change



Terminal Area Alternative 2

Alternative 2 includes the following elements (see **Exhibit 5-9 - Terminal Area Alternative 2).**

- Expand rental car ready/return parking near the terminal
- Construct a QTA facility west of the terminal near Airport Road
- Construct rental car storage lot west of the terminal between ready return and the QTA
- Create a loop road with cell phone parking parallel to the road
- Add employee parking southeast of the existing lot
- Construct ARFF Station in another airport functional area

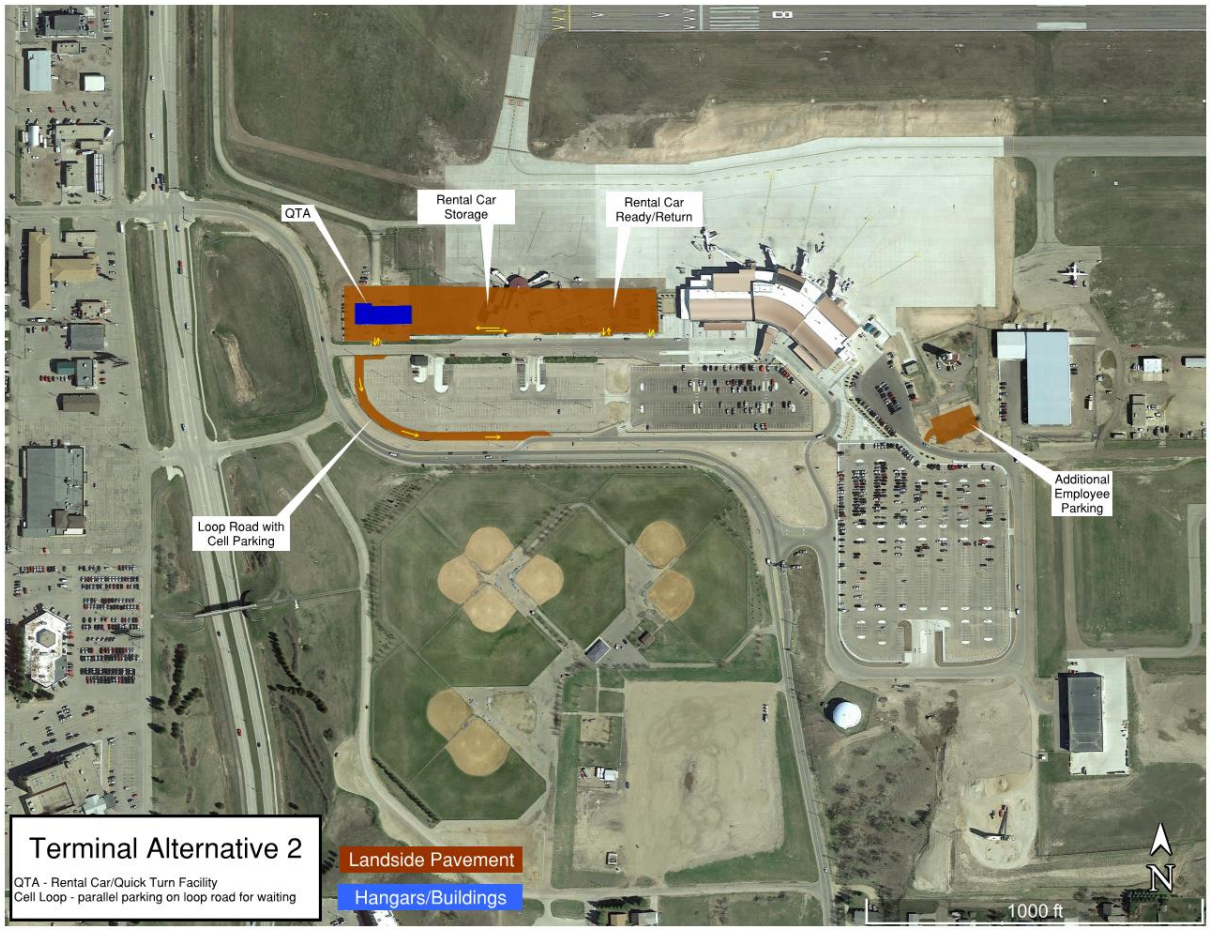
Advantages:

- Additional employee parking added to meet facility needs
- Rental car ready/return parking located adjacent to terminal
- Rental car parking for ready/return and storage can be phased

Disadvantages:

- No time savings by using loop road since it is in similar location and alignment with Airport Road

Exhibit 5-9 - Terminal Area Alternative 2



Terminal Area Alternative 4

Alternative 4 includes the following elements (see **Exhibit 5-10 - Terminal Area Alternative 4**).

- Expand rental car ready/return parking near the terminal
- Construct a QTA facility west of the terminal near Airport Road (near old terminal)
- Construct rental car storage lot west of the terminal between ready return and the QTA
- Create a loop road and a cell-phone waiting lot west of the loop road
- Add employee parking southeast of existing lot
- Separate short-term and long-term parking in main lot; add a new, staffed entry/exit facility
- Relocate ARFF Station to the western edge of the terminal apron

Advantages:

- Additional employee parking added to meet current lack of sufficient parking
- Cell phone waiting lot created from west end of existing parking, utilizing existing facilities
- New staffed exit at long-term lot which allows cash and credit transactions and will alleviate back-ups when large arriving flights are exiting the parking area
- ARFF Station near airline service and with direct access to Taxiway D and B, connecting conveniently to the midpoint and ends of both runways with minimal interaction with aircraft/equipment
- ARFF would have convenient landside access with Airport Road to a signalized intersection at U.S. 83/Broadway
- ARFF Station construction in new location allows current facilities to function during construction
- Relocation of ARFF Station opens up 200'+ of apron frontage for hangars
- ARFF Station location makes use of area otherwise unusable for a key airport safety function

Disadvantages:

- No time savings in using loop road which is similar in location and alignment with Airport Road
- New exit for long-term lot will require additional cost and staffing

Exhibit 5-10 - Terminal Area Alternative 4

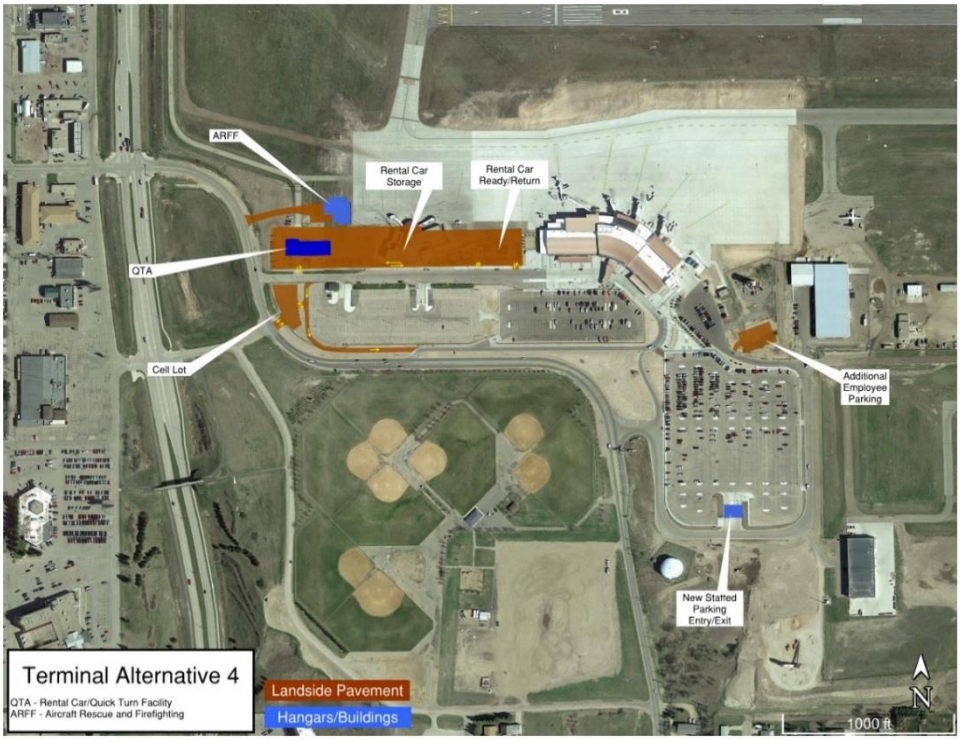


Table 5-9 – Terminal Area Summary

Factor	No Change	Alternative 2	Alternative 4
Proposed Action		QTA West with Rental Car Ready Return and Storage; Loop Road with turn out lane for Cell Waiting; Expand Employee Lot	QTA West with Rental Car Ready Return and Storage; Loop Road with Cell Waiting lot; Expand Employee Lot; ARFF Station near QTA
Operational Performance	Total Public Parking availability meets needs through planning period, inefficient rental car operations	QTA on airport improves Rental Car efficiency; Rental car parking simplifies layout for companies and customers	Quick airside access for ARFF Station; QTA improves Rental Car efficiency; Rental car parking simplifies layout for companies and customers
Safety & Standards	Compatible with Airport Design Standards	Compatible with Airport Design Standards	Compatible with Airport Design Standards
Other Planning Tenets	Utilize existing parking facilities	Re-purpose old terminal building space	Re-purpose old terminal building space
Environmental	None	No Significant Impacts	No Significant Impacts
Fiscal	Minimal Cost	QTA $3.45m Paving/Other $1.48m	QTA $3.45m Paving/Other $1.76m ARFF Station $4.33m
Preferred Alternative	NO	**YES**	NO

Source: KLJ Analysis

Recommendation(s) - After reviewing the options the No Change option will not meet the rental car needs through the planning period. A QTA facility and additional parking to the west of the current terminal is recommended for expandability and passenger convenience. The addition of an ARFF station is compatible with other planned passenger terminal development. There are no other uses expected in

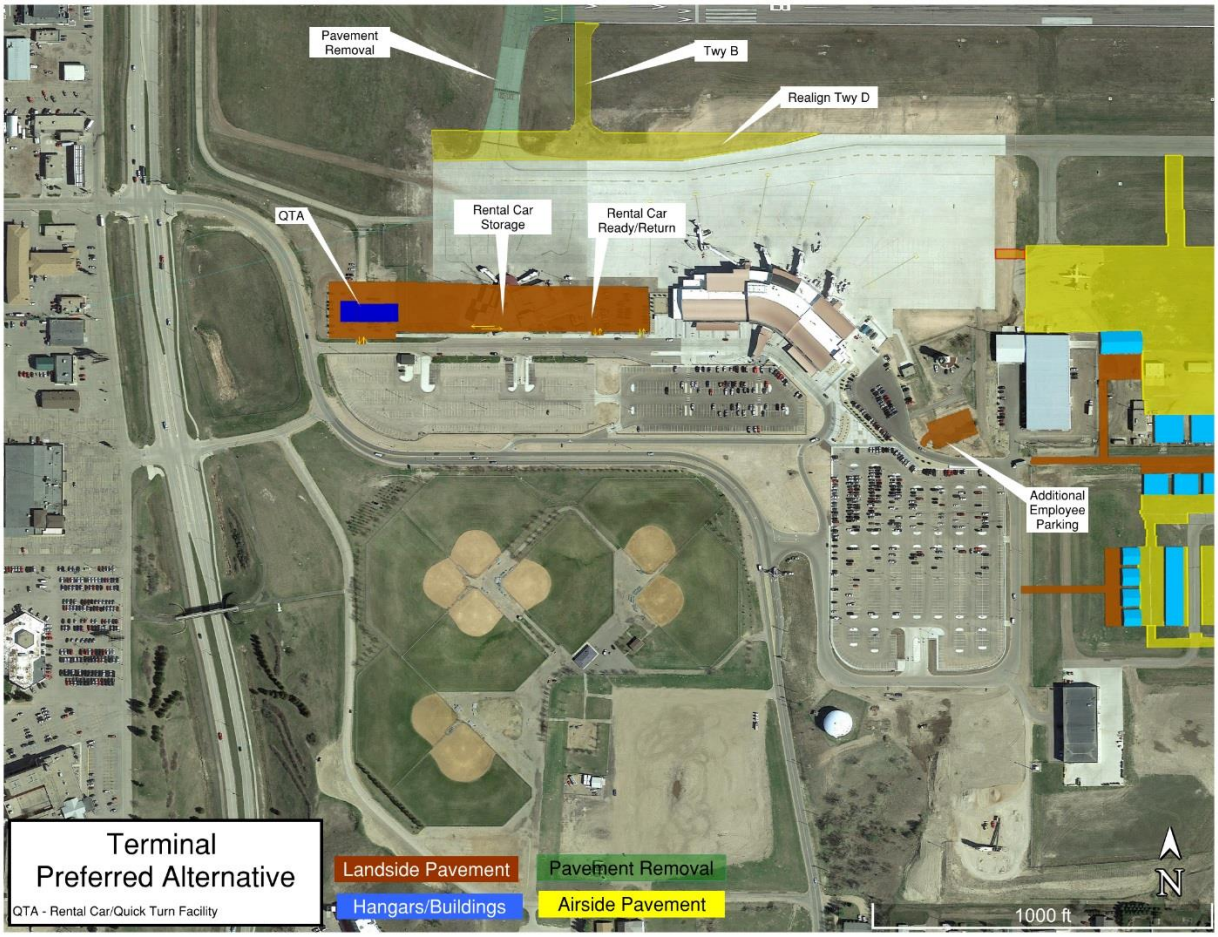
this area that would conflict with the ARFF Station and the ARFF Station would be outside of the departure surface for Runway 26.

It was determined that there is not enough demand at this time to plan for a loop road or cell lot. As a result, these elements of the alternatives will not be included in the plan.

Preferred Alternative

The preferred alternative is Alternative 2 to construct a combined QTA, rental car storage, and rental car ready-return lot to the west of the new terminal building. This was chosen because it required minimal changes but accommodated needs identified in the planning period. No loop road was included in the preferred alternative but additional employee parking is included. See **Exhibit 5-11 Preferred Alternative.**

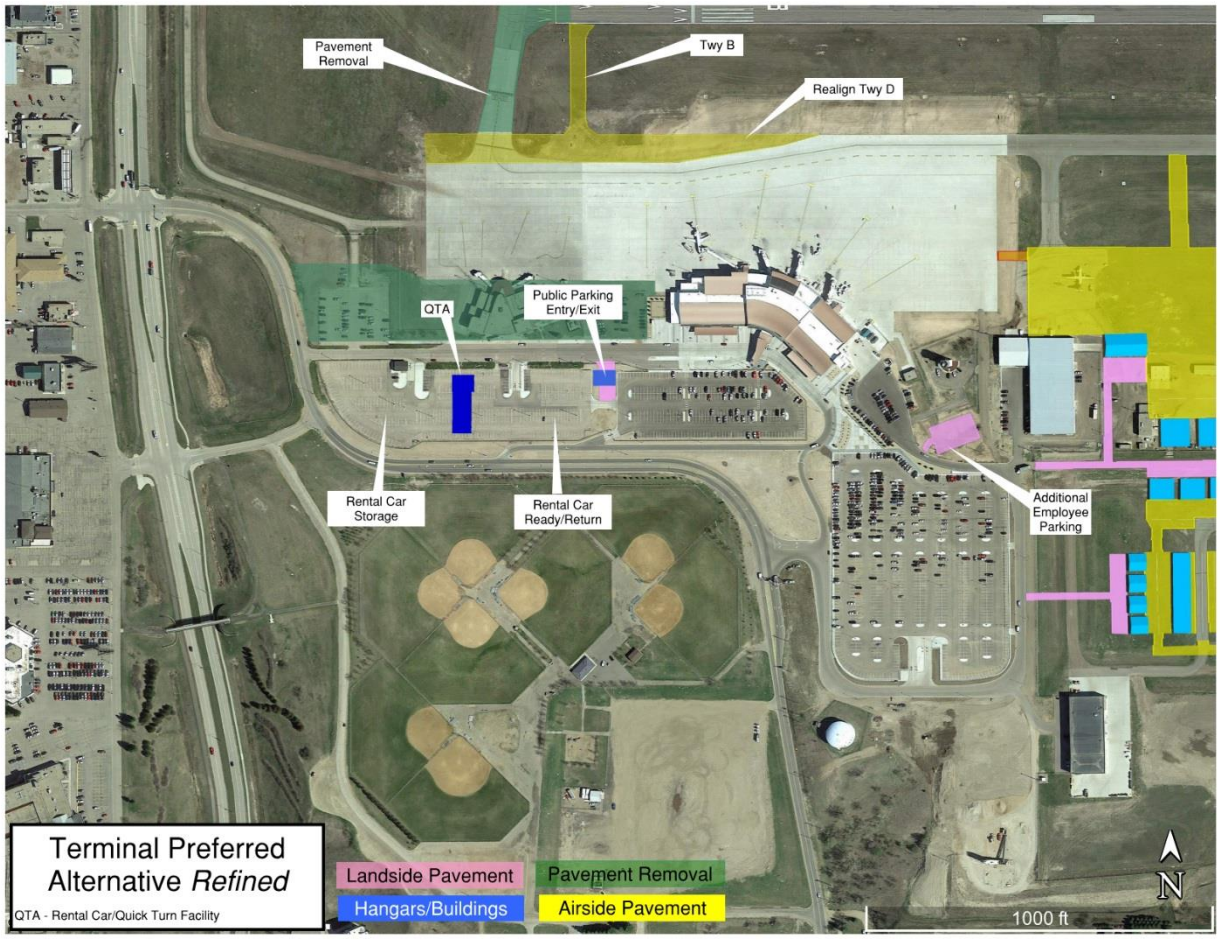
Exhibit 5-11 – Terminal Area Preferred Alternative



Preferred Alternative - Refined

After the preferred alternative was selected, and while the Airport Layout Plan was being developed, the airport elected to change the arrangement for the QTA and rental car parking areas. The change was done because the paid parking lot south of the old terminal were being minimally used and could cost-effectively be repurposed for the rental car needs. As it relates to the demand for parking identified in Chapter 4, this preferred alternative provides 1,075 public spaces where 1,100 are demanded through the planning period. For Rental Cars, it provides approximately 300 spaces where 353 are demanded through the planning period. **The refined preferred alternative 2 is depicted in Exhibit 5-11R Preferred Alternative - Refined.**

Exhibit 5-11R - Terminal Area Preferred Alternative - Refined



General Aviation – West Area

GENERAL AVIATION

Background

MOT is forecast to see a consistent presence of general aviation (GA) operations and based aircraft. The airport is the only public-use airport serving the immediate Minot area. The facility should be sufficient to meet the GA needs of the area, in addition to the commercial needs already identified. GA has seen growth in the Minot area but development of facilities has only occurred on an incremental basis.

The following section summarizes key GA facility requirement findings:

- There is currently an average of 25 based aircraft located on the apron on a regular basis.
- There are four (4) small hangar structures north of the FBO which are beyond their useful life and should be replaced or removed to make room for hangar development.
- There are four (4) other hangars south of the ARFF station which are beyond their useful life.
- MOT's newest hangars continue to be developed in the south GA area near the SRE building.
- Development plans should have the flexibility to accommodate growth for different sizes of aircraft and types of users.

GA activity at MOT is concentrated in two areas; one on the west side just north of Runway 8 and the other just southeast of the terminal building. The west area is constrained by its orientation to U.S. 83/Broadway, but additional development space is available between the existing ramp and Taxiway B. The south area is open and has seen recent development, but does have a height restriction on hangars so the ATCT can maintain visual line-of-sight with Taxiway C. **Table 5-10 General Aviation Space Requirements** summarizes the space demands from Chapter 4.

There are two primary groups of GA aircraft that future hangar development is intended to address. These are Airplane Design Group 1 (ADG-I) Aircraft (<49' wingspan, with a 79' Taxilane Object Free Area TOFA) and ADG-II Aircraft (≥49' but <79' wingspan, with a 115' TOFA). To simplify how the alternatives are examined, the GA areas are identified in **Exhibit 5-7 Airport Areas**.

Table 5-10 – General Aviation Space Requirements

Area	Existing	Base Demand	PAL 2	PAL 4
Hangar Space (SF)				
Area without Aircraft currently using Tie-Downs	128,840	123,030	178,376	227,721
Surplus (Deficiency)		*5,810*	*(50,464)*	*(98,881)*
All Based Aircraft		164,479	238,944	307,678
Surplus (Deficiency)		(35,639)	(110,104)	(178,838)
Apron Space (SY)				
Transient Aircraft Only	57,000	37,400	39,600	40,700
Surplus (Deficiency)		*19,600*	*17,400*	*16,300*
Transient and Based Aircraft using Tie-Downs		69,300	74,470	82,060
Surplus (Deficiency)		*(12,520)*	*(17,470)*	*(25,060)*

Source: KLJ Analysis

AIR CARGO

Background

Air cargo operations at times utilize GA facilities at MOT. For this reason, both GA and Air Cargo are evaluated concurrently in this study.

The air cargo area at MOT is considered a vital component of the airport. As a regional destination point for two cargo airlines (FedEx and UPS), and the U.S. Postal Service (USPS), accommodating future growth needs at the airport is important. Currently cargo activity is split with UPS and USPS ground handled on the GA apron in the west area, and FedEx handled in a building in the south area.

The following section summarizes air cargo facility requirements:

- Provide an initial 6,700 SY of air cargo apron with an estimated need up to 9,100 SY through the planning period.
- Locate the cargo apron so there is flexibility to either store aircraft in hangars or conveniently tow aircraft for storage in other hangars.
- UPS and USPS operators use vans which enter the west apron area from nearby gates to ground load aircraft. FedEx uses vans to load/unload from a building in the south area.

The critical design aircraft for cargo operations is an ATR-42, an ADG-III airplane with Taxiway Design Group 2 standards. Through PAL 4, the apron space will need to approximately double to meet forecast demand.

Several air cargo development concepts were evaluated to accommodate facility requirements, taking into consideration the existing infrastructure and current split operations. The cargo alternatives are included in the area alternatives listed below.

COMBINED ALTERNATIVES

General Aviation – West Area

There were three (3) alternatives carried forward for the west area. The Alternatives were 1, 4 and 5E. One of these alternatives included the removal of the FAA-owned VOR facility. See information below regarding each alternative and **Table 5-11 West General Aviation Area Summary**. The alternatives that were dismissed included elements such as realigning Taxiway B, additional alternatives with VOR removal, and a variety of hangar layouts. The airport narrowed the alternatives to those with Taxiway B in place, a few hangar layout options and just one with VOR removal. Exhibits of all the alternatives reviewed are included in **Appendix R – Alternatives**.

In the alternative exhibits, please note that just because a new hangar is shown over the top of an existing hangar it does not necessarily mean it is required. It is demonstrating that larger hangars can be placed where smaller or outdated hangars exist today. All hangar removal and construction is expected to be demand and financing-based decisions.

No Change

All existing hangars remain in their current location. If hangar reconstruction is necessary, the hangar is reconstructed in its current size with any existing space limitations. See **Exhibit 5-12 West GA Area – No Change**.

Advantages:

- Lowest cost alternative for the airport

Disadvantages:

- No prescribed location for new ADG-I or ADG-II aircraft hangar development
- Two southern most hangars are within the limits of the Runway 26 Departure Surface and are limited to approximately 25’ in height
- Apron taxilane object free area standards are not met between parked aircraft/objects
- Landside development depth remains constrained along main apron
- No solution for future ARFF station

Exhibit 5-12 – West GA Area – No Change

West GA Alternative 1

This alternative develops the area with minimal impact on existing buildings except as dictated by private development timelines. See **Exhibit 5-13 – West GA Area Alternative 1**. Features of this alternative are:

- Expand Apron east and square hangars with U.S. Highway 83/Broadway
- Remove T-Hangars and develop northwest portion as an enclave for ADG-II Specialized Aviation Service Operator (SASO)
- Construct internal road west of Runway 8 connecting the GA apron with terminal apron
- Establish dedicated ADG-II and SASO area on southwestern portion of existing apron with buildings square with U.S. Highway 83/Broadway
- Establish ADG-I conventional hangar area north of the existing apron
- Establish ADG-I T-Hangar/Tie-Down area in southern portion of the existing apron and extending east
- Relocate ARFF Station to south end of existing apron and use existing Taxiway B2 and portion of apron for ARFF access directly to Taxiway B

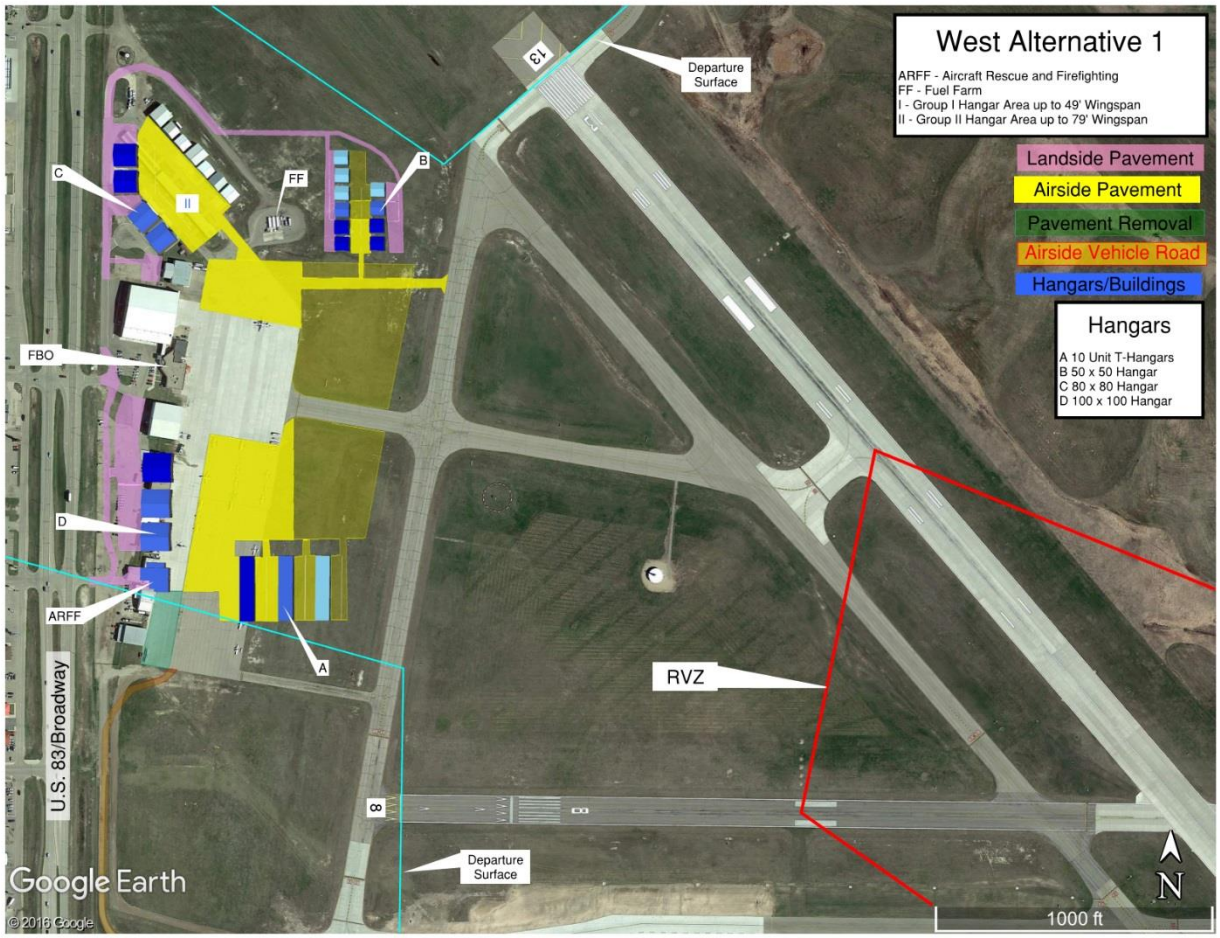
Advantages:

- Provides for a phased plan that addresses old hangars that have exceeded their useful life
- Logical, sequenced development plan showing dedicated areas for different hangar sizes/types
- Provides flexible depth expansion plan for apron to meet growing needs
- Maintains all hangars in the north except as replacements are needed
- Avoids impact to newer northern-most hangars facing southwest, and provides for landside access to these hangars
- Reconfiguration provides additional landside development depth along main apron for roadways and parking lots
- Provides plan to clear the Runway 26 FAA Departure Surface
- T-Hangars developed in a separate area near current tie-downs
- Fuel farm stays in place with new fuel road to terminal area
- ARFF station remains in current general area
- ARFF station construction in new location can allow current facilities to function during construction
- Relocation of ARFF station opens up 200'+ of apron frontage for hangars in short-term

Disadvantages:

- Oldest T-Hangars are shown to be removed which may be challenging for airport management
- VOR remains in-place, restricting ultimate hangar development to the east
- ARFF construction will require removal of some existing hangars (some of which are 50+ years old requiring an architectural inventory and coordination with the State Historical Society)
- ARFF on GA apron will require maneuvering of equipment around aircraft

Exhibit 5-13 – West GA Area Alternative 1



West GA Alternative 4

This alternative develops the area with minimal impact on existing buildings except as dictated by private development timelines. The existing FBO area is maintained but allows new large hangar and apron development after the potential relocation of the FAA-owned VOR. T-Hangars are placed in this new area. See **Exhibit 5-14 - West GA Area Alternative 4**. Features of this alternative are:

- Expand northern portion of Apron east and square with U.S. 83/Broadway
- Remove T-Hangars and develop northwest portion as an enclave for ADG-II SASO activity while not impacting southwest facing hangars
- Establish ADG-II and ADG-I conventional hangar area north of the existing apron
- Establish ADG-II+ SASO area and new apron near existing VOR
- Construct new taxiway connecting GA apron to Taxiway C3, east of the new apron
- Relocate Fuel Farm to new east apron area
- Self-Fueling at south end of new apron
- Relocate ARFF Station to terminal area (See **Exhibit 5-10 Terminal Area Alternative 4**)
- Hangars along the south apron area are not required to be removed in the short-term

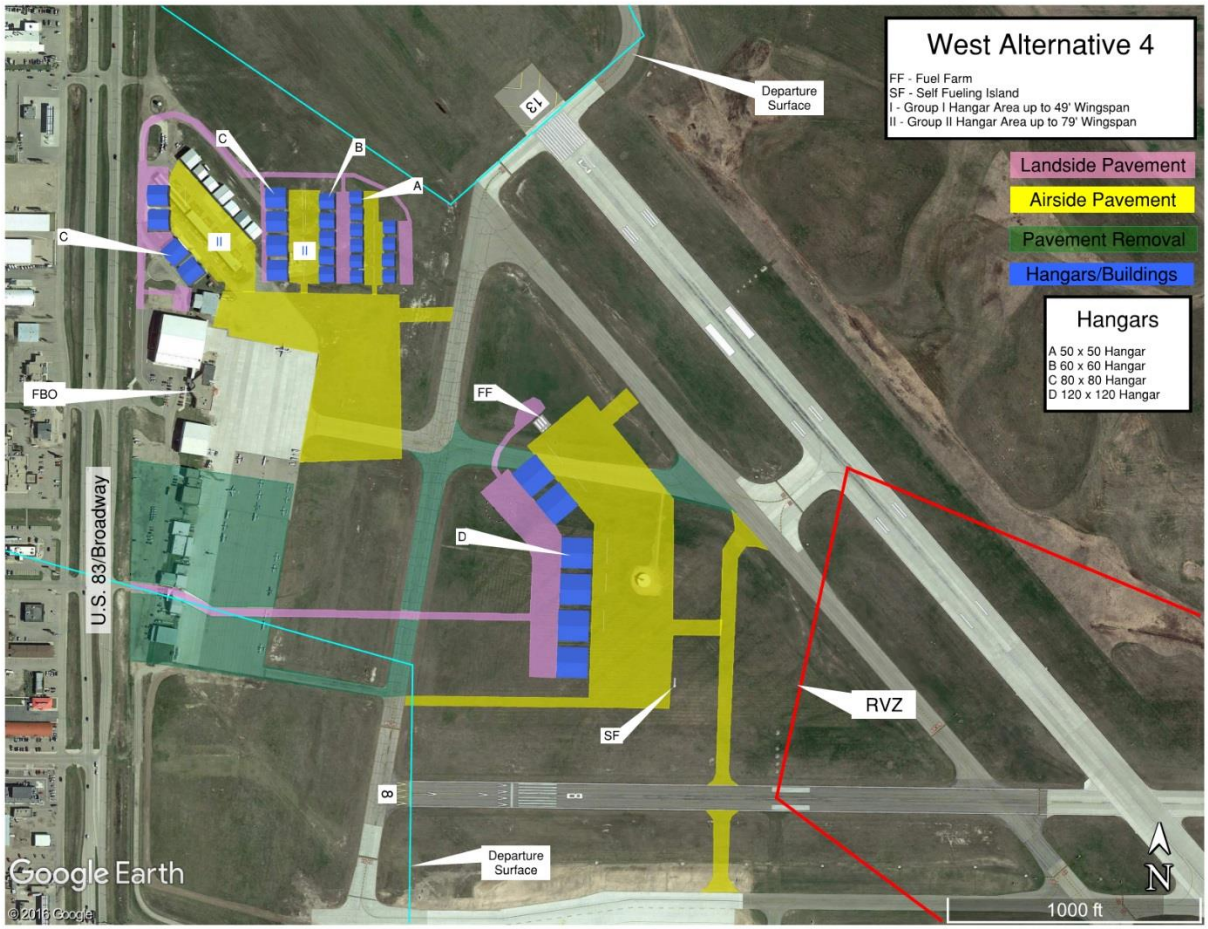
Advantages:

- Sequenced development plan showing dedicated areas for different hangar sizes/types
- Expands apron width to aid in aircraft maneuverability
- FAA-owned VOR removed which provides for more long-term development space
- Opens areas along U.S. 83/Broadway for potential compatible non-aeronautical development
- Phase-able plan with existing Taxiway B alignment
- Provides opportunity for long-term commercial development (i.e. second FBO).
- Maximizes use of north area for small hangar development
- ARFF station construction in new location can allow current facilities to function during construction

Disadvantages:

- New large hangar/SASO development is contingent on VOR removal (largely dependent on FAA actions), which is likely achievable only in the long-term
- Oldest T-Hangars are shown to be removed which may be challenging for airport management
- Southernmost hangars proposed to be relocated to provide access road
- Apron expansion may be triggered in short-term as south GA pavement has reached end of its useful life
- Separates GA apron areas which may be confusing for users
- Fuel farm must be relocated in lieu of hangar development
- Costliest alternative which will also be challenging to phase until FAA VOR is removed
- Eliminates convenient Taxiway B route from commercial apron to Runway 13
- Will require new ATCT to maintain line of sight to all aircraft movement areas

Exhibit 5-14 – West GA Area Alternative 4



West GA Alternative 5E

This alternative underwent several iterations to build upon the current apron configuration and maintain the existing Taxiway B alignment. See **Exhibit 5-15 - West GA Area Alternative 5E.** Features of this alternative are:

- Remove T-Hangars and develop northwest portion as an enclave for ADG-II SASO activity while not impacting southwest facing hangars
- Retain current fuel farm
- Maintain ARFF station in current location
- Establish ADG-I area on northeast east edge of existing apron with buildings aligned with existing apron
- Establish separate ADG-I T-Hangar/Tie-Down area in southern portion of the existing apron and extending east

Advantages:

- Logical, sequenced development plan showing dedicated areas for different hangar sizes/types
- Provides additional landside development depth for roadways and parking lots
- Does not trigger immediate relocation of hangars along existing apron
- New northeast hangar development area has landside access, maximizes use of existing infrastructure and lowers cost
- Fuel farm stays in place, minimizing expense
- Optional landside access can be created near new T-Hangars
- Reconstructing ARFF Station in current location provides most direct routing from GA area to airfield

Disadvantages:

- Oldest T-Hangars are shown to be removed which may be challenging for airport management
- Landside development depth remains constrained along main apron
- VOR remains in-place, restricting ultimate hangar development to the east
- Fuel trucks would not have an airside route outside of the movement areas and would use taxilanes/taxiways (crossing Runway 8/26), to get to terminal area
- If landside access to T-Hangars is added there would only be one entry/exit taxiway to the apron, increasing the risk of head-on aircraft conflicts
- Large aircraft apron depth is limited by hangar development on the east side of the apron
- T-Hangar buildings oriented east-west (north-south facing doors) are not recommended due to snow drifting on south side and ice buildup on the north side of hangars

Exhibit 5-15 – West GA Area Alternative 5E

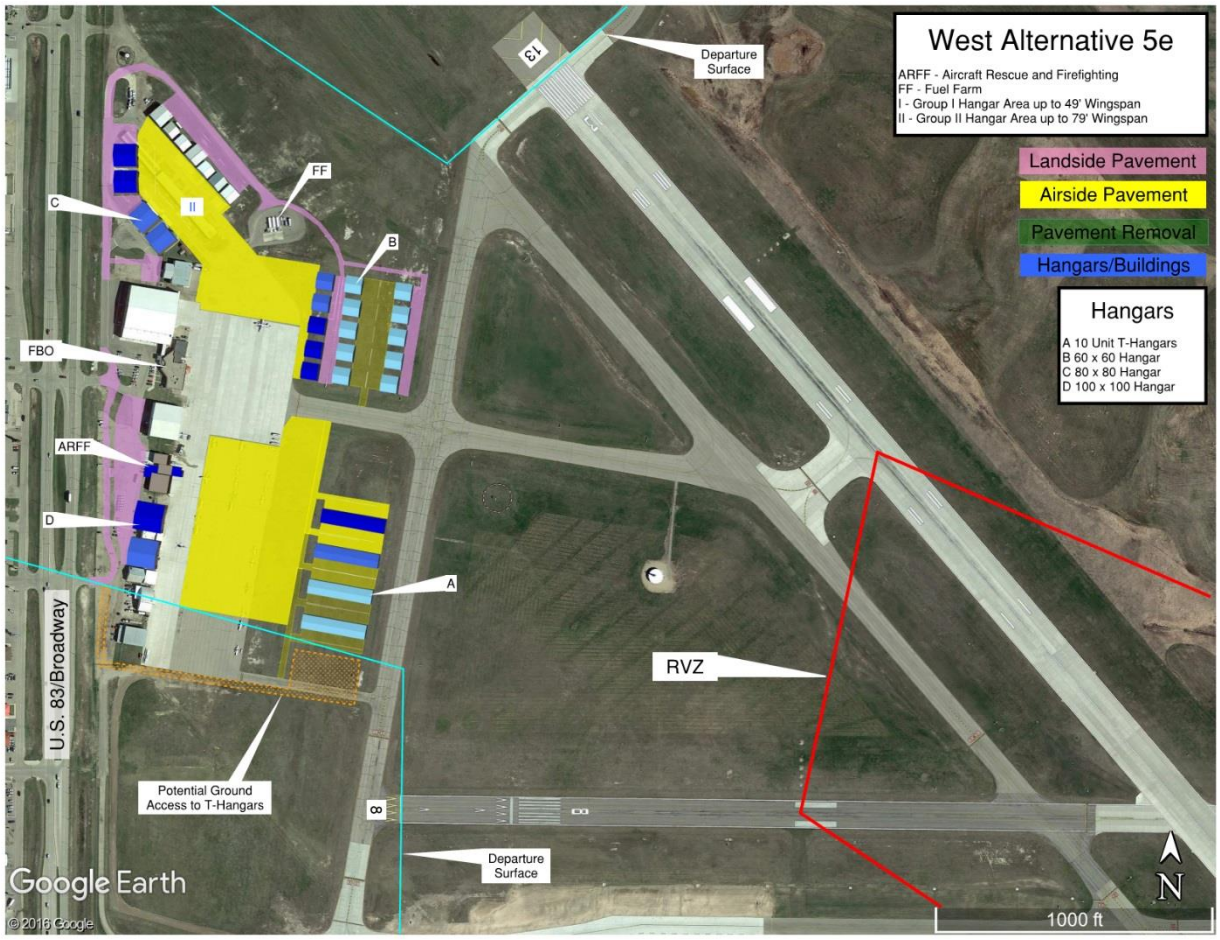


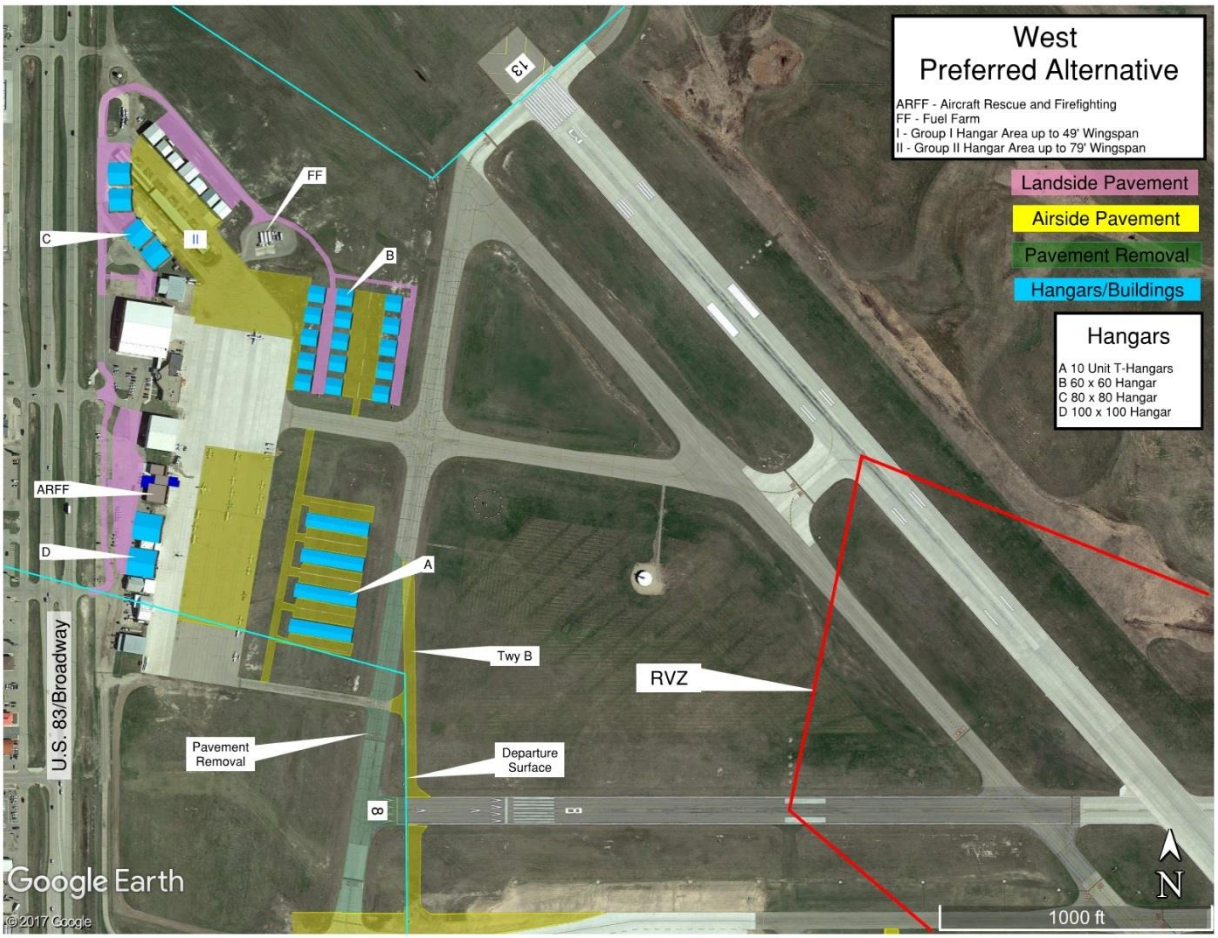
Table 5-11 – West General Aviation Area Summary

Factor	No Change	Alternative 1	Alternative 4	Alternative 5E
Proposed Action	-	SASO and ADG-I North; Tie-down and T-Hangars South; New ARFF Station on southern portion of Apron	SASO and ADG-II North; FBO/SASO on new apron; ARFF Station at Terminal	SASO and ADG-I North and East; Tie-down and T-Hangars South; Expand/Reconstruct ARFF Station
Operational Performance				
T-Hangars	15,900 SF (16 spaces)	35,100 SF (30 spaces)	No New T-Hangars	46,800 SF (40 spaces)
Small Conventional Hangars	59,640 SF (17 units)	73,200 sf (22 units)	91,200 sf (27 units)	85,700 SF (28 units)
Large Conventional Hangars	38,300 SF (2 units)	68,300 SF (5 units)	98,300 SF (7 units)	58,300 SF (4 units)
Total Hangars*** Surplus (Deficiency) by PAL 4	113,840 SF (113,881)	176,600 SF (51,121)	189,500 SF (38,221)	190,800 SF (36,921)
Apron Surplus (Deficiency) by PAL 4	57,000 SY (25,060)	82,800 SY 740	93,100 SY 11,040	64,400 SY (17,660)
Other	-	Capacity-Flexible Development Areas	Taxiway B Removed	Potential Single Apron Access Point
Safety & Standards	Apron Taxilane OFAs Do Not Meet Standards	Meets Standards	Meets Standards	Meets Standards
Other Planning Tenets	No Change	Flexible Apron Development	Challenging to phase; dependent on VOR removal	Limits FBO apron depth
Environmental	No Change	Possible Historic Structure Impacts*	Possible Historic Structure Impacts*	Possible Historic Structure Impacts*
Fiscal**				
Airside Paving		$12.0 Million	$16.6 Million	$9.5 Million
Landside Paving		$1.8 Million	$2.7 Million	$2.1 Million
Buildings		$13.2 Million	$19.0 Million	$14.4 Million
Other		-	$0.6 Million	-
Total	None	**$27.0 Million**	**$38.9 Million**	**$26.0 Million**
ARFF Station		$4.4 Million (new)	*See Terminal*	$2.76 Million (rehab)
Preferred Alternative	NO	NO	NO	**YES**

** Some Hangars in the West GA Area are more than 50 years old. These hangars may require an Architectural Inventory and approval from the State Historic Preservation Office (SHPO) prior to removal.*
***Assumes full-build out of alternative as shown*
**** Hangar area requirements are for entire airport including South Area in the next Section.*
Source: KLJ Analysis

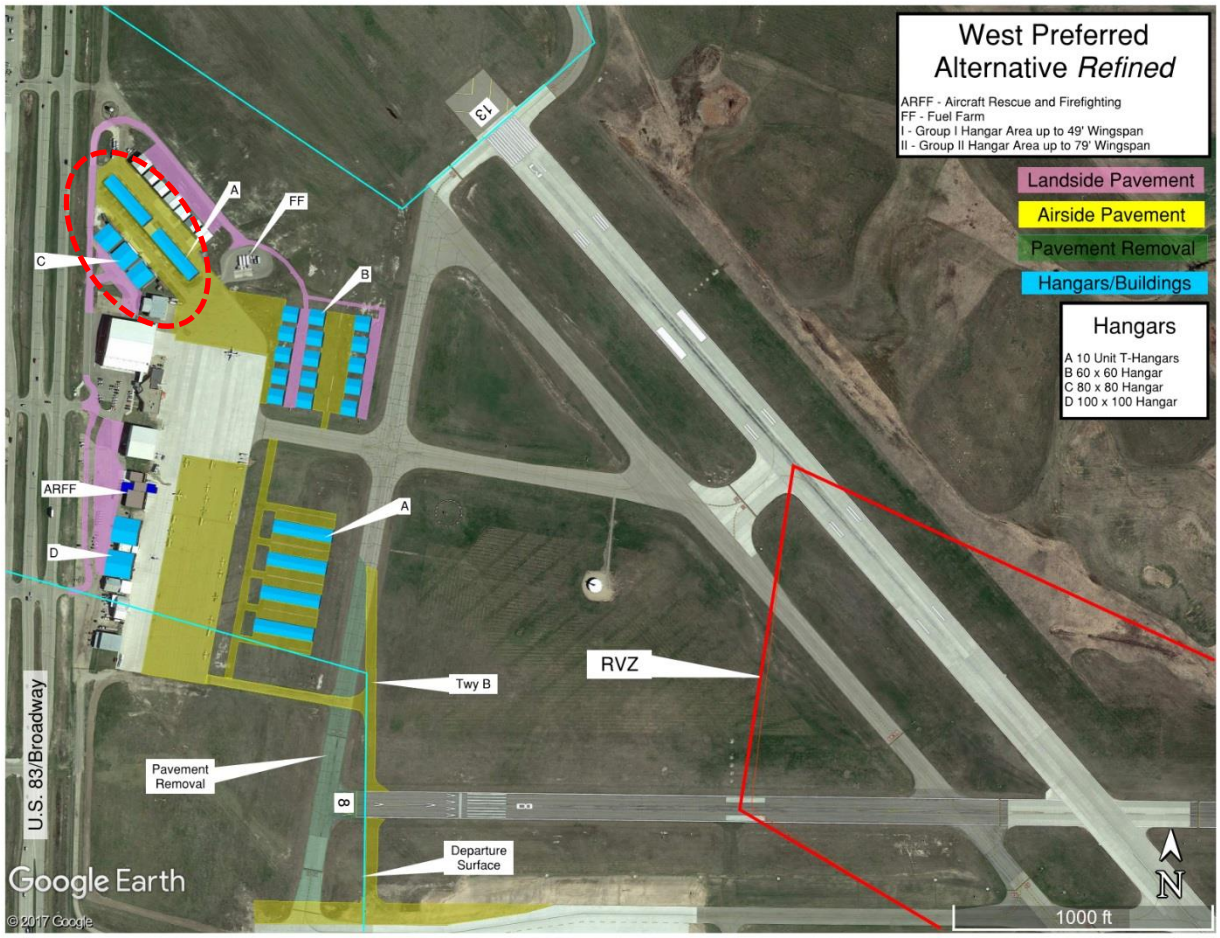
Recommendation - The Alternative 4 was dismissed as it requires the removal of the VOR which is not scheduled within the planning period nor in control of the airport. Either Alternatives 1 or 5E provide sufficient space for the development expected to occur within the planning period. Alternative 5E was chosen with a modification to maintain the current alignment of Taxiway B resulting in the T-Hangars moved slightly west. Alternative 5E was chosen because of the lower cost of construction and ability to accommodate hangar development with limited additional paving. This modified Alternative 5E is included in the Preferred Alternative and is provided in **Exhibit 5-16 West General Aviation Area Preferred Alternative**.

Exhibit 5-16 – West General Aviation Area Preferred Alternative



Preferred Alternative - Refined - During the development of the ALP the preferred alternative 5E was further refined. The changes were made to maximize the use of existing infrastructure as much as possible. The changes include the removal of the ADG-II hangars in the north end and replacement of T-Hangars rather than total removal in this same area. **Exhibit 5-16R West General Aviation Area Preferred Alternative - Refined depicts the refined preferred alternative.**

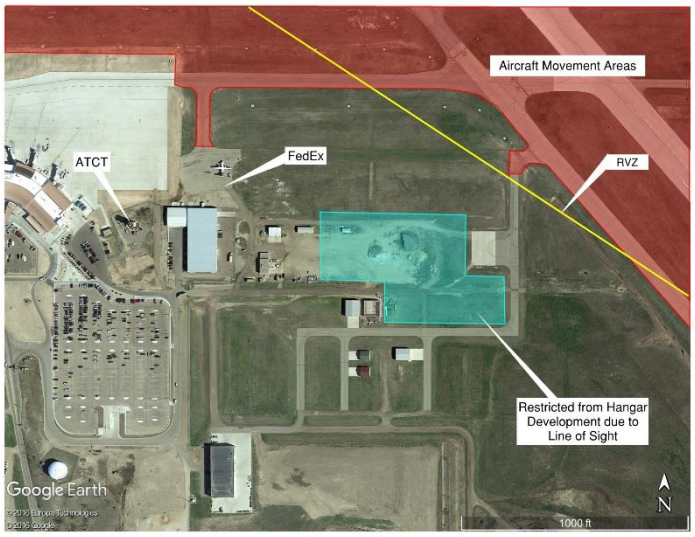
Exhibit 5-16R – West General Aviation Area Preferred Alternative - Refined



General Aviation – South Area

There were three alternatives finalized for the south GA and air cargo area. These were Alternatives 1, 3 and 4. The other alternatives that were dismissed had elements such as additional hangar layouts, relocation of the ATCT facility, FBO and SASO hangars, and new entry roads to the south area. The airport dismissed these other alternatives as not practical. These other alternatives are included in **Appendix R - Alternatives**.

These alternatives that carried forward for analysis show the ATCT in its current location. Hangar development is limited to still maintain adequate ATCT line-of-sight to all aircraft movement areas. Some hangar development areas identified in previous ALPs cannot be developed if the ATCT remains because of line of sight considerations. The general area that is restricted from hangar development is shown in this figure.



See details of each alternative below and **Table 5-12 South General Aviation Area Summary**.

No Change

Hangar development would be allowed without any changes to taxilane infrastructure and with no guidance as to hangar sizing. Cargo area would not be expanded. See **Exhibit 5-17 – South GA Area – No Change**.

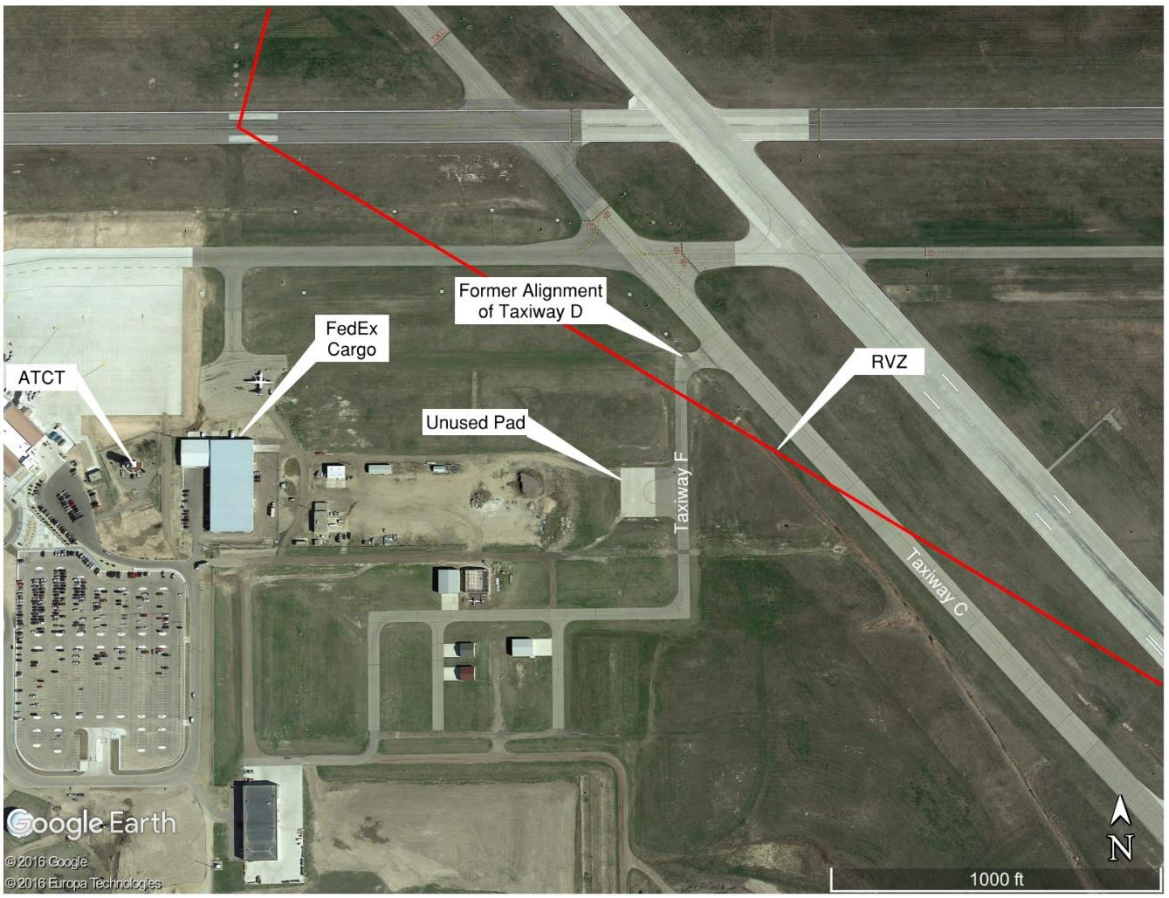
Advantages:

- Lowest cost alternative for the airport

Disadvantages:

- No sequenced development for different hangar development types in south area
- New hangar development would be directed to other portions of the airport (West GA) to meet facility requirements, or facility needs not met at MOT
- Insufficient space for existing or forecasted cargo activity

Exhibit 5-17 – South GA Area – No Change



South GA Alternative 1

This alternative includes ADG-I hangar development areas with limited landside access. ATCT remains in the current location and there is no hangar development that conflicts with existing ATCT line of site to the airfield movement areas. The existing cargo area is expanded to meet facility needs. See **Exhibit 5-18 - South GA Alternative 1**. Features of this alternative are:

- Provides for ADG-I box and T-Hangar development
- Air cargo complex expanded in the existing cargo area with room for FedEx, UPS, and USPS
- Self-fueling established
- Airfield roads added for fuel trucks and other equipment
- New secondary taxiway connecting the south edge of the hangar area directly to Taxiway C

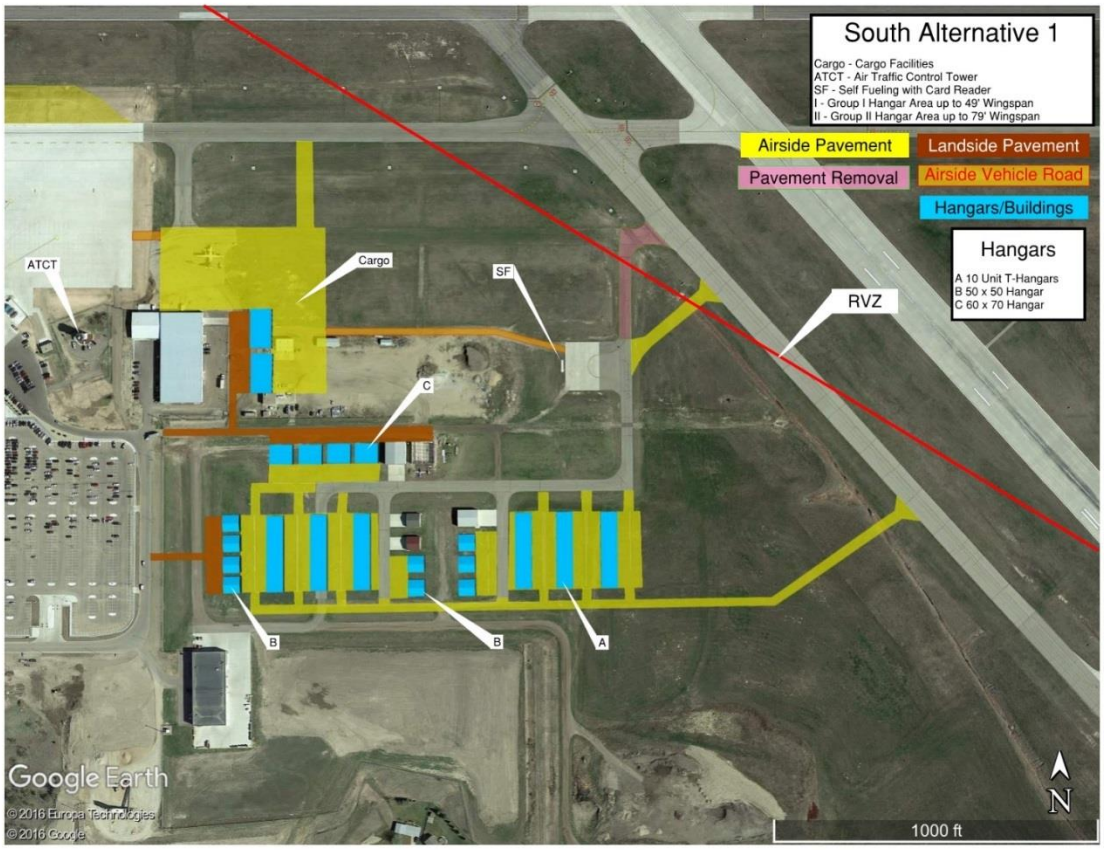
Advantages:

- Maximizes the use of the area for ADG-I aircraft hangars
- Air cargo consolidated to one single area for efficiency
- Two access taxiways to exit/enter area, minimizing head-to-head conflicts
- Self-fueling added with fuel truck access without entering movement area
- Directs larger SASO and ADG-II hangar development to higher-visibility west GA area

Disadvantages:

- Development remains limited by ATCT line-of-sight
- New taxilanes required to maximize use of space
- West taxilane would be demolished
- Limited dedicated landside access to hangars
- No dedicated space for aerial applicator hangars

Exhibit 5-18 - South GA Area Alternative 1



South GA Alternative 3

This alternative develops the area for ADG-II aircraft with landside access to most hangars. The ATCT stays in the current location and there is no hangar development that conflicts with ATCT line-of-sight. See **Exhibit 5-19 - South GA Alternative 3**. Features of this alternative are:

- Air cargo apron is expanded
- Aerial applicator hangars adjacent to public air cargo apron
- ADG-II conventional hangar development
- Self-fueling established
- Airfield roads added for fuel trucks and other equipment

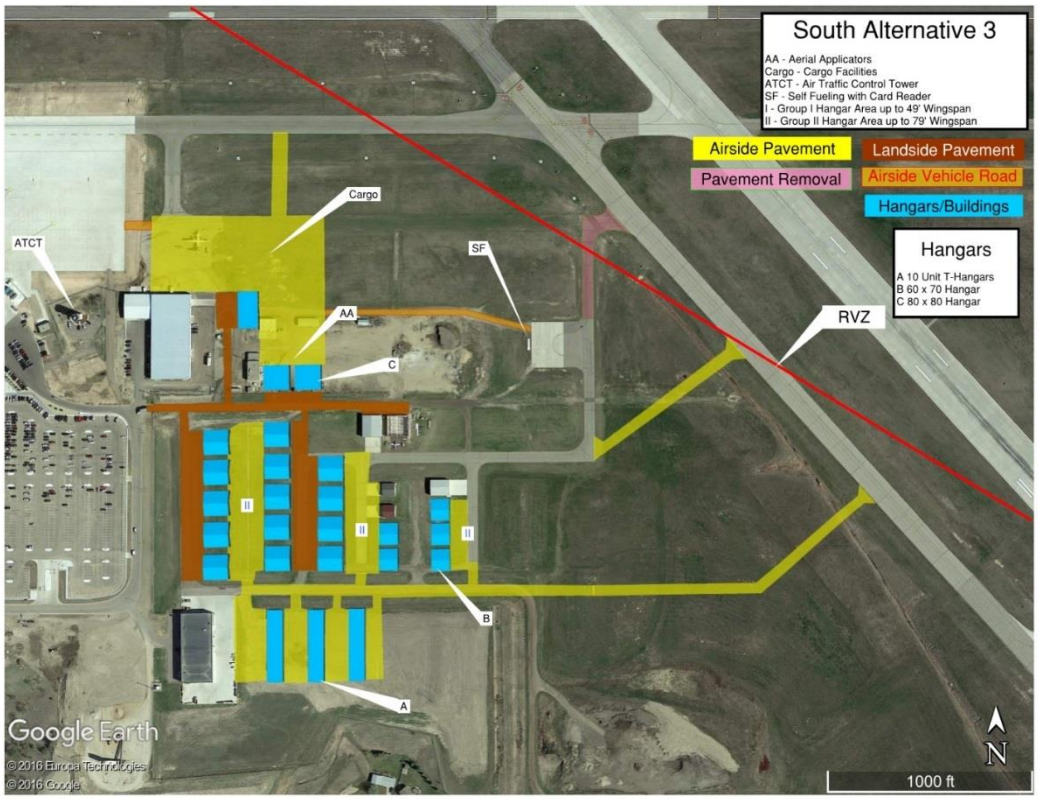
Advantages:

- Flexible development space for various hangars types including T-Hangars and up to ADG-II conventional hangars
- Dedicated landside access to most ADG-II conventional hangars
- Air cargo consolidated to one single area for efficiency
- Two access taxiways to exit/enter area, minimizing head-to-head conflicts
- Self-fueling added with fuel truck access without entering movement area

Disadvantages:

- Multiple existing taxilanes would be reconfigured
- Access points from Taxiway C lead to different development areas which may lead to confusion
- Landside access will require private and/or airport funding as it may not be eligible for AIP funds
- Aerial applicator apron area will require proactive infrastructure improvements
- Aerial applicator operations will be mixed with airline and cargo operations for movement on Taxiway D

Exhibit 5-19 - South GA Area Alternative 3



South GA Alternative 4

This alternative develops the area for both ADG-I and ADG-II aircraft with partial landside access. See **Exhibit 5-20 - South GA Area Alternative 4**. Features of this alternative are:

- Air cargo area expanded to provide space for FedEx and UPS
- New taxiway connecting the south edge of the hangar area directly to Taxiway C
- ADG-I T-Hangar development
- Up to ADG-II conventional hangar development
- Self-fueling established on pad area off Taxiway F
- Roads added for fuel trucks and Ground Service Equipment (GSE) connecting terminal apron to cargo apron, and from cargo apron to self-fuel pad

Advantages:

- Limited infrastructure expense by preserving taxilane spacing as originally constructed
- Two access taxiways to exit/enter area, minimizing head-to-head conflicts
- Air cargo consolidated to one single area for efficiency
- Self-Fueling added with Fuel Truck access without entering movement area

Disadvantages:

- ADG-II hangar spacing when area will likely have mostly ADG-I aircraft, resulting in extra pavement not eligible for AIP funds

Exhibit 5-20 – South GA Area Alternative 4

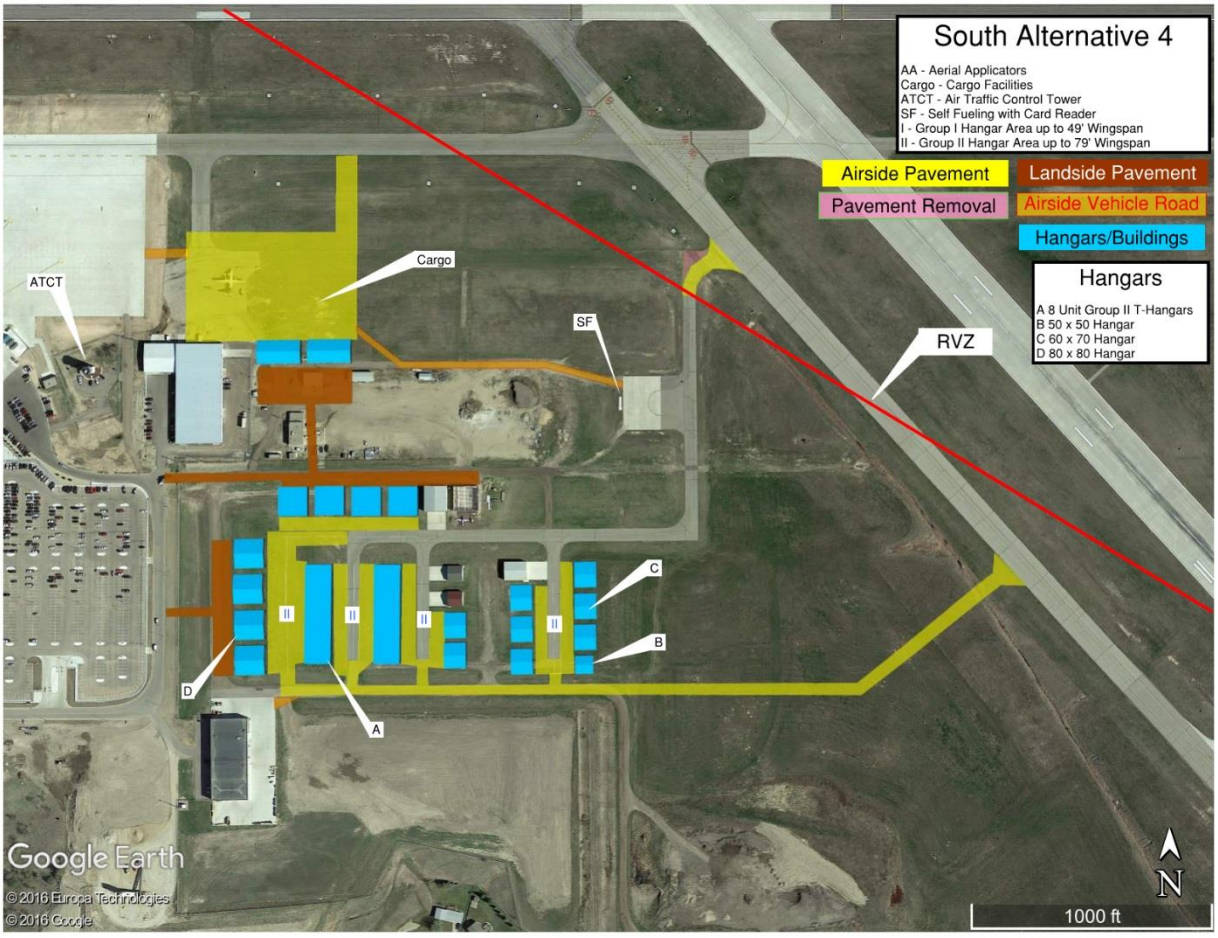


Table 5-12 – South General Aviation Area Summary

Factor	No Change	Alternative 1	Alternative 3	Alternative 4
Proposed Action	-	ADG-I conventional and T-Hangars; Expand Air Cargo apron	ADG-II hangars with landside access; ADG-I and T-Hangars; Expand Air Cargo apron; Aerial Applicators	Up to ADG-II hangar development with existing taxilane spacing; Expand Air Cargo apron
Operational Performance				
T-Hangars	-	70,200 SF (60 spaces)	35,100 SF (30 spaces)	ADG-II Units 38,880 SF (16 spaces)
Small Conventional Hangars	15,000 SF (17 units)	54,300 SF (18 units)	138,400 SF (26 units)	102,300 SF (22 units)
Large Conventional Hangars	-	-	-	-
Total Hangars	15,000 SF	124,500 SF	173,500 SF	141,180 SF
Apron	4,800 SY	18,600 SY	20,900 SY	15,800 SY
Other	Does Not Meet Overall Capacity Needs	Opportunity for West GA to Serve Larger/Commercial Hangar Development	Aerial Applicators would utilize commercial taxiway	Opportunity for West GA to Serve Commercial Hangar Development
Safety & Standards	Meets Standards	Meets Standards	Meets Standards	Meets Standards
Other Planning Tenets	No Sequenced Development Plan	Reconfigures Existing Taxilanes for Efficiency	Reconfigures Existing Taxilanes for Efficiency	Maximizes Use of Existing Infrastructure
Environmental	None	Possible Cultural Resource Impacts*	Possible Cultural Resource Impacts*	Possible Cultural Resource Impacts*
Fiscal**				
Airside Paving		$5.8 Million	$7.2 Million	$5.5 Million
Landside Paving		$0.7 Million	$1.1 Million	$0.9 Million
Buildings		$13.2 Million	$16.4 Million	$13.6 Million
Total		**$19.7 Million**	**$24.7 Million**	**$20.0 Million**
Preferred Alternative	NO	**YES***	NO	NO

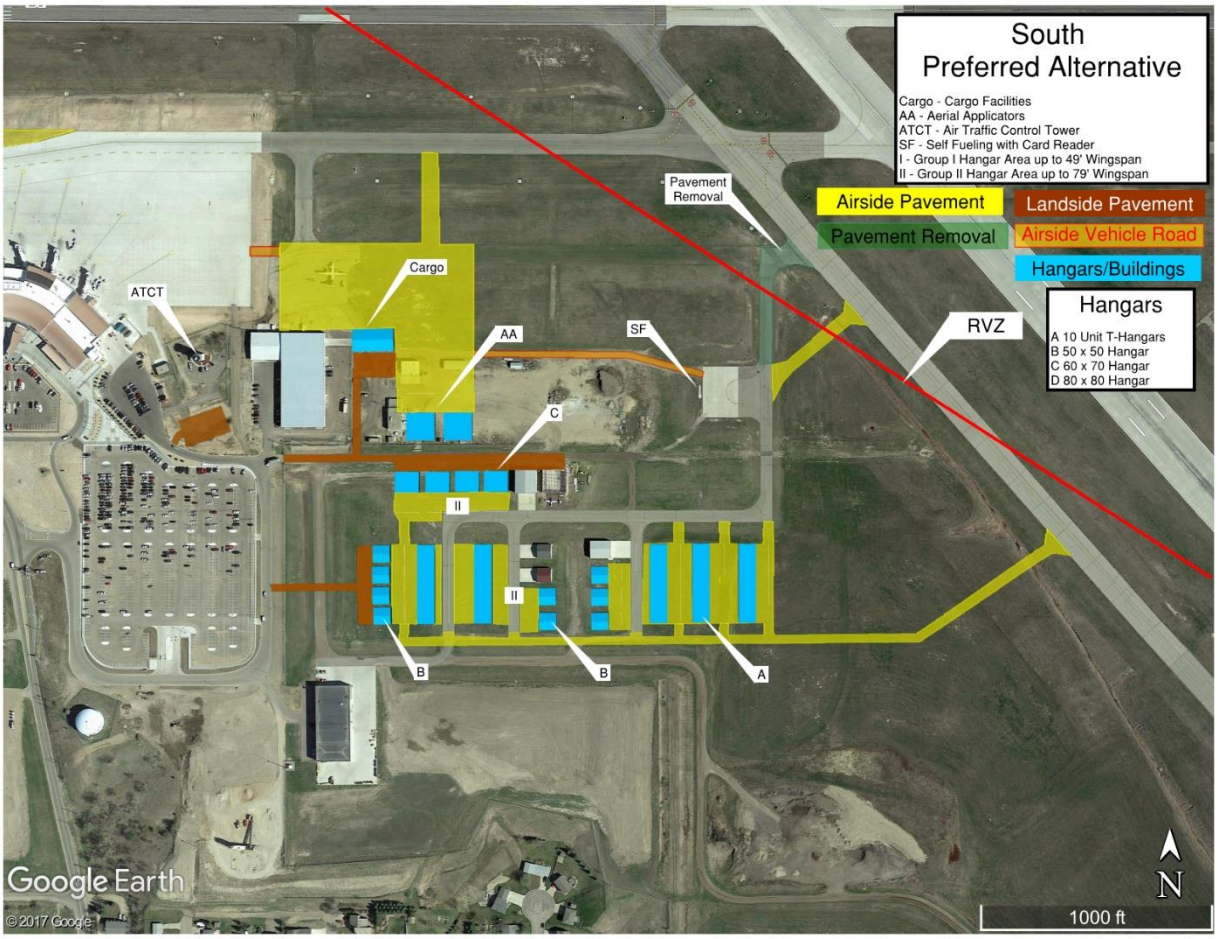
** Some isolated cultural findings were identified in the South GA Area and the Minot International Airport has some identified tribal sites on the property. Development in this area may require coordination with the FAA, Tribal Historic Preservation Officer (THPO), State Historic Preservation Office (SHPO) and possibly Tribal Monitors.*

***Assumes full-build out of alternative as shown*

Source: KLJ Analysis

Recommendation - Alternatives 1, 3 or 4 can each meet the needs for aircraft storage through the planning period dependent on demand. After reviewing each of the alternatives, the airport chose Alternative 1 as the preferred alternative with a few modifications. One T-Hangar to the west was removed so that the existing taxilane could remain. The aerial applicators were added near the cargo area with slight modifications to the cargo area. Please note the preferred alternative also shows the Taxiway F option was selected. The preferred alternative was therefore focused mostly on Group I aircraft and allowed demand based development. It also allowed space for aerial applicators in a functional location. See **Exhibit 5-21 South General Aviation Area Preferred Alternative.**

Exhibit 5-21 – South General Aviation Area Preferred Alternative

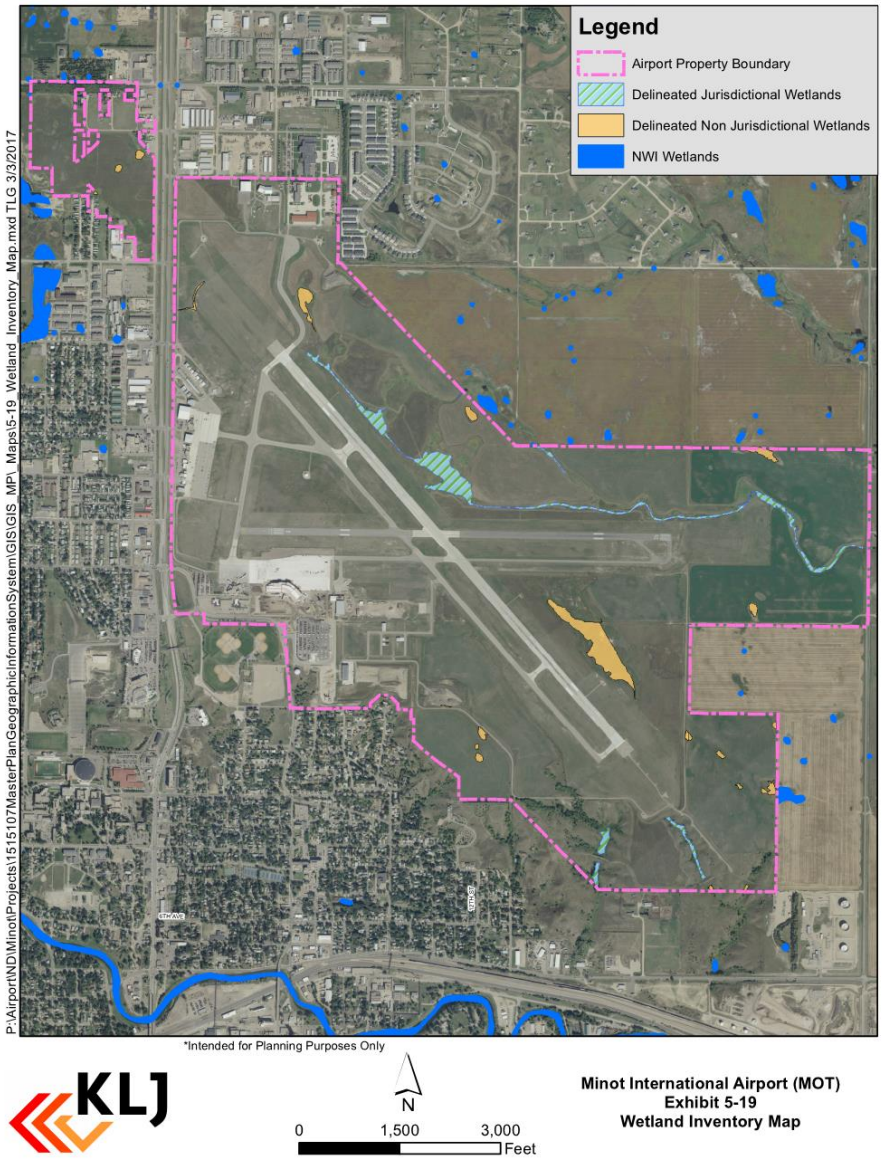


General Aviation - East Area

The area of the airport east of Runway 13-31 and south of Runway 8-26 was considered for long-term and ultimate development. The development was focused in the southwest quadrant because of the existence of a full parallel taxiways to both runways providing convenient airfield access. The alternatives that developed the area north of Runway 8-26 were dismissed because of the lack of taxiway access and jurisdictional wetlands. Exhibits of all the alternatives reviewed on the east side are included in **Appendix R - Alternatives**.

The east area has no existing infrastructure or utilities. There is a desire to utilize the east area as a Foreign Trade Zone (FTZ) connecting to city industrial development to the southeast of the airport. There are some environmental elements to consider for development in the east area, including non-jurisdictional wetlands and some isolated cultural findings. The wetland findings are shown on **Exhibit 5-22 - Minot Wetlands Map**.

Exhibit 5-22 – Minot Airport Wetlands



No Change

No development would occur on the east side of the airport.

Advantages:

- No impact on wetland or potential cultural features

Disadvantages:

- No other location identified for Foreign Trade Zone (FTZ)

East GA Alternative

There was one building alternative that proceeded ahead for the east area, which is the preferred alternative. See **Exhibit 5-23 - East GA Area Alternative**. This included the following potential development:

- ATCT complex relocated to this area
- Air cargo apron and other FTZ-related facilities east of the ATCT
- Aerial applicator hangars on an apron connected to the threshold of Runway 31
- FTZ designation with potential aeronautical and non-aeronautical uses

Advantages:

- Makes use of existing Taxiway D for access to the airfield
- Convenient location to industrial development on east side of Minot
- ATCT development in this area could trigger utility/road infrastructure development
- FTZ can be used for aeronautical and non-aeronautical uses (subject to FAA approval)
- Development can trigger modifying the marsh area in the exhibit to minimize wildlife attractants per the Wildlife Hazard Management Plan recommendations

Disadvantages:

- Significant cost to extend new infrastructure to east side, including but not limited to water, sewer, paved roads, electrical, and natural gas utilities
- Aerial Applicator will be positioned to use Runway 31 accessing through the glide slope critical area (additional aircraft holding procedures needed)

Exhibit 5-23 – East GA Area Alternative

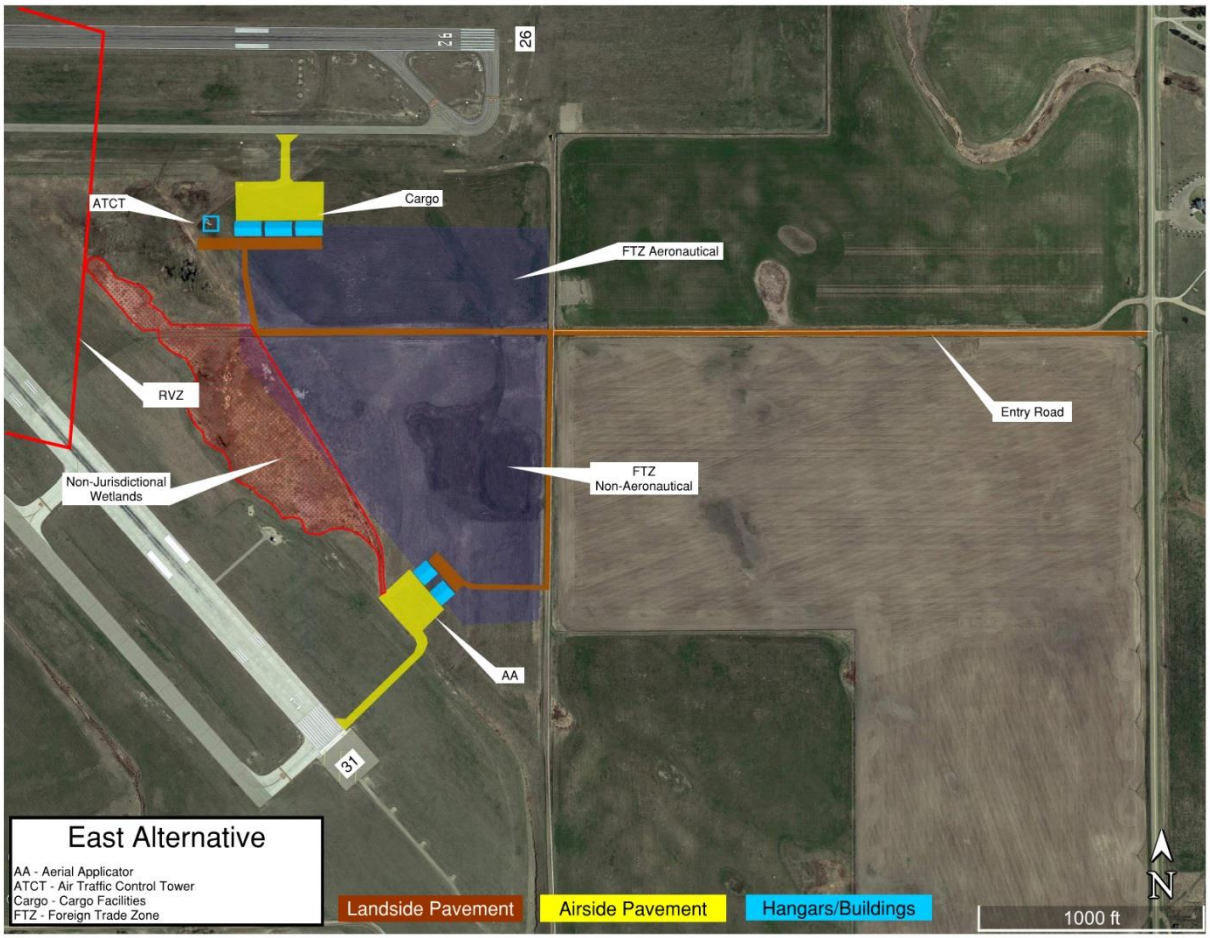


Table 5-13 – East General Aviation Summary

Factor	No Change	East Alternative
Proposed Action	-	ATCT, Cargo and Aerial Applicator added with FTZ for Aeronautical and Non-Aeronautical
Operational Performance	-	Dedicated airside and landside access for development; Aerial Applicators use of primary runway will result in diverse mix of aircraft
Safety & Standards	Meets Standards	Meets Standards
Other Planning Tenets	Development must be provided by constrained West and South GA areas	Creates Opportunities for New Development Within South and West GA Areas
Environmental	-	Possible Wetland and Cultural Impacts*
Fiscal**	N/A	Airside Paving $2.4 Million Landside Paving $1.9 Million Utilities $2.3 Million ATCT $5.2 Million Hangars $4.0 Million **Total $15.8 Million**
Preferred Alternative	NO	**YES**

** Non-jurisdictional wetlands in the East area may require further review. There are also isolated cultural findings identified in the East Area and the Minot International Airport has some identified tribal sites on the property. Development in this area may require coordination with the FAA, Tribal Historic Preservation Officer (THPO), State Historic Preservation Office (SHPO) and possibly Tribal Monitors.*
***Assumes full-build out of alternative as shown*

Source: KLJ Analysis

Recommendation - While development in the east area is not expected in the short-term, it was determined to show this development in the Preferred Alternative to provide the option for a new ATCT location, potential Foreign Trade Zone, and Cargo. The preferred alternative does not include Aerial Applicator development. This option was chosen because it preserved space for general aviation uses that would be complimentary to the other areas of general aviation development and was an ideal location for ATCT and Aeronautical/Non-Aeronautical industrial type development. The preferred alternative is shown in **Exhibit 5-24 East Preferred Alternative**.

Preferred Alternative - Refined - During the development of the ALP the east preferred alternative was further refined. The changes were made to relocate the ATCT from the east area to the northeast area and to add an aerial applicator area. Exhibit 5-24R East General Aviation Area Preferred Alternative - Refined depicts the refined preferred alternative.

Exhibit 5-24 – East GA Area Preferred Alternative

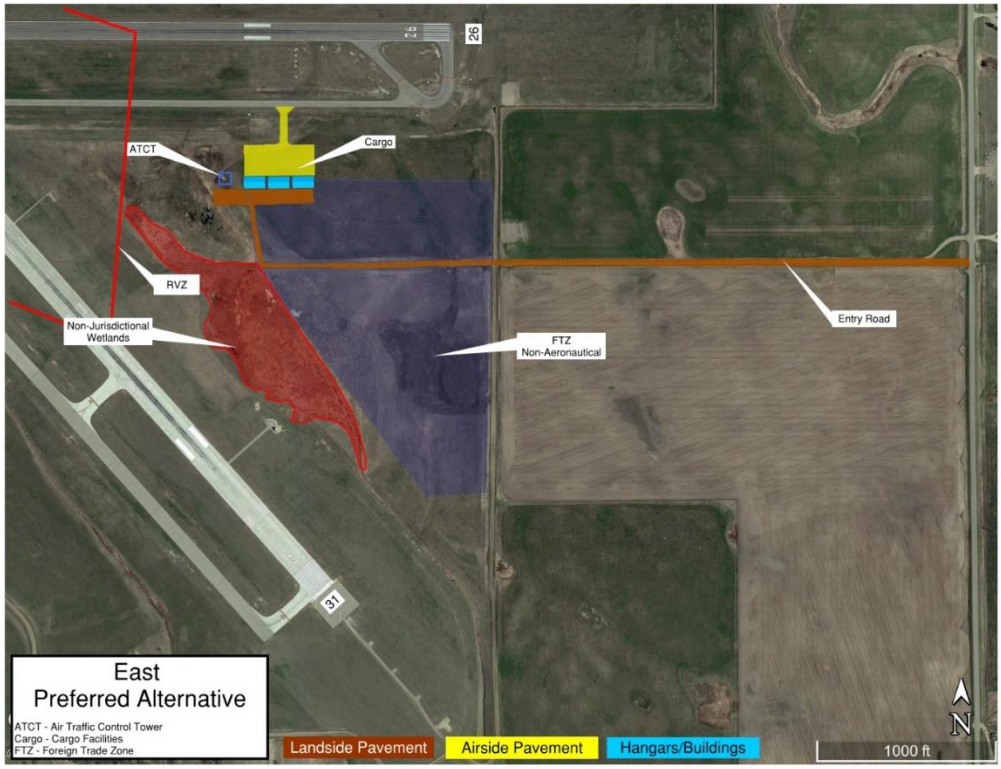
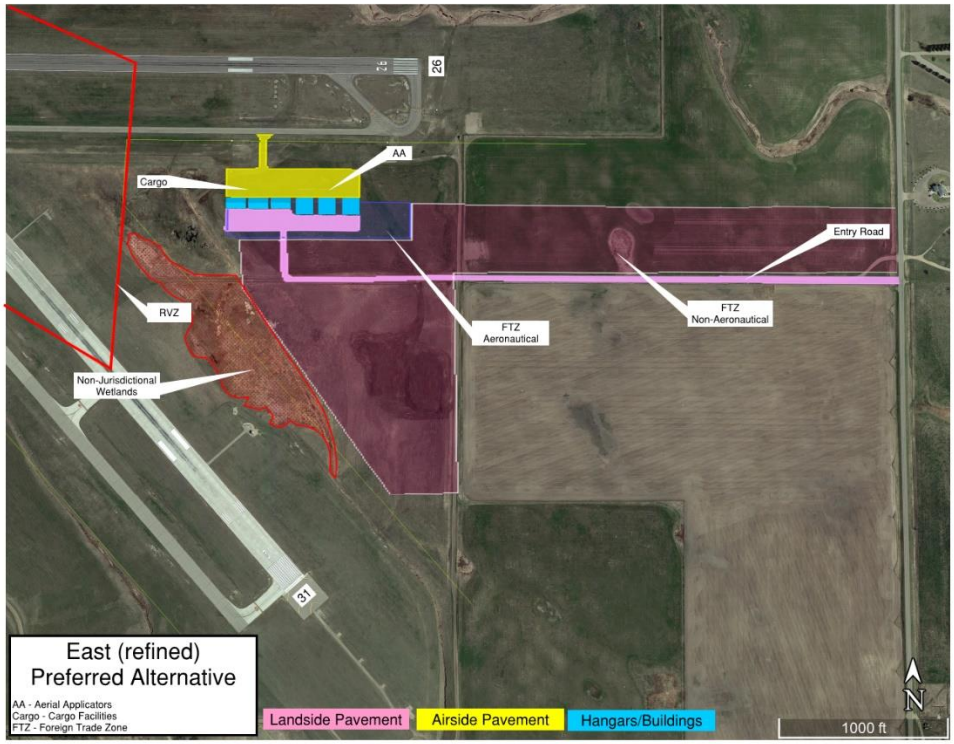


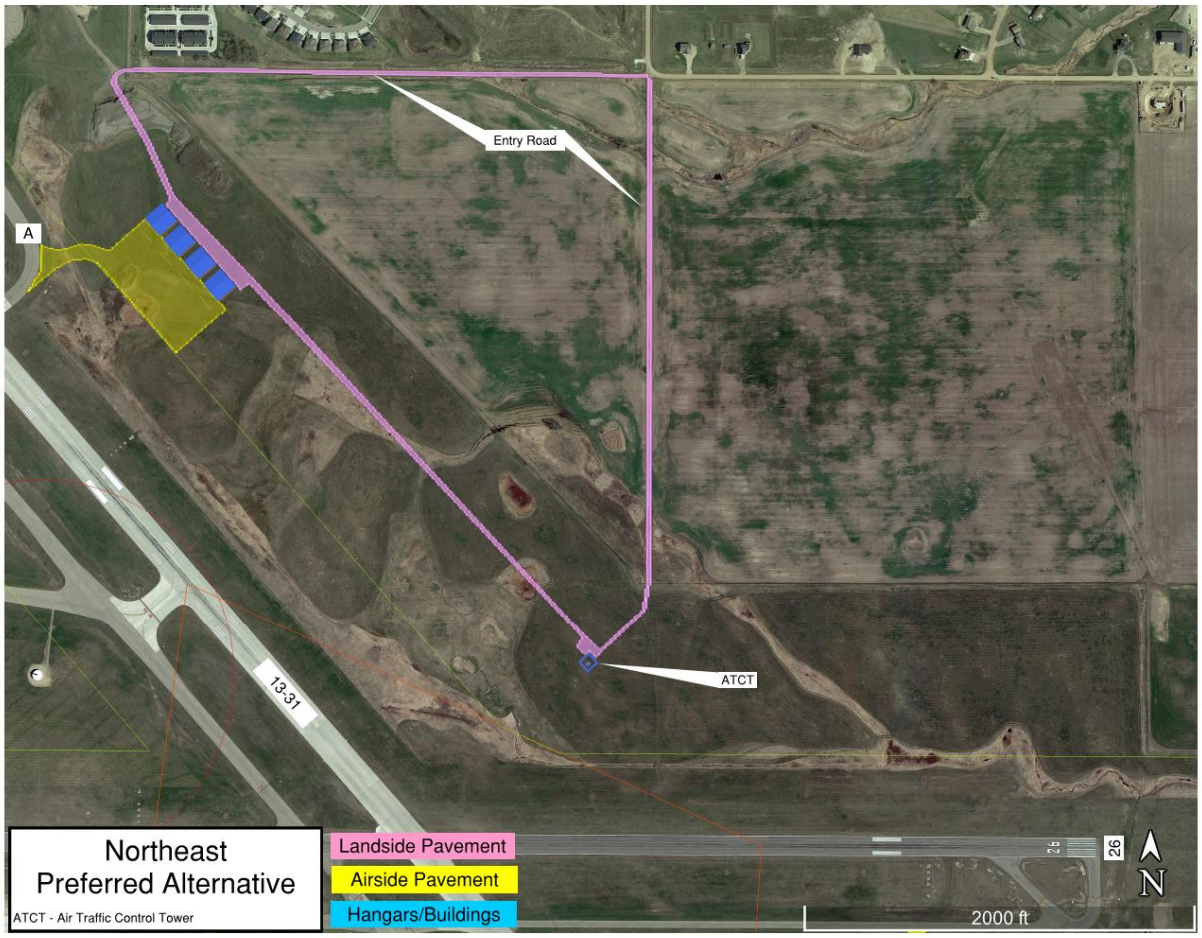
Exhibit 5-24r – East GA Area Preferred Alternative – Refined



General Aviation - Northeast Area

During the Airport Layout Plan process an area for development was added in the northeast part of the airport. The area of the airport east of Runway 13-31 and north of Runway 8-26 and was considered for long-term and ultimate development. The development includes the location for the ATCT and large hangars which would access Taxiway A.

Exhibit 5-25 – Northeast Area Preferred Alternative



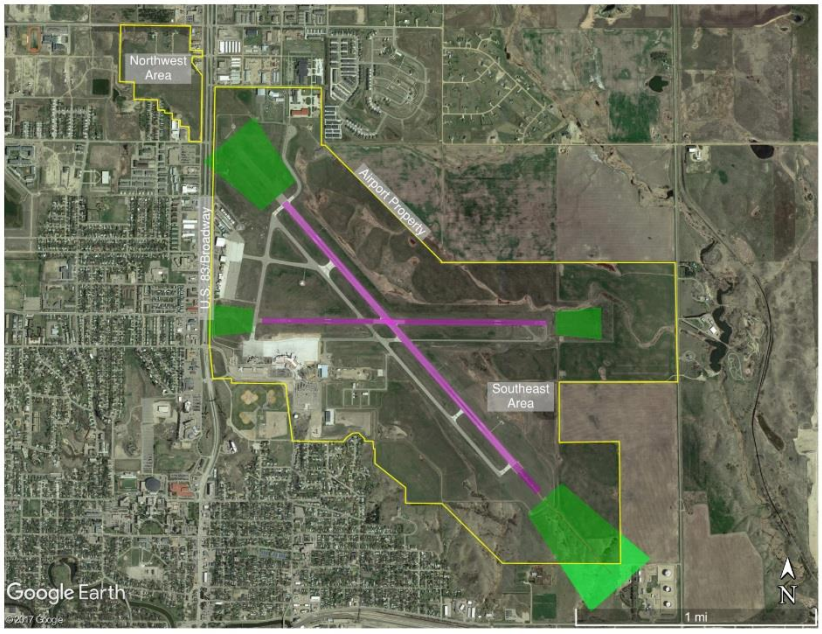
Military Facilities

Recommended development of NDARNG facilities are driven by their own facility master plan studies. These facilities have a lease with the airport through 2036, beyond the planning period for this study.

The boundary for the NDARNG facilities is not proposed to change. It is recommended that the airport continue to coordinate with the NDARNG to assure that the Army National Guard and all other users can operate effectively with each other. Some uses by the NDARNG are non-aeronautical in nature.

Non-Aeronautical Development Areas

There are portions of the airport that do not have an aeronautical development or airport land use protection purpose. These areas could otherwise be considered for non-aeronautical/aviation compatible development. Compatibility will include issues such as protecting safety surfaces, limiting wildlife hazards and protecting from incompatible uses on the ground. Potential non-aeronautical development areas are identified and discussed below. All non-aeronautical development is required to be shown on the Airport Layout Plan (ALP) and approved by FAA.



Northwest Area

The airport has property west of U.S. Highway 83/Broadway which is separated from the airfield. The property has height restrictions and was acquired to control land use in the Runway 13 approach zone. This property is also outside of existing and planned future RPZ. Compatible development could occur in this area through a long-term lease, or land release request through the FAA. The Exhibit "A"/Airport Property Map should be referenced to identify airport owned property. Structures must not penetrate any airspace protective surfaces. A cursory review shows the most restrictive FAR Part 77 airspace surface crosses the corner of 30th Avenue NW and U.S. Highway 83/Broadway approximately 45 feet above the ground.

Southeast Area

The airport owns property east of Runway 13-31 with access to 27th Street NE, close to future city industrial development. Non-aeronautical development, including a foreign trade zone (FTZ), could be included in a portion of this area in conjunction with aeronautical development.

Recommendation(s)

Depicting airport property for future non-aeronautical use to the west of U.S. Highway 83/Broadway outside of the FAA RPZ is recommended. Property to the east of Runway 13-31 is recommended to be identified for potential non-aeronautical development, outside of critical protection areas. See Exhibit 5-26 Preferred Alternative.

Support Facility Alternatives

Airport Traffic Control Tower

The airport is responsible, in cooperation with the FAA, for siting, constructing, and maintaining an Airport Traffic Control Tower (ATCT) for the airport. The airport, through this master plan study, is conducting a cursory review of potential sites so that future ATCT sites can remain feasible.

The existing ATCT facility may or may not be maintained at the current site, which is currently situated between the airline terminal and FedEx cargo area. No significant improvements have been made with the ATCT facility other than maintenance since its original construction in 1976. The current facility has limited line-of-sight to the southern portion of Taxiway B. As a result, hangar development in the South area is limited in height to maintain line of site with Taxiway C.

There were two alternative locations brought forward for airport consideration. These were in the existing location (new tower construction) and in the east area. When a new tower location is examined in the future it will be required for FAA Air Traffic division to complete a tower siting study to determine up to three preferred sites. The preferred alternative was to preserve space for both ATCT locations. Further details are provided in the south and east area alternatives noted previously.

Fueling Facilities

The existing fuel farm located in the west GA area is sufficient through the planning period. The current location conflicts with some hangar development alternatives, but only in the long-term. Other locations for the fuel farm were identified in the alternatives. In addition, there was interest by the airport in identifying space for self-fueling. A self-fueling location in the south area was identified. See GA alternatives for the west and south areas for details on the fuel farm and self-fueling.

Aircraft Rescue and Fire Fighting (ARFF)

The ARFF station is a joint use facility serving both ARFF and structural firefighting. It is owned by the airport and staffed by firefighters from the City of Minot. There are deficiencies with the facility related to functionality, end of useful life, and crew quarters. A copy of the Building Assessment report, provided to KLJ in June 2016, is included in **Appendix J – Support Facilities**. A summary of the findings is noted as follows:

- Quarters and Office Areas occupy a narrow area between ARFF Apparatus Bays and Structural Apparatus Bays leaving little space for expansion (less than 2,000 SF currently and approximately 4,000 SF needed)
- Building was constructed close to existing grade and has several ongoing drainage issues with storm water and ground water
- Building is poorly insulated
- Building originally used an under-slab ventilation system that filled with ground water, was filled with concrete, but still presents air quality issues into the building
- Current Code requires automatic sprinklers
- Current Code requires egress windows from sleeping areas
- 8” steps between quarters/offices to apparatus bays does not meet ADA requirements
- Doorways do not meet ADA requirements
- Dormitory area is very small and does not provide gender equity with separation by plywood partitions and curtains
- The one bathroom for the crew quarters serves as toilet and shower room for all staff
- Mechanical and Electrical systems are inadequate

The airport is examining a major rehabilitation or replacement of the facility. Because the rehabilitation is currently estimated to be 64% of the cost of a new facility, the City of Minot is considering a replacement facility. Several locations were identified, each with access to the airfield and U.S. Highway 83/Broadway. See west GA and terminal area development for details. The preferred alternative for ARFF was concluded to expand and modify the station in its existing location. The ARFF is included in the West General Aviation Area preferred alternative.

Airport Maintenance & Snow Removal Equipment (SRE)

As a component of the new terminal building project, a new SRE facility was constructed in the south area. The building was sized using FAA criteria based on all critical snow removal areas and the existing/future equipment needed to clear these pavement areas in 30 minutes. The building is sufficiently sized and located to meet the airport's critical snow removal needs through the planning period. The most notable item is to assure that with any hangar development in the south area, the SRE must continue to have uninhibited access to the airfield without being required to enter the airfield through perimeter gates.

Customs and Border Protection (CBP)

The current CBP General Aviation Facility (GAF) located at the FBO is of sufficient size currently based on the aircraft using the airport. The CBP facility is approximately 2,800 SF in size and can efficiently handle aircraft of 10-15 passengers at a time. The current CBP GAF standard is approximately 3,000 SF. The facility size was determined to be sufficient to meet the needs of the airport through the planning period. No alternatives were examined for expansion or relocation.

However, even though the facility is sized sufficient and located appropriately for GA needs, the building was originally constructed in 1958 as the airport's passenger terminal. At one point the CBP began to occupy this area to provide customs services for passengers. In 1990, when a new terminal was constructed in the south area of the airport, CBP remained at its current location. Since 1990, very little improvements have been made to the facility. The facility is therefore in need of refurbishment and should be assessed whether the mechanical systems are adequate.

The next level up for a CBP facility from the GAF is a Federal Inspection Services (FIS) Facility. The smallest of these would be one designed for 50-200 passengers per hour and would require approximately 12,000 to 15,000 SF of space, typically connected to the passenger terminal building. An FIS allows for larger scheduled and unscheduled commercial flights to be processed. Although not evaluated in this plan, a logical location for an FIS at MOT is connected to the west portion of the new terminal building.

Security Fencing & Wildlife Control

It is recommended from the Wildlife Hazard Management Plan (WHMP) that the fencing be increased from 8' to 10' high. The security fencing change is included in the preferred alternative.

Internal Perimeter Road

An internal perimeter road provides secure airside access for authorized vehicles and minimize the need to cross active runways and taxiways. The current perimeter road is paved for a small portion around the MOT airport. The remaining portions are a mixture of all-weather and trail.

Fuel trucks are typically not licensed to traverse public roadways. Because of this, a paved internal perimeter road for fuel trucks should be reconstructed/established between the west apron area, the terminal apron, cargo apron, and south hangar area. This is compatible with the preferred alternative development and will be shown in the ALP.

It is recommended that the airport continue to add material to create all-weather roads around the airport perimeter. To minimize Foreign Object Debris on aircraft operational surfaces, FAA recommends the first 300 feet of a connecting access road should be paved connecting with any airfield pavement. This is generally met at MOT but should be maintained.

Airport Utilities

The location and type of airport utilities for facility development will be considered at the time of facility development. A significant existing deficiency is the lack of utilities to support any development on the east side of airport property. Development must consider the location and capacity of water main lines to assure sufficient fire protection is in place. The existing water system and city building codes will influence the types of construction for buildings at the airport.

Preferred Development Strategy

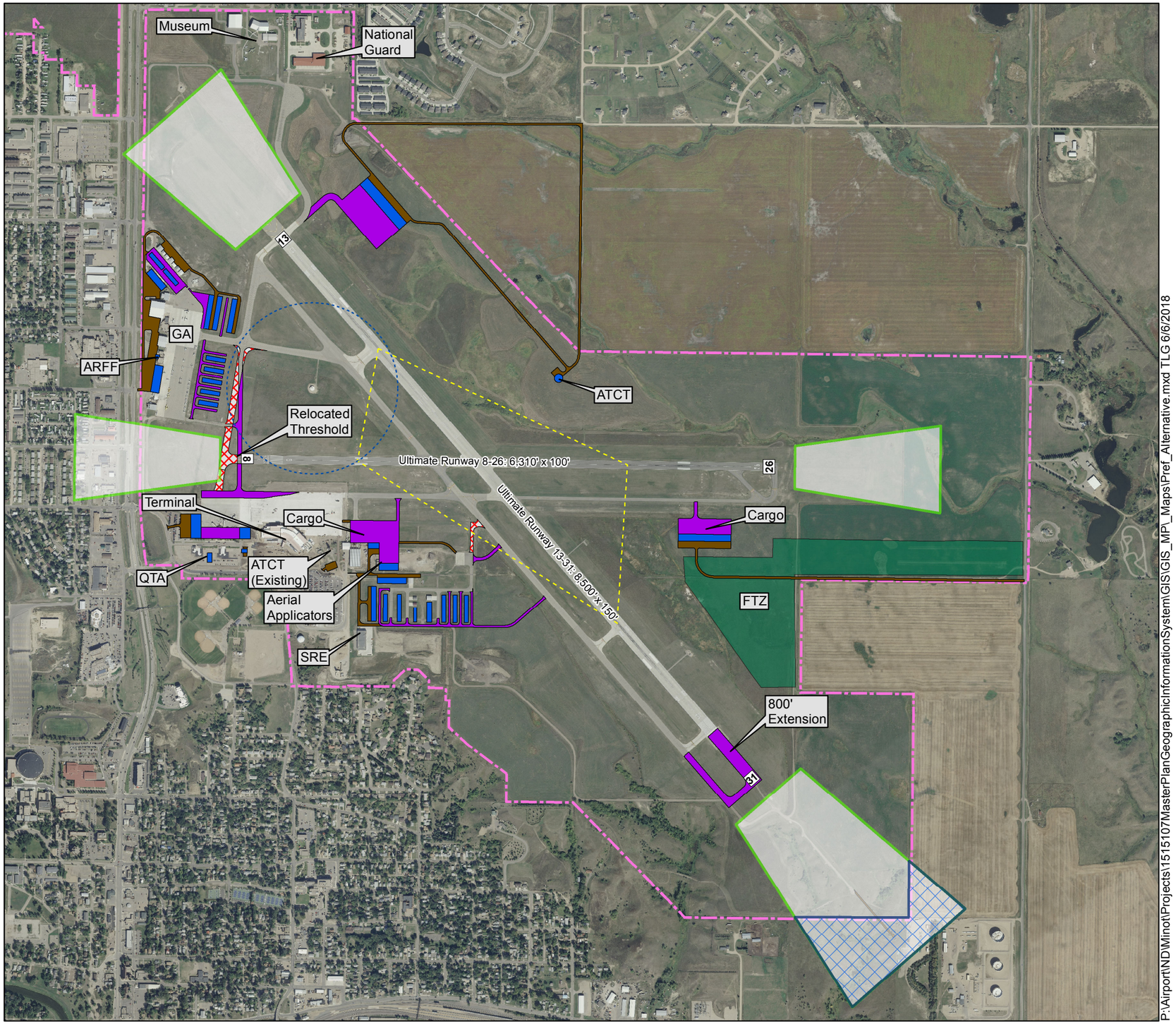
Table 5-15 Preferred Development Strategy presents a draft phasing plan. This serves as an overall summary of the preferred alternatives for each functional area. This plan is subject to change from refinements in **Chapter 6: Implementation Plan** based on Airport Capital Improvement Plan (AICP) financial considerations. The timing of improvements based on Planning Activity Levels should be adjusted accordingly should activity levels change from the approved forecast. The strategy assumes facility maintenance and rehabilitation will be completed as necessary.

Table 5-14 – Preferred Development Strategy

	Near-Term 0-5 Years PAL 1	Mid-Term 6-10 Years PAL 2	Long-Term 11-20 Years PAL 3 & 4	Ultimate 20+ Years Beyond PAL 4
Airfield	• Taxiway B Runway Guard Lights at Runway 8 • New Taxiway F connection to Taxiway C	• Straighten Taxiway D • Lower Approach Minimums for Runway 13 from 1 mile to ¾ mile	• Relocate Runway 8 Threshold • Realign Taxiway B	• Extend Runway 31 800’
Passenger Terminal	• QTA Facility • Add Rental Car Ready/Return Parking	• Add Employee Parking • Add Long Term Lot Booth	• Add Rental Car Storage	• None
General Aviation & Other	• Remove dilapidated T-Hangars in West area and replace hangar capacity ad demand dictates • Aerial Applicator area as demand dictates	• Add hangars as demand requires	• Add hangars as demand requires	• Add hangars as demand requires
Landside	• None	• None	• Utilities to east side as demand dictates	• None
Support	• ARFF Expansion/Renovation	• None	• None	• None

Source: KLJ Analysis

Exhibit 5-26 Preferred Alternative



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Legend

- Existing VOR 1000' Critical Area
- Ultimate Runway Visibility Zone
- Foreign Trade Zone
- Pavement Removal
- Ultimate Airside Pavement
- Ultimate Landside Pavement
- Ultimate Buildings
- Ultimate Runway Protection Zone
- Airport Property Boundary
- RPZ Land Acquisition - Fee/Easement

ARFF - Aircraft Rescue and Firefighting
QTA - Quick Turn-Around Rental Car Servicing
SRE - Snow Removal Equipment Building
ATCT - Air Traffic Control Tower
GA - General Aviation

N

0 500 1,000 2,000 Feet

*Intended for Planning Purposes Only

KLJ

Minot International Airport (MOT)
Preferred Alternative