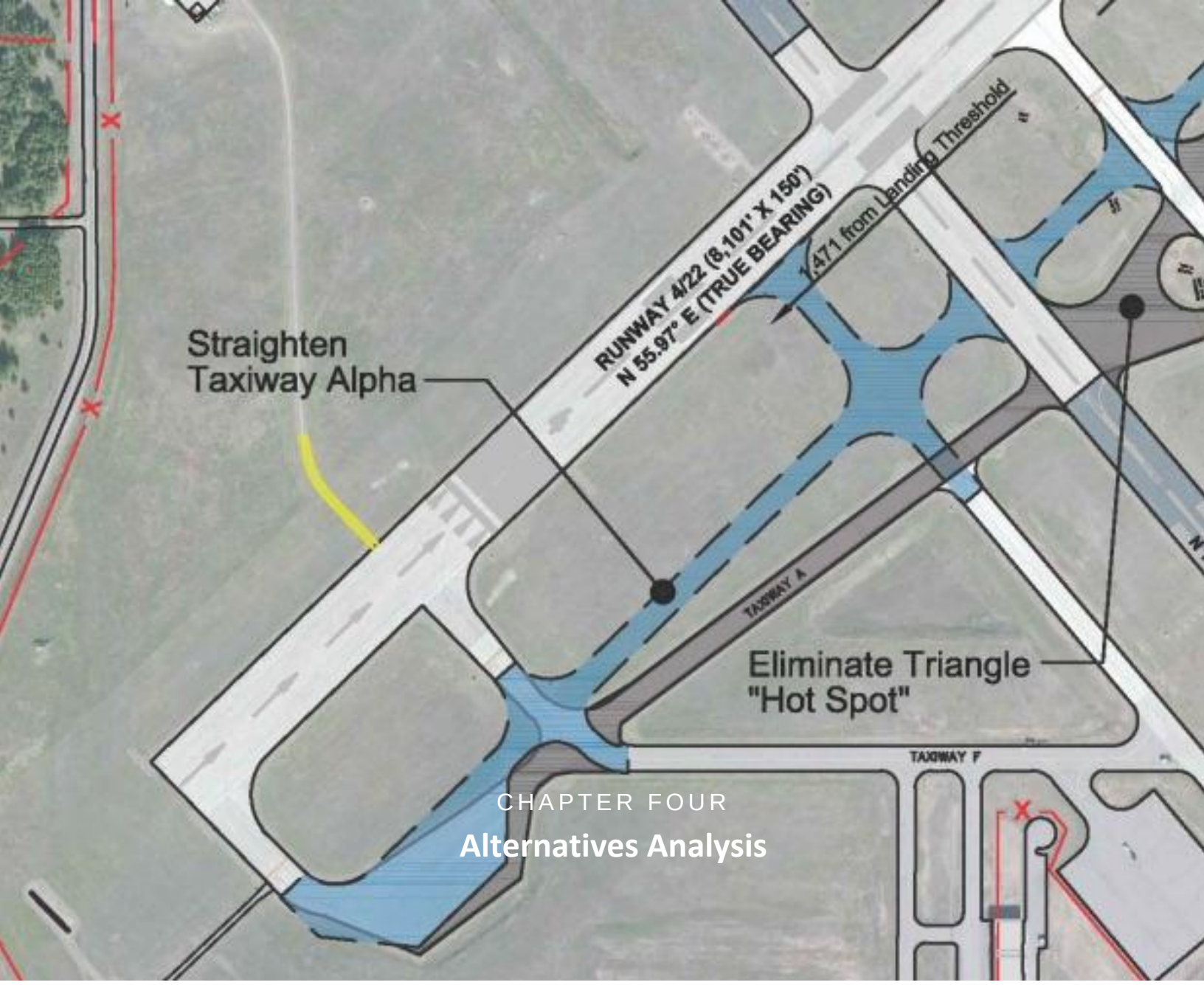


CHAPTER FOUR

Alternatives Analysis

4.0 OVERVIEW

This chapter presents and analyzes alternatives for meeting the facility requirements documented in Chapter 3. These alternatives take into consideration the long-term development of the Airport, while also planning for the implementation of near-term improvement projects. For each facility type, several improvement scenarios that meet the facility requirements were considered in the development of alternatives. Development alternatives are presented in the following sections:

- Runway/Taxiway Alternatives
- Navigational Aid Alternatives
- Passenger Terminal Alternatives
- Automobile Parking Alternatives
- Fuel Facility Alternatives
- Aircraft Deicing Facility Alternatives
- Aircraft Hangar Alternatives
- Aircraft Rescue and Firefighting (ARFF) Facility Alternatives
- Cargo Facility Alternatives

4.1 RUNWAY/TAXIWAY ALTERNATIVES

This section presents alternatives for meeting facility requirements associated with the runway and taxiway system at the Chippewa Valley Regional Airport (EAU), as follows:

- Runway 4/22 Declared Distances
- Taxiway System Reconfiguration Alternatives
- Runway 4 Hold Bay Alternatives
- Runway 14/32 Extension Alternatives

4.1.1 Runway 4/22 Declared Distances

As discussed in Chapter 3, FAA guidance recommends that the current 8,101-foot length of Runway 4/22 be maintained throughout the 20-year planning period. Therefore, no extensions to the current runway will be required. However, the current declared distances for Runway 4/22 do not maximize the possible operational distances for aircraft operators, and alternatives developed for this Master Plan Update should consider future implementation of the longest possible declared distances on Runway 4/22. These declared distances are shown in **Table 4-1**.

Table 4-1: Runway 4/22 Declared Distances

Runway	TORA	TODA	ASDA	LDA
Current Published Declared Distances				
4	8,101’	8,101’	8,101’	7,301’
22	7,301’	7,301’	7,301’	7,301’
Current Allowable Declared Distances				
4	8,101’	8,101’	8,101’	**7,300’**
22	**8,101’**	**8,101’**	**7,301’**	**7,301’**
Longest Possible Declared Distances				
4	8,101’	8,101’	8,101’	**7,701’**
22	8,101’	8,101’	**7,301’**	**7,301’**

Note: Highlighted current allowable declared distances are those which are different from the current published declared distances; highlighted longest possible declared distances are those which are different from the current allowable declared distances.

TORA = Takeoff Run Available *ASDA = Accelerate Stop Distance Available*

TODA = Takeoff Distance Available *LDA = Landing Distance Available*

Source: FAA Airport Facility Directory, 2 MAY 2013 to 27 JUN 2013

In 2011 and 2012, several operational and safety concerns were identified with the existing taxiway configuration and the Runway 4 hold bay. The resolution of these issues will determine, to a large extent, the possibility of achieving the longest possible declared distances shown in Table 4-1. The following two sections identify alternatives for resolving the taxiway configuration and hold bay concerns, and declared distances associated with the preferred solutions.

4.1.2 Taxiway System Reconfiguration Alternatives

As discussed in Chapter 3, portions of the current taxiway system south of Runway 4/22 present operational issues and safety concerns. These concerns are associated with unusual angles and connections between Taxiways 'A', 'B', 'C', and 'D', and can be summarized as follows:

- Non-parallel segments of Taxiway 'A' do not comply with the full-length parallel taxiway recommendation contained in FAA Advisory Circular 150/5300-13A, *Airport Design*.
- The current angled configuration of Taxiway 'A' results in a confusing triangle of intersections between Taxiways 'A', 'B', and 'C' immediately southwest of the commercial aircraft apron and immediately northeast of Runway 14/32. This triangle is labeled as a "hot spot" for aircraft incidents on the FAA Airport Diagram due to the close spacing of the taxiway intersections and their close proximity to Runway 14/32.
- The non-standard acute angle of Taxiway 'D' may cause confusion among operators unfamiliar with facilities and procedures at the Airport.
- Taxiway 'D' directly connects the aircraft parking apron to Runway 4/22, which heightens the potential for runway incursions and other aircraft incidents.

Five alternatives were developed that seek to address taxiway reconfiguration needs associated with these concerns.

Taxiway Alternative 1: Straighten Taxiway 'D'

The first alternative proposes realigning Taxiway 'D' to a 90-degree angle at its current location, 1,783 feet from the Runway 4 threshold and 5,517 feet from the Runway 22 threshold (see **Figure 4-1**). This location is preferred by based aircraft operators for a combination of two reasons:

1) Runway 22 is the preferred runway for landings, and
2) Taxiway 'D' is far enough removed from the Runway 22 threshold to allow for aircraft touchdown and deceleration prior to exiting the runway at this location in many situations.

This alternative corrects the acute angle of Taxiway 'D'. However, it still results in a direct connection between the aircraft parking apron and Runway 4/22; does not resolve the "hot-spot" triangle of Taxiways 'A', 'B', and 'C'; and does not provide for a fully-parallel Taxiway 'A'. As a result this alternative was removed from consideration.

Taxiway Alternative 2: Straighten and Relocate Taxiway 'D' 450' to the Northeast

The second alternative proposes moving Taxiway 'D' further northeast and aligning the taxiway at a 90-degree angle to Taxiway 'A' (see **Figure 4-2**). At this new proposed location, Taxiway 'D' would be 2,237 feet from Runway 4 threshold and 5,063 feet from the Runway 22 threshold.

This alternative solves both issues associated with Taxiway 'D': its acute angle and its direct connection of the aircraft parking apron to Runway 4/22. However, it does not resolve the "hot-spot" triangle of Taxiways 'A', 'B', and 'C'; and does not provide for a full parallel Taxiway 'A'. In addition, this location caused concern among based aircraft operators because it is too close to the Runway 22 threshold to provide for aircraft touchdown and deceleration prior to exiting the runway. For these reasons, this alternative was removed from consideration.

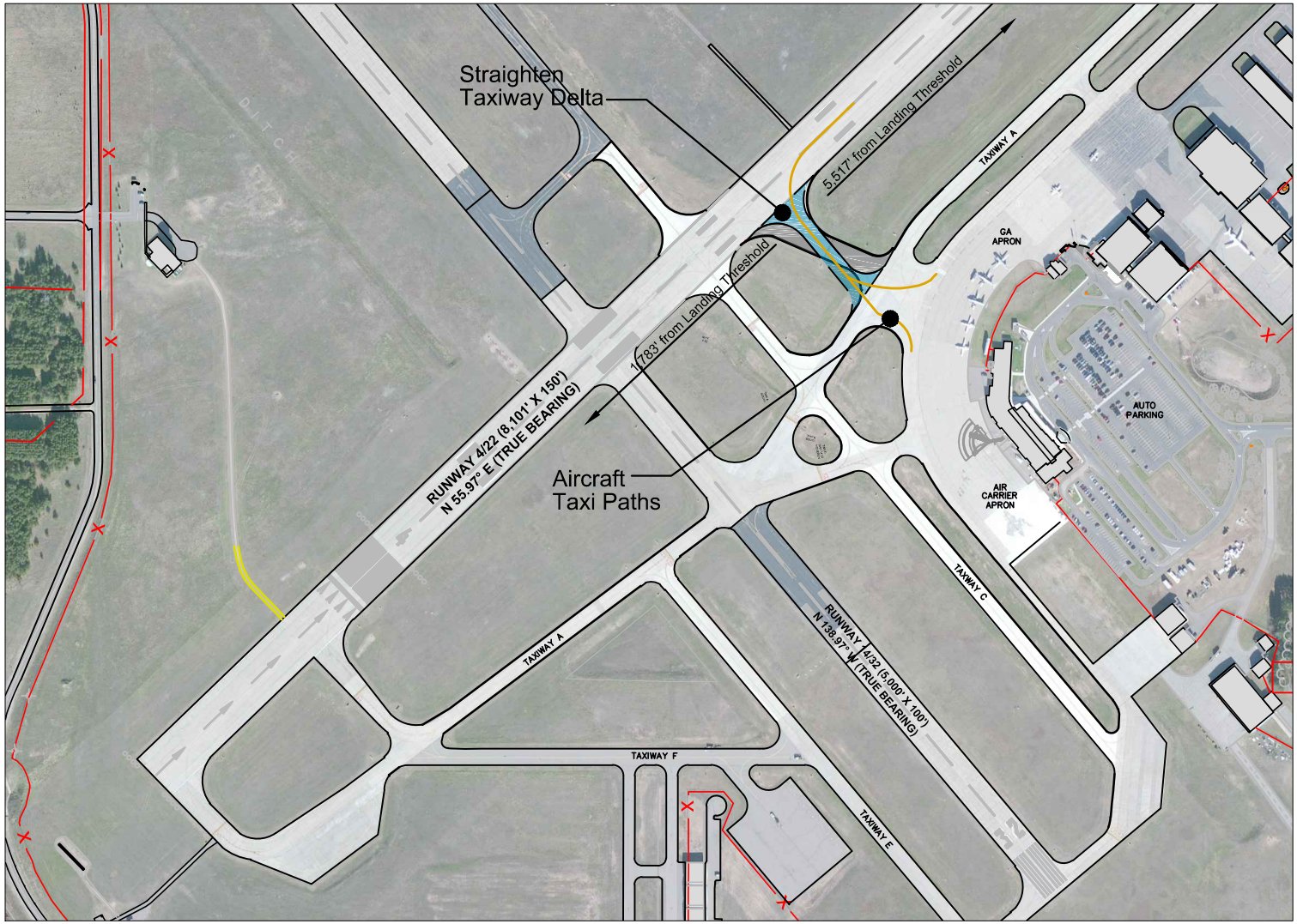


FIGURE 4-1

Taxiway Alternative 1: Straighten Taxiway 'D'

PROS

- Eliminates Non-Standard Exit Taxiway Angle
- Maintains Existing Runway 22 Threshold to Taxiway Distance (5,517')

CONS

- Maintains Direct Apron to Runway Access
- Maintains Non-Parallel Segments of Taxiway 'A' and Taxiway A/B/C Hotspot

NORTH

0 250' 500'

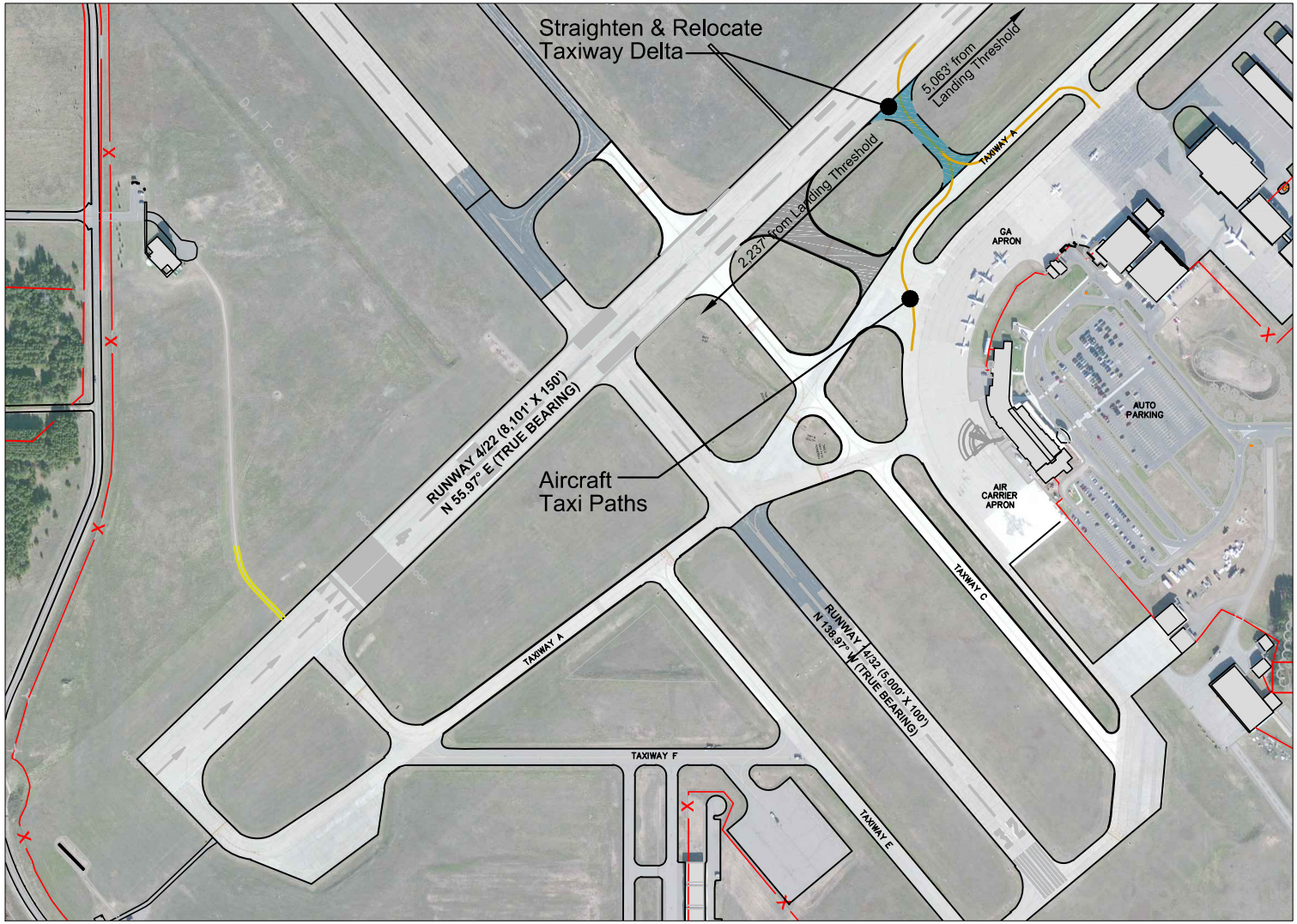


FIGURE 4-2

Taxiway Alternative 2: Straighten and Relocate Taxiway 'D' (450' NE)

PROS

- Eliminates Non-Standard Exit Taxiway Angle
- Eliminates Direct Apron to Runway Access

CONS

- Reduces Runway 22 Threshold to Taxiway Distance (from 5,517' to 5,063')
- Maintains Non-Parallel Segments of Taxiway 'A' and Taxiway A/B/C Hotspot

NORTH

0 250' 500'

Taxiway Alternative 3: Straighten and Relocate Taxiway 'D' 225' to the Northeast

The third alternative proposes moving Taxiway 'D' to a location approximately halfway between the locations proposed for Alternatives 1 and 2 (see **Figure 4-3**). At this new proposed location, Taxiway 'D' would be 2,012 feet from Runway 4 threshold and 5,288 feet from the Runway 22 threshold.

Like Alternative 2, this alternative solves both issues associated with Taxiway 'D': its acute angle and its direct connection of the aircraft parking apron to Runway 4/22. However, it does not resolve the "hot-spot" triangle of Taxiways 'A', 'B', and 'C'; and does not provide for a full parallel Taxiway 'A'. For these reasons, this alternative was removed from consideration.

Taxiway Alternative 4: Close Taxiway 'D'

The fourth alternative proposes to remove Taxiway 'D' without replacing it elsewhere (see **Figure 4-4**). As a result, aircraft operators would have to exit Runway 4/22 at Taxiway 'C' instead of Taxiway 'D', then turn left at Taxiway 'A' or Taxiway 'B' to access the aircraft parking apron.

Like Alternatives 2 and 3, this alternative solves both issues associated with Taxiway 'D': its acute angle and its direct connection of the aircraft parking apron to Runway 4/22. However, it does not resolve the "hot-spot" triangle of Taxiways 'A', 'B', and 'C'; and does not provide for a full parallel Taxiway 'A'. For these reasons, this alternative was removed from consideration.

Taxiway Alternative 5: Straighten Taxiway 'A' and Close Taxiways 'B' & 'D'

The final alternative proposes removing the portions of Taxiway 'D' and Taxiway 'B' that connect the parallel taxiways to their respective runways; removing segments of Taxiway 'A' that are not parallel to Runway 4/22; and replacing the removed segments of Taxiway 'A' with new segments that are parallel to Runway 4/22 (see **Figure 4-5**). Like Alternative 4, aircraft operators would have to exit Runway 4/22 at Taxiway 'C' instead of Taxiway 'D'.

Preferred Taxiway Alternative

Alternative 5 resolves all four operational issues and safety concerns with the current taxiway configuration at the Chippewa Valley Regional Airport by:

1) Providing a full parallel taxiway to Runway 4/22;
2) Eliminating the "hot-spot" triangle of Taxiways 'A', 'B', and 'C';
3) Resolving the confusing acute angle of Taxiway 'D'; and
4) Eliminating any direct connections between the aircraft parking apron and Runway 4/22.

For these reasons, Alternative 5 was chosen by the Airport Commission as the preferred alternative. At a meeting held on March 7, 2012, the FAA RSAT committee concurred that this alternative would be a satisfactory resolution to the safety concerns associated with the existing taxiway configuration.

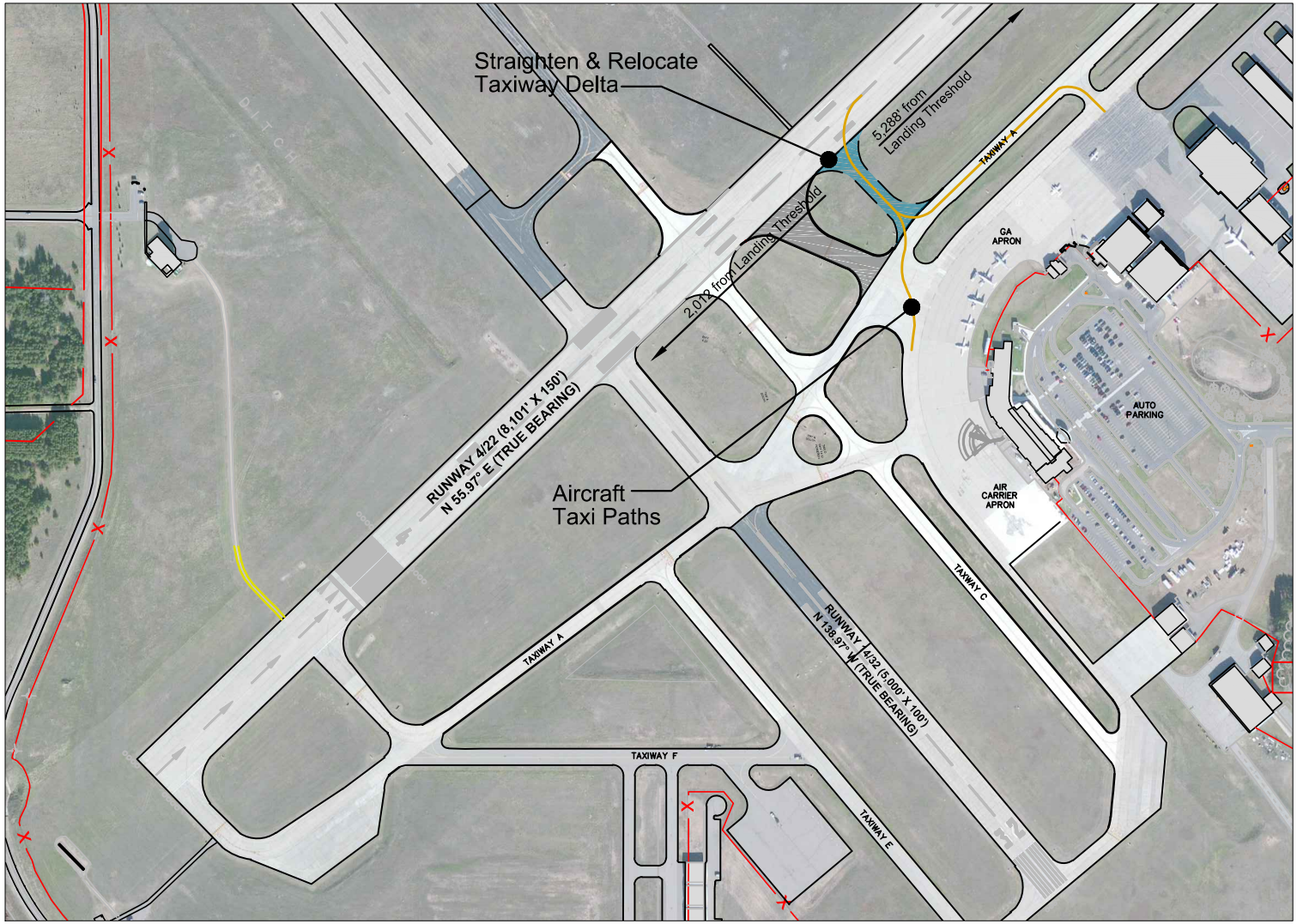


FIGURE 4-3

Taxiway Alternative 3: Straighten and Relocate Taxiway 'D' (225' NE)

PROS

- Eliminates Non-Standard Exit Taxiway Angle
- Eliminates Direct Apron to Runway Access

CONS

- Reduces Runway 22 Threshold to Taxiway Distance (from 5,517' to 5,288')
- Maintains Non-Parallel Segments of Taxiway 'A' and Taxiway A/B/C Hotspot

NORTH

0 250' 500'

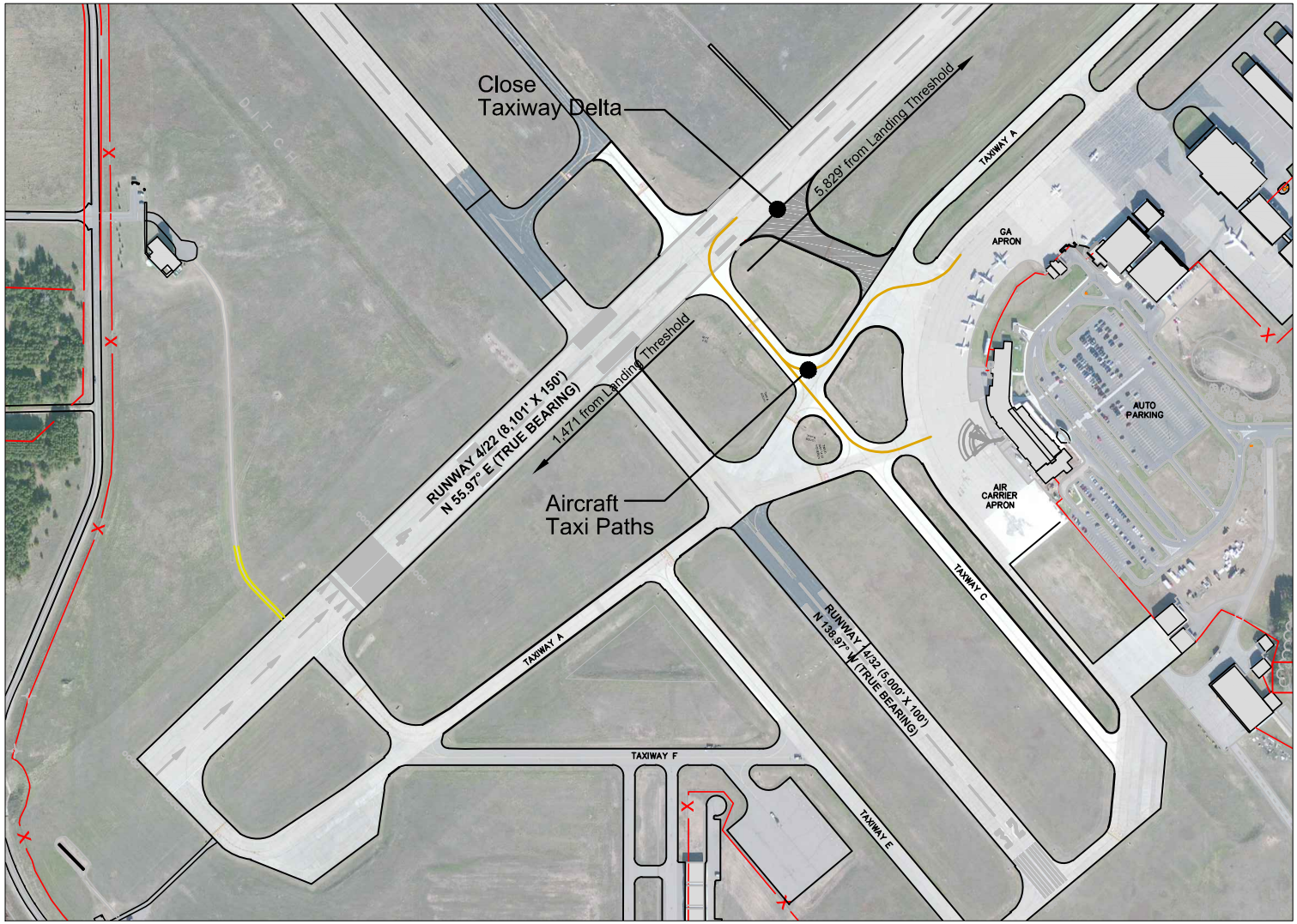


FIGURE 4-4

Taxiway Alternative 4: Close Taxiway 'D'

PROS

- Eliminates Non-Standard Exit Taxiway Angle
- Eliminates Direct Apron to Runway Access

CONS

- Maintains Non-Parallel Segments of Taxiway 'A' and Taxiway A/B/C Hotspot

NORTH

0 250' 500'

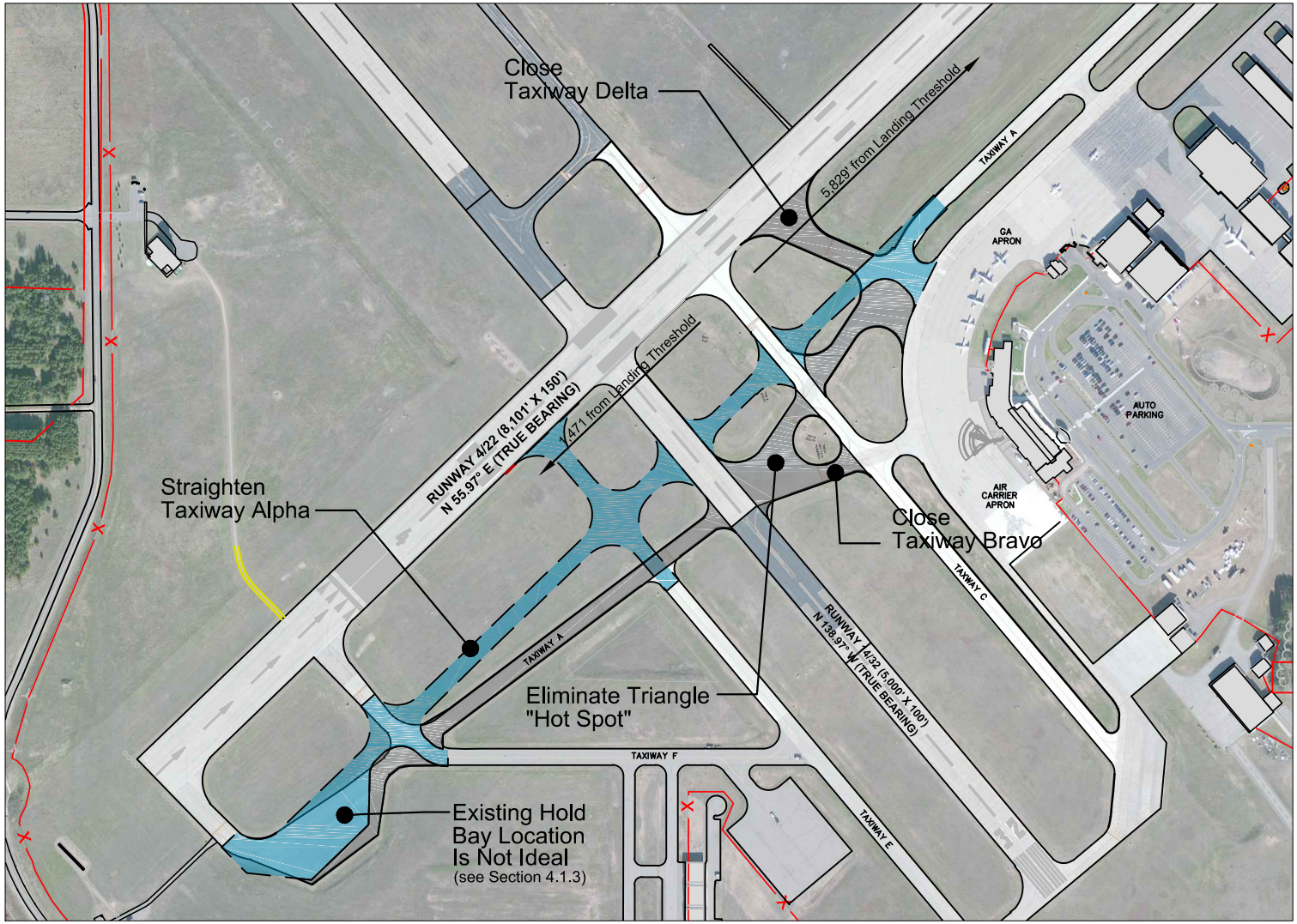


FIGURE 4-5

Taxiway Alternative 5: Straighten Taxiway 'A' & Close Taxiways 'B' & 'D'

PROS

- Eliminates Non-Standard Exit Taxiway Angle
- Eliminates Direct Apron to Runway Access
- Provides Full Length Parallel Taxiway for Runway 22
- Eliminates Taxiway A/B/C Hotspot

NORTH

0 250' 500'

4.1.3 Runway 4 Hold Bay Alternatives

As discussed in Chapter 3, Runway 4 currently has a displaced threshold located 800' to the northeast of the physical runway pavement end, and an aircraft hold bay is located adjacent to Taxiway 'A' at the southwestern end of the taxiway and beyond the Runway 4 displaced threshold. This configuration results in conflicts with Runway Protection Zone (RPZ), TERPS approach surface, and precision obstacle free zone (POFZ) design criteria prescribed by the FAA. Five development alternatives were developed that seek to mitigate conflicts associated with the RPZ, TERPS approach surface, and POFZ, while allowing for the construction of the preferred taxiway configuration alternative presented in the previous section.

Hold Bay Alternative 1: Realign Runway 4 Hold Bay with Taxiway 'A'

Alternative 1 involves reconstructing the hold bay in its existing location while realigning it with Taxiway 'A' (see **Figure 4-6**). This alternative would not address operational hazards associated with taxiway and hold bay pavement within the RPZ and POFZ, and would likely require increases in instrument approach procedure minimums. For these reasons, this is not a viable alternative.

Hold Bay Alternative 2: Relocate Runway 4 Hold Bay

Alternative 2 involves reconstructing the hold bay northeast of Taxiway 'A5' while maintaining the existing 8,101' length of Taxiway 'A' (see **Figure 4-7**). This alternative would relocate the entire hold bay outside the RPZ. However, it would not address operational hazards associated with taxiway pavement within the RPZ and POFZ, and would likely require increases in instrument approach procedure minimums. For these reasons, this is not a viable alternative.

Hold Bay Alternative 3: Relocate Runway 4 Hold Bay, Relocate Taxiway 'A5' 200' Northeast, and Close Taxiway 'A' South of Taxiway 'A5'

Alternative 3 involves reconstructing the hold bay northeast of Taxiway 'A5'; reconstructing Taxiway 'A5' 200' to the northeast of its existing location; and closing Taxiway 'A' south of Taxiway 'A5' (see **Figure 4-8**). This alternative would remove all hold bay and taxiway pavements from the Runway 4 RPZ and POFZ, and would not require increases in instrument approach procedure visibility minimums. The length of Taxiway 'A' would be reduced to 7,300' under this alternative. The remaining 801' of Runway 4/22 would be available for takeoff via back-taxi on the runway. This alternative would not allow for implementation of the longest possible Runway 4/22 declared distances presented in Section 4.1.1

Hold Bay Alternative 4: Relocate Runway 4 Hold Bay, Close Taxiway 'A' South of Taxiway 'A5', and Relocate Runway 4 Landing Threshold 201' Southeast

Alternative 4 is similar to Alternative 3, but also includes relocating the Runway 4 landing threshold 201' to the southwest to align with existing Taxiway 'A5' (see **Figure 4-9**). This alternative would remove all hold bay and taxiway pavements from the Runway 4 RPZ and POFZ, and is not expected to require increases in instrument approach procedure visibility minimums. The length of Taxiway 'A' would be reduced to 7,501' under this alternative. The remaining 600' of Runway 4/22 would be available for takeoff via back-taxi on the runway. The relocated Runway 4 threshold would increase the landing distance available (LDA) on Runway 4 from 7,301' to 7,501'; however, it would also require the relocation of several NAVAIDs (threshold lights, PAPI, and REILs) and revisions to all Runway 4 approach procedures. This alternative would not allow for implementation of the longest possible Runway 4/22 declared distances presented in Section 4.1.1

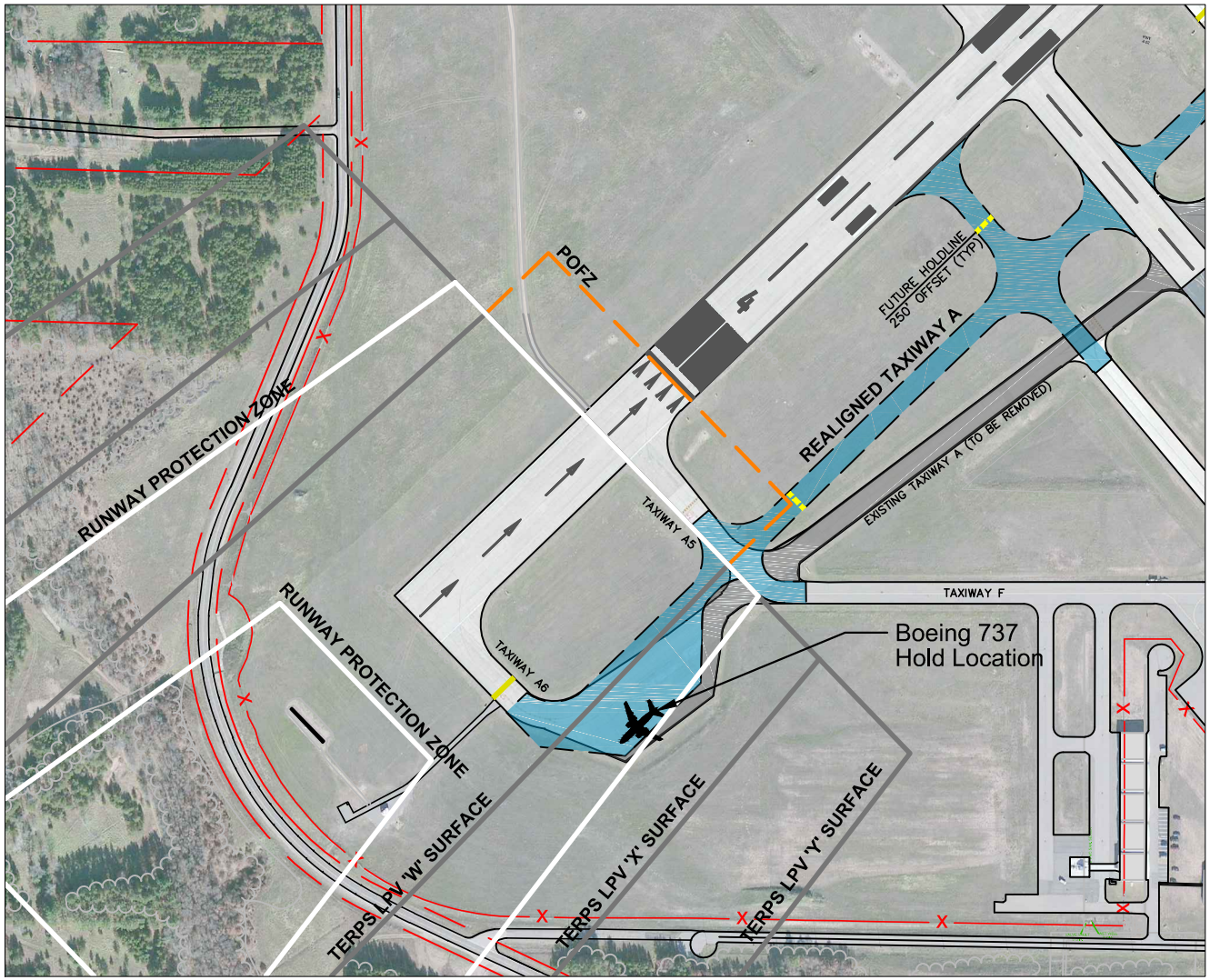


FIGURE 4-6

Hold Bay Alternative 1: Realign Runway 4 Hold Bay with Taxiway 'A'

PROS

- Maintains Existing Operating Procedures
- No Back-Taxi on Runway Required to Utilize Full Runway Length for Takeoff
- Does Not Require Relocation of Runway 4 NAVAIDs (REILs, PAPI, Threshold Lights)

CONS

- Hold Bay Location Within RPZ Not Constistent with FAA Guidelines
- May Require Increase in Runway 4 Approach Minimums
- Aircraft Taxiing on Taxiway 'A' Must Hold Outside POFZ During Low Visibility Conditions

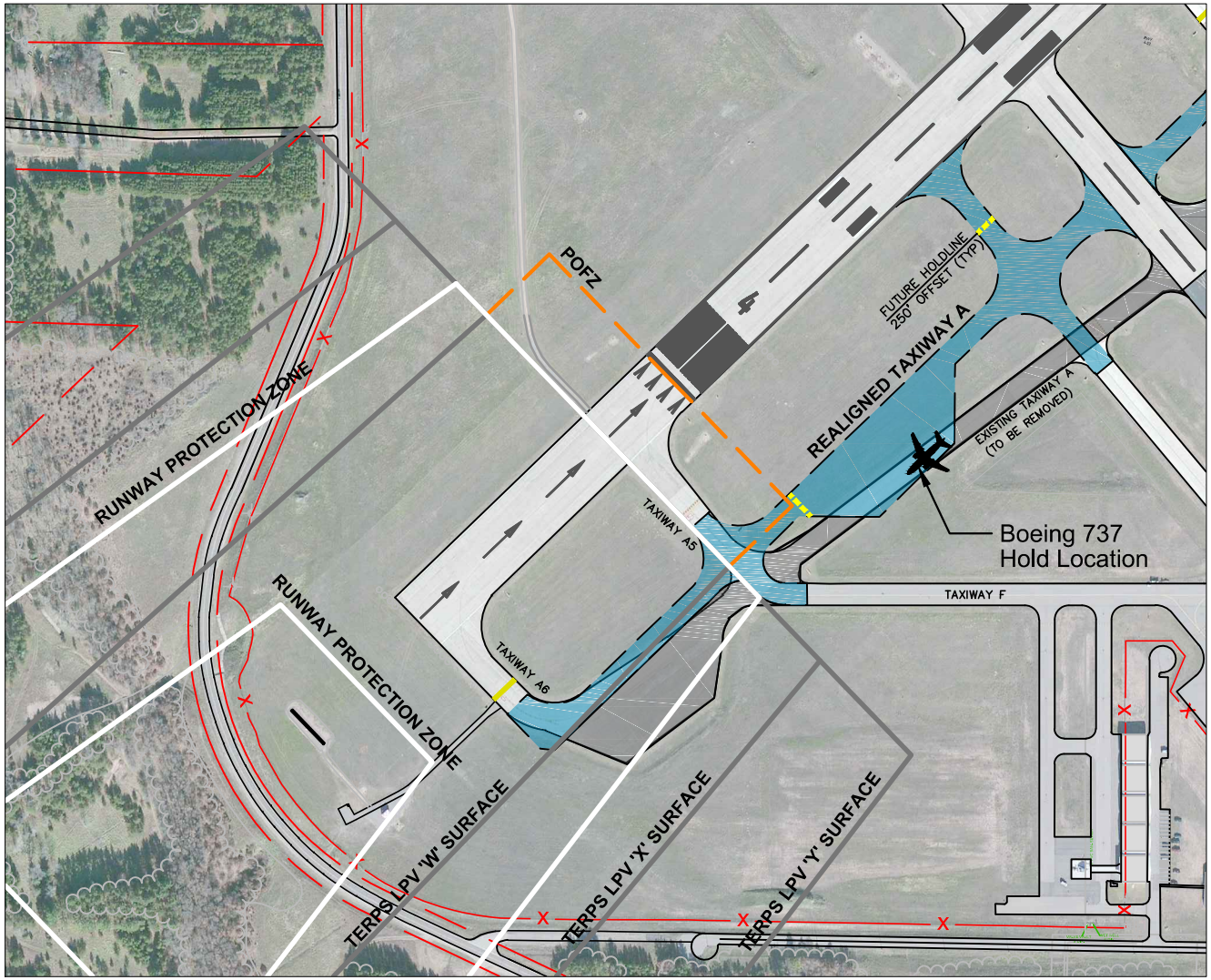


FIGURE 4-7

Hold Bay Alternative 2: Relocate Runway 4 Hold Bay

PROS

- Removes Entire Hold Bay from RPZ
- Does Not Require Relocation of Runway 4 NAVAIDs (REILs, PAPI, Threshold Lights)
- No Back-Taxi on Runway Required to Utilize Full Runway Length for Takeoff

CONS

- Aircraft Taxiing on Taxiway 'A' Must Hold Outside POFZ During Low Visibility Conditions
- May Require an Increase in Runway 4 Approach Minimums

NORTH

0 200' 400'

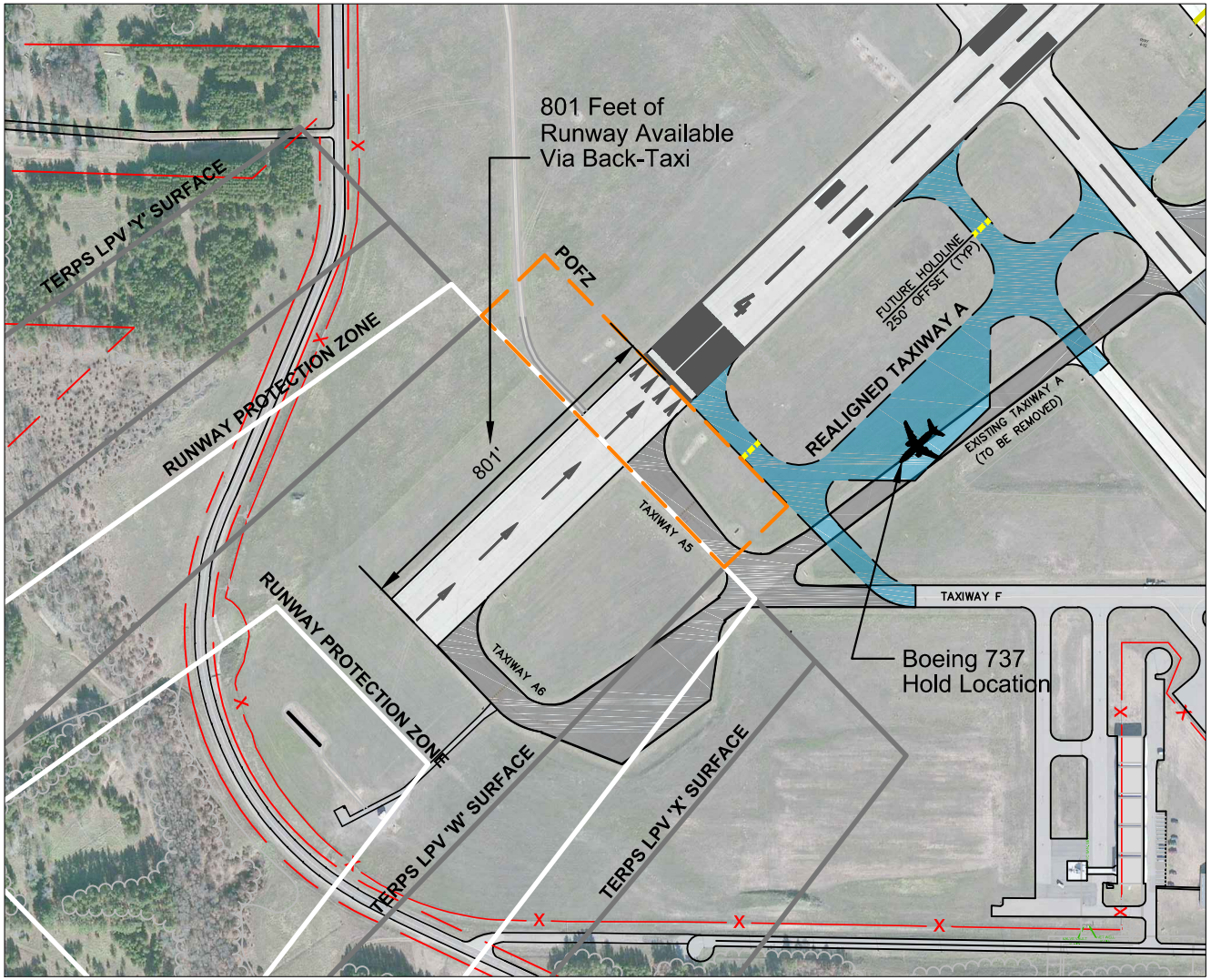


FIGURE 4-8

Hold Bay Alternative 3: Relocate Hold Bay, Relocate Taxiway 'A5' 200' Northeast, and Close Taxiway 'A' South of Taxiway 'A5'

PROS

- Removes Entire Hold Bay from RPZ
- Does Not Require an Increase in Runway 4 Approach Minimums
- Does Not Require Relocation of Runway 4 NAVAIDs (REILs, PAPI, Threshold Lights)
- Does Not Require Revision of Runway 4 Instrument Approach Procedures
- Removes Taxiway A & A5 from POFZ

CONS

- Aircraft Must Back-Taxi on Runway to Utilize Full Runway Length for Takeoff
- Taxiway A5 Must be Reconstructed to Remove Taxiways A & A5 from the POFZ

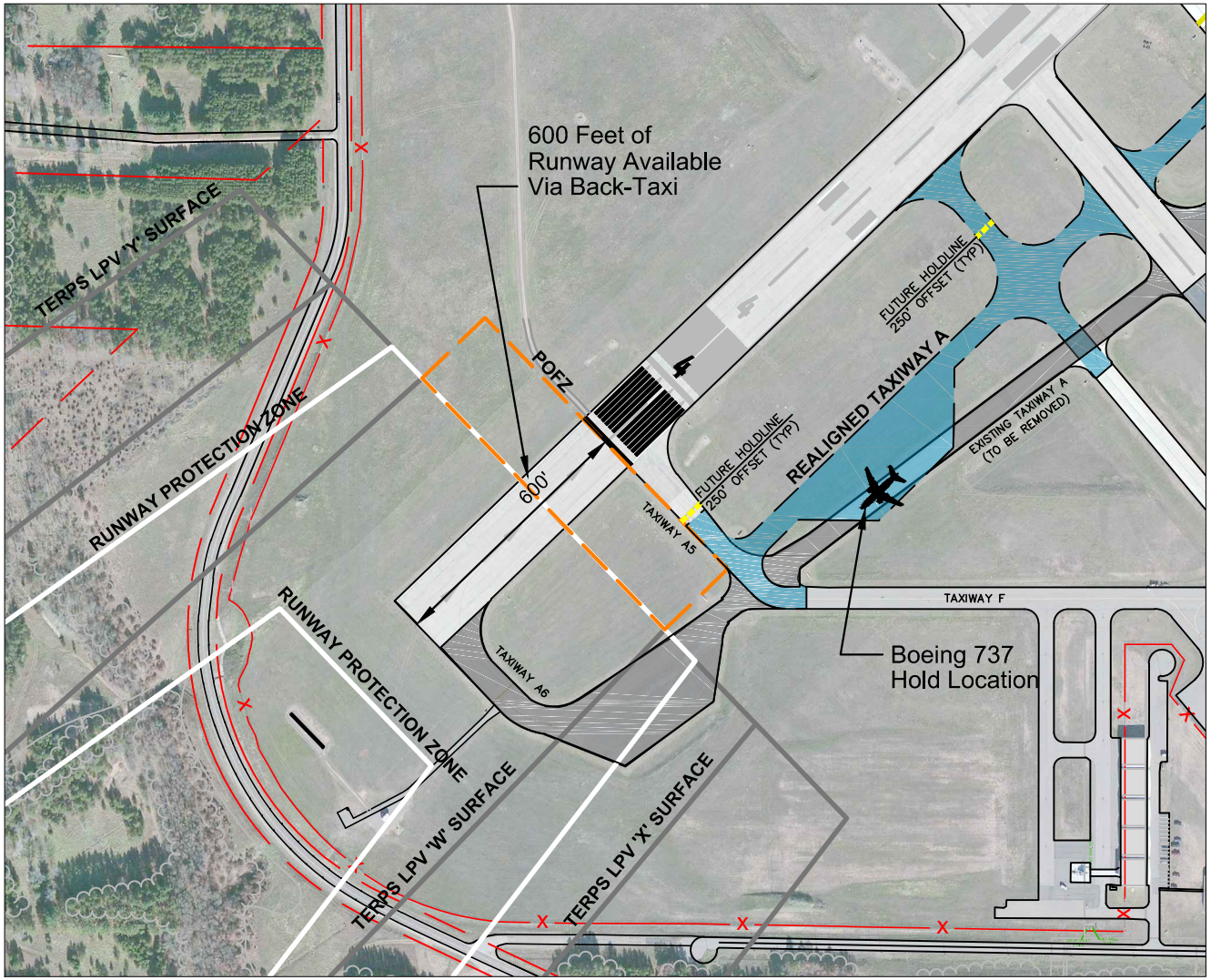


FIGURE 4-9

Hold Bay Alternative 4: Relocate Hold Bay, Close Taxiway 'A' South of Taxiway 'A5', and Relocate Runway 4 Landing Threshold 201' Southeast

PROS

- Removes Entire Hold Bay from RPZ
- Does Not Require an Increase in Runway 4 Approach Minimums
- Removes Taxiway 'A' & A5 from POFZ
- Provides Additional 201' of LDA for Runway 4
- Minimizes Operator Confusion Associated with Landing Threshold and Connector Taxiway Locations

CONS

- Aircraft Must Back-Taxi on Runway to Utilize Full Runway Length for Takeoff
- Requires Relocation of Runway 4 NAVAIDs (REILs, PAPI, Threshold Lights)
- Requires Revision of Runway 4 Instrument Approach Procedures

NORTH
0 200' 400'

Hold Bay Alternative 5: Relocate Hold Bay, Close Taxiway 'A' South of Taxiway 'A5', and Relocate Runway 4 Landing Threshold and Reconstruct Taxiway 'A5' 401' Southeast

Alternative 5 is similar to Alternative 3, but also includes relocating the Runway 4 landing threshold 401' to the southwest to provide the longest possible LDA for Runway 4 (see **Figure 4-10**). This alternative would remove all hold bay and taxiway pavements from the Runway 4 RPZ and POFZ, and is not expected to require increases in instrument approach procedure visibility minimums. The length of Taxiway 'A' would be reduced to 7,701' under this alternative. The remaining 400' of Runway 4/22 would be available for takeoff via back-taxi on the runway. The relocated Runway 4 threshold would increase the landing distance available (LDA) on Runway 4 from 7,301' to 7,701'; however, it would also require the relocation of several NAVAIDs (threshold lights, PAPI, and REILs) and revisions to all Runway 4 approach procedures. This alternative would allow for implementation of the longest possible Runway 4/22 declared distances presented in Section 4.1.1

Preferred Runway 4 Hold Bay Alternative

The five Runway 4 hold bay alternatives are compared in **Table 4-2**. Alternatives 1 and 2 do not resolve airfield layout conflicts associated with RPZ, TERPS, and POFZ design criteria, while Alternatives 3, 4, and 5 are expected to resolve these conflicts. The two main differences between Alternatives 3, 4, and 5 are the length of Taxiway 'A' and the Runway 4 displaced threshold location.

Table 4-2: Runway 4 Hold Bay Alternatives Comparison

	Design Criteria			Operational Changes			
Alternative	**Resolves RPZ Conflict**	**Resolves TERPS Conflict**	**Resolves POFZ Conflict**	**Relocate NAVAIDs**	**Revise Approach Procedures**	**Aircraft Back-Taxi on Runway**	**Longest Possible Declared Distances**
1							
2							
3	X	X	X			X	
4	X	X	X	X	X	X	
5	X	X	X	X	X	X	X

Based on the runway length requirements of the critical aircraft fleet and the current back-taxi procedures on Runway 4/22, the Runway 4 threshold should be located as far to the southwest as possible. Alternative 5 locates the threshold as far to the southwest as possible, thereby reducing the length of back-taxi on Runway 4/22, satisfying the runway length requirements of the majority of the critical aircraft fleet in most conditions, and implementing the longest possible declared distances presented in Section 4.1.1. For these reasons, Alternative 5 provides the preferred threshold and hold bay location for Runway 4 while eliminating operational hazards identified in Chapter 3.

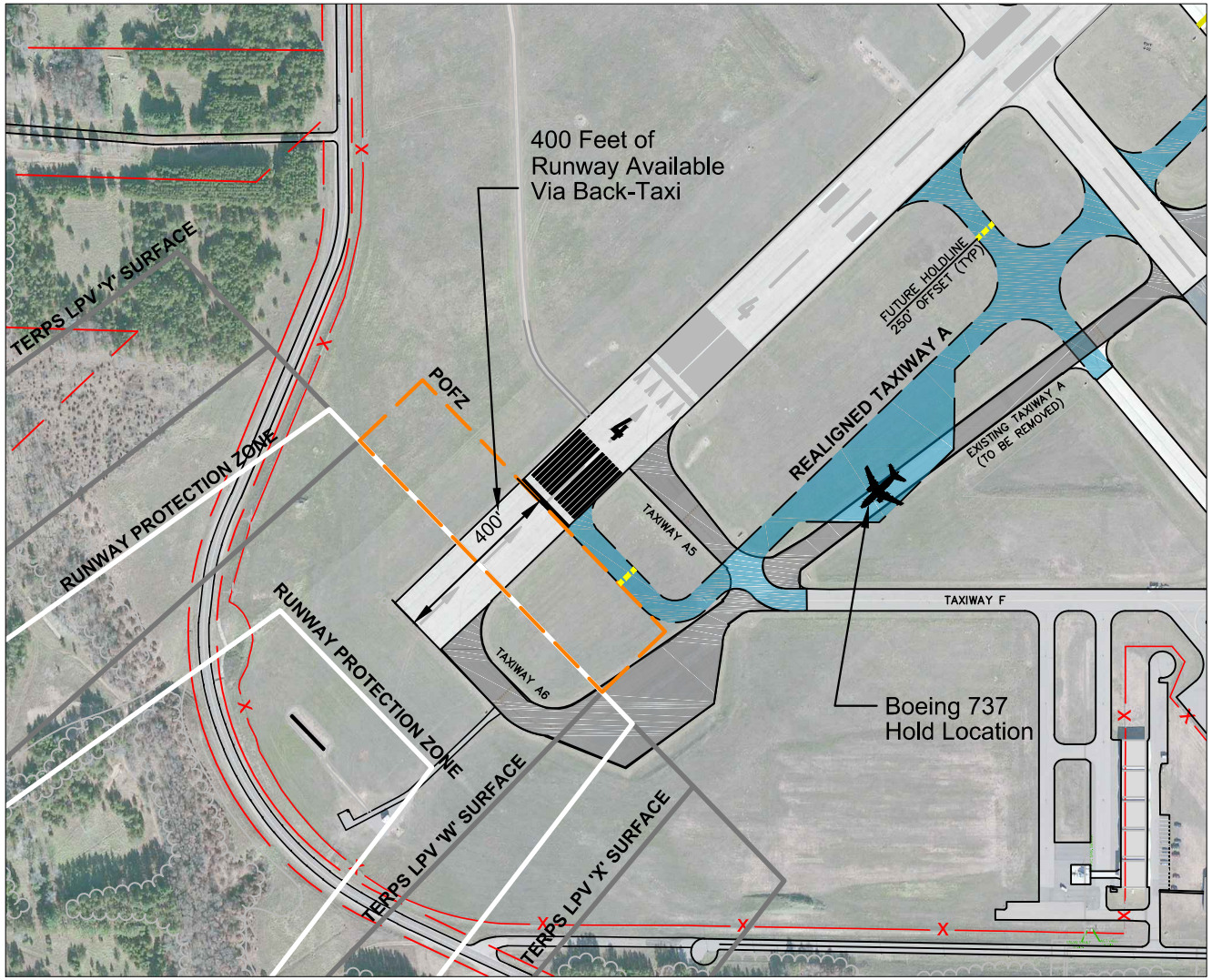


FIGURE 4-10

Hold Bay Alternative 5: Relocate Runway 4 Hold Bay, Close Taxiway 'A' South of Taxiway 'A5', and Relocate Landing Threshold 401' Southeast to Provide Longest Possible Landing Distance

PROS

- Removes Entire Hold Bay from RPZ
- Does Not Require an Increase in Runway 4 Approach Minimums
- Removes Taxiway 'A' & A5 from POFZ
- Provides Additional 401' of LDA for Runway 4
- Minimizes Operator Confusion Associated with Landing Threshold and Connector Taxiway Locations

CONS

- Aircraft Must Back-Taxi on Runway to Utilize Full Runway Length for Takeoff
- Added Cost Associated with Taxiway 'A5' Relocation
- Requires Relocation of Runway 4 NAVAIDs (REILs, PAPI, Threshold Lights)
- Requires Revision of Runway 4 Instrument Approach Procedures

4.1.4 Runway 14/32 Extension Alternatives

As noted in Chapter 3, the length for Runway 14/32 recommended by FAA guidance is 6,400 feet. The existing location and orientation of Runway 14/32, as well as topography and land uses surrounding the runway render the needed length difficult to achieve. Four alternatives have been developed for an extension to Runway 14/32 that seek to maximize runway length while minimizing off-Airport impacts associated with a runway extension.

Runway 14/32 Alternative 1

Alternative 1 involves a 115-foot extension to Runway end 14 for a total runway length of 5,115 feet (see **Figure 4-11**). This is the maximum possible extension that still provides clearance of Airport Road by the current FAR Part 77 visual approach surface. This alternative would not require closure of Airport Road and would not have significant adverse effects on Airport neighbors. However, an extension of 115 feet would have a marginal benefit and would not allow for nighttime use of a future non-precision instrument approach to Runway end 14.

Runway 14/32 Alternative 2

Alternative 2 involves a 250-foot extension to Runway end 14 for a total runway length of 5,250 feet (see **Figure 4-12**). This is the maximum possible extension that still provides clearance of Airport Road by the threshold siting surface required by AC 150/5300-13A for visual operations by large aircraft and instrument minimums greater than or equal to one statute mile (day only). The FAR Part 77 visual approach surface would not clear Airport Road under this alternative. This alternative would not require the closure of Airport Road and would not have significant adverse effects on Airport neighbors. Similar to Alternative 1, an extension of 250 feet would have a marginal benefit and would not allow for nighttime use of a future non-precision instrument approach to Runway end 14.

Runway 14/32 Alternative 3A

Alternative 3A involves a 500-foot extension to Runway end 14 and a 350-foot extension to Runway end 32, for a total extension of 850 feet (see **Figure 4-13A**). Alternative 3A provides a total runway length of 5,850 feet, which is the maximum possible length without closing and/or relocating Starr Avenue or North Lane. This alternative would allow for future non-precision instrument approaches to both runway ends with visibility minimums not less than 1 statute mile; however providing these approaches would require the closure of Airport Road beyond Runway end 14, and the relocation of Hallie Lane and the Airport-controlled service road on the Runway 32 end. This alternative would also have significant adverse effects to Airport neighbors beyond Runway end 32.

Runway 14/32 Alternative 3B

Alternative 3B is similar to Alternative 3A in that it includes the same overall 850-foot extension; however, it would allow for non-precision approach visibility minimums of ¾ statute miles on both runway ends (see **Figure 4-13B**). Providing these lower minimums would have significant additional adverse effects on Airport neighbors beyond both runway ends, and may require additional road closures and/or relocations on the Runway 32 end.

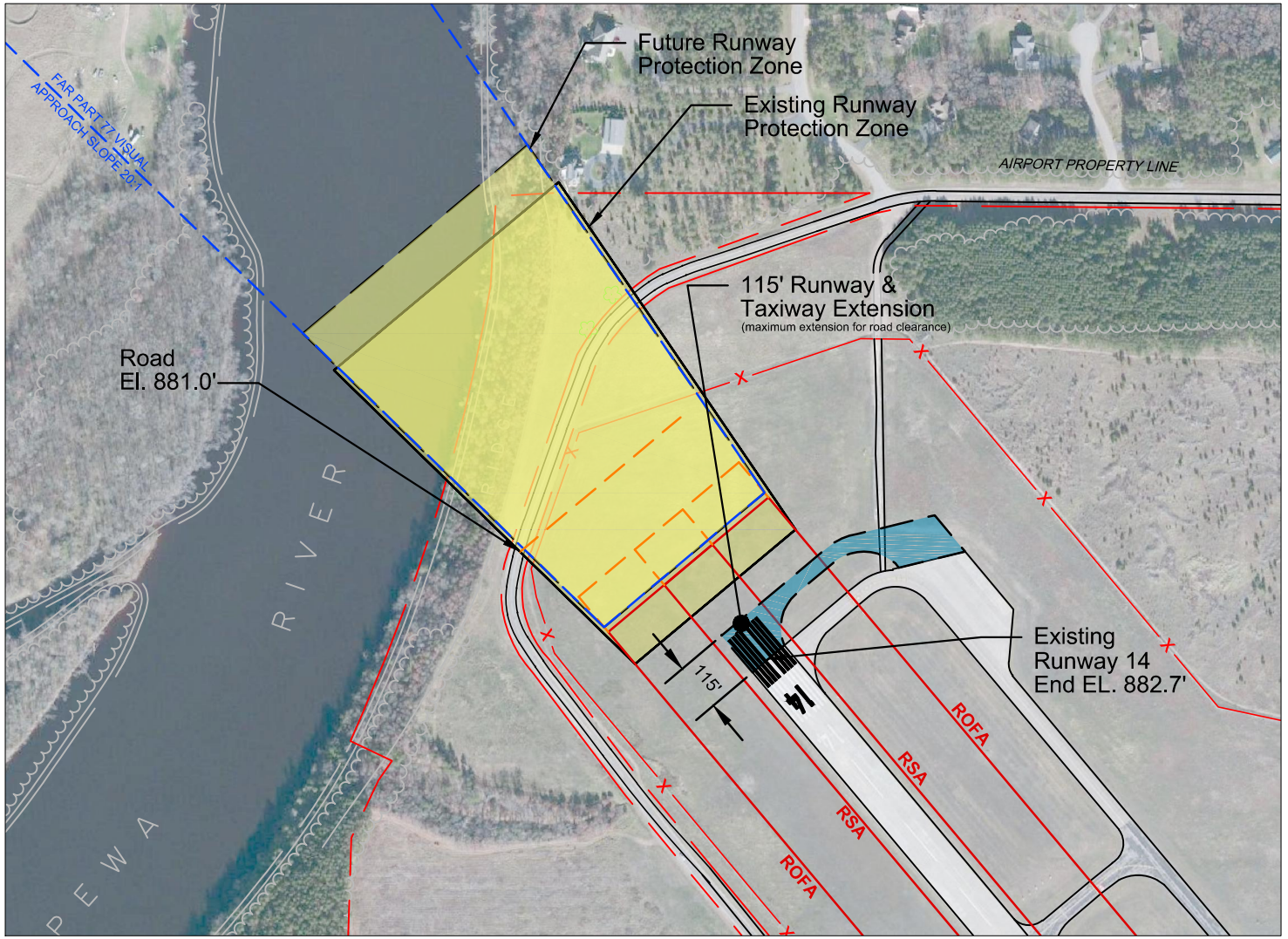


FIGURE 4-11

Runway 14/32 Extension Alternative 1 (115' Extension)

- Total Runway Length = 5,115'

PROS

- Does Not Require Closure of Airport Road
- Does Not Have Significant Adverse Effects on Airport Neighbors

CONS

- Minimal Operational Benefit Associated with Additional 115' of Runway Length
- Does Not Allow for Future Non-Precision Instrument Approaches to Runway 14

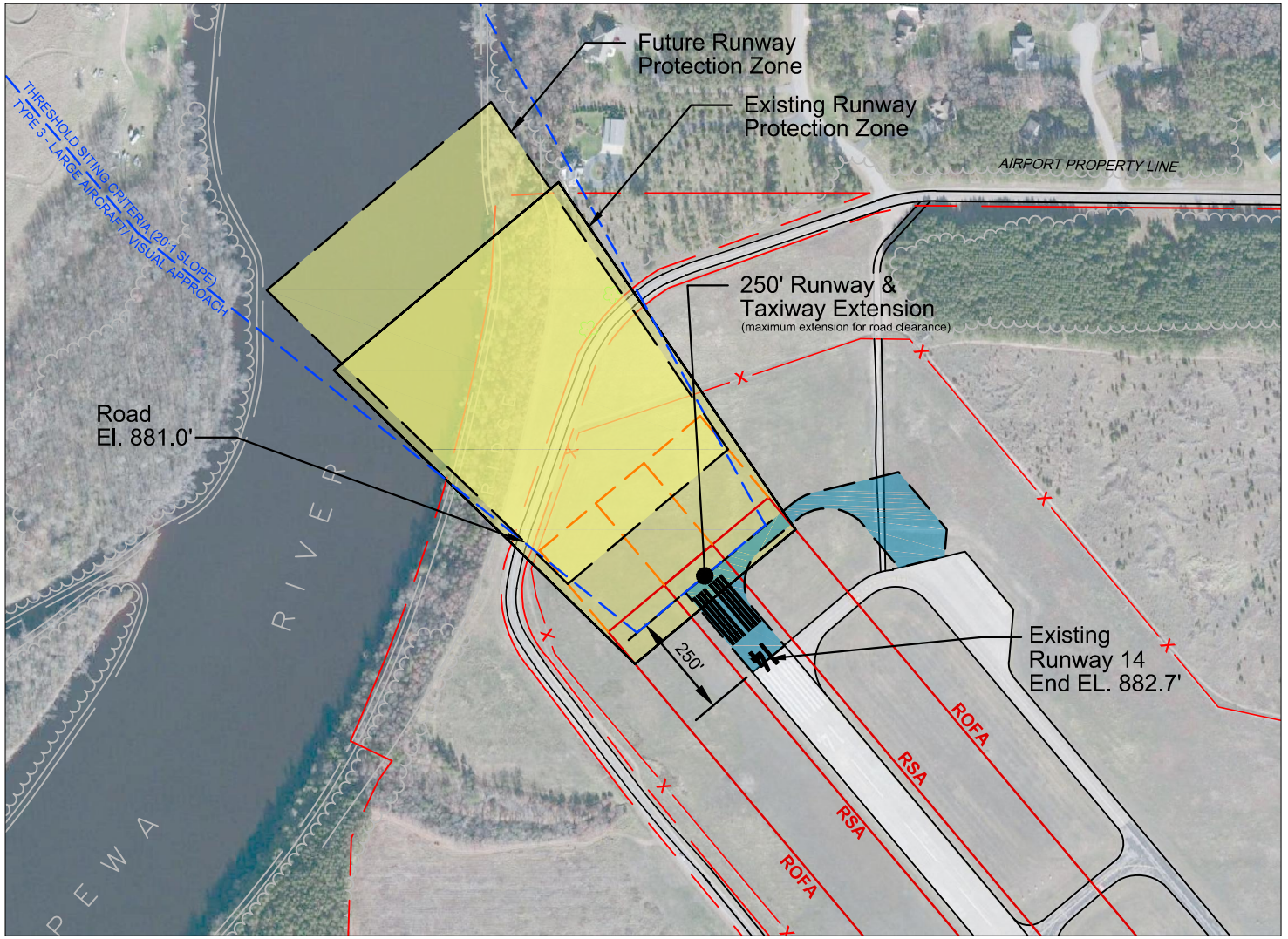


FIGURE 4-12

Runway 14/32 Extension Alternative 2 (250' Extension)

- Total Runway Length = 5,250'

PROS

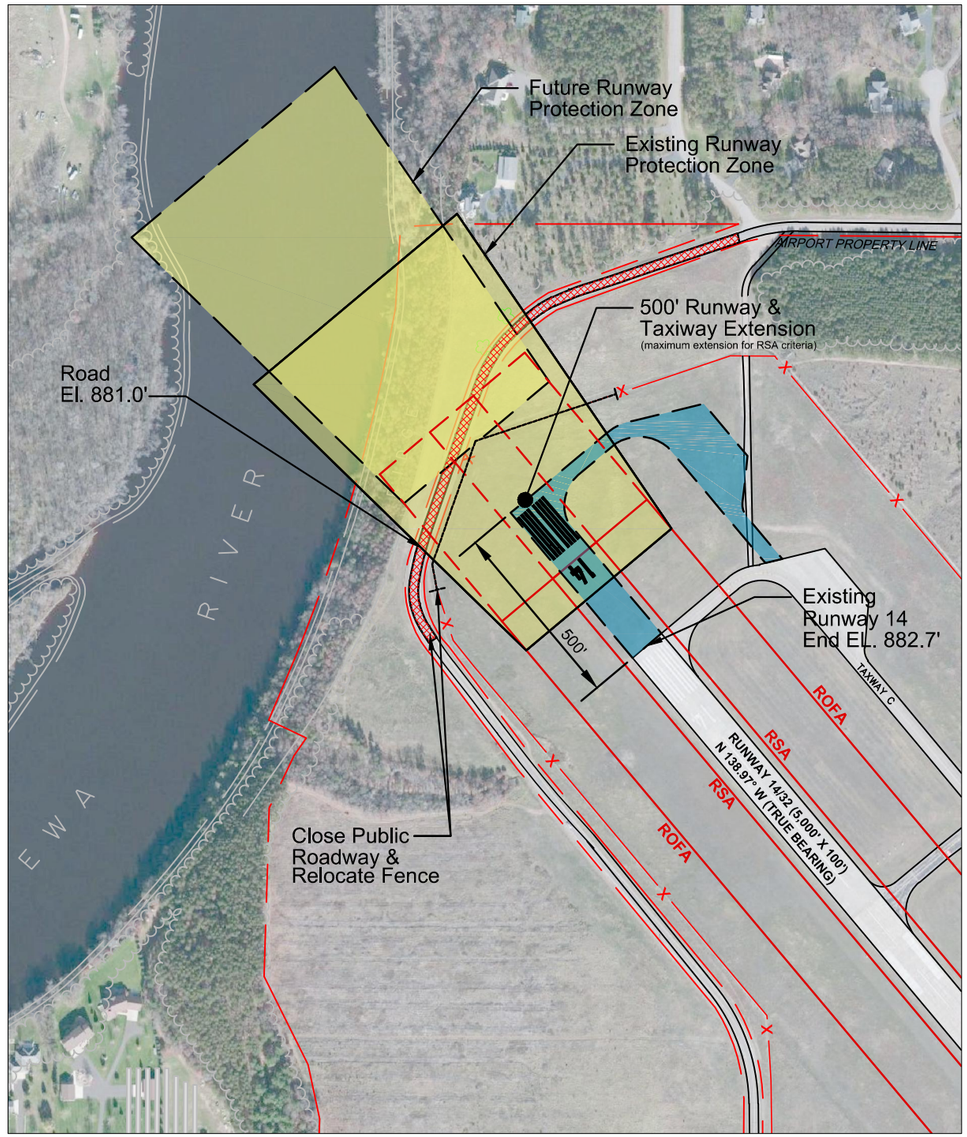
- Does Not Require Closure of Airport Road
- Does Not Have Significant Adverse Effects on Airport Neighbors

CONS

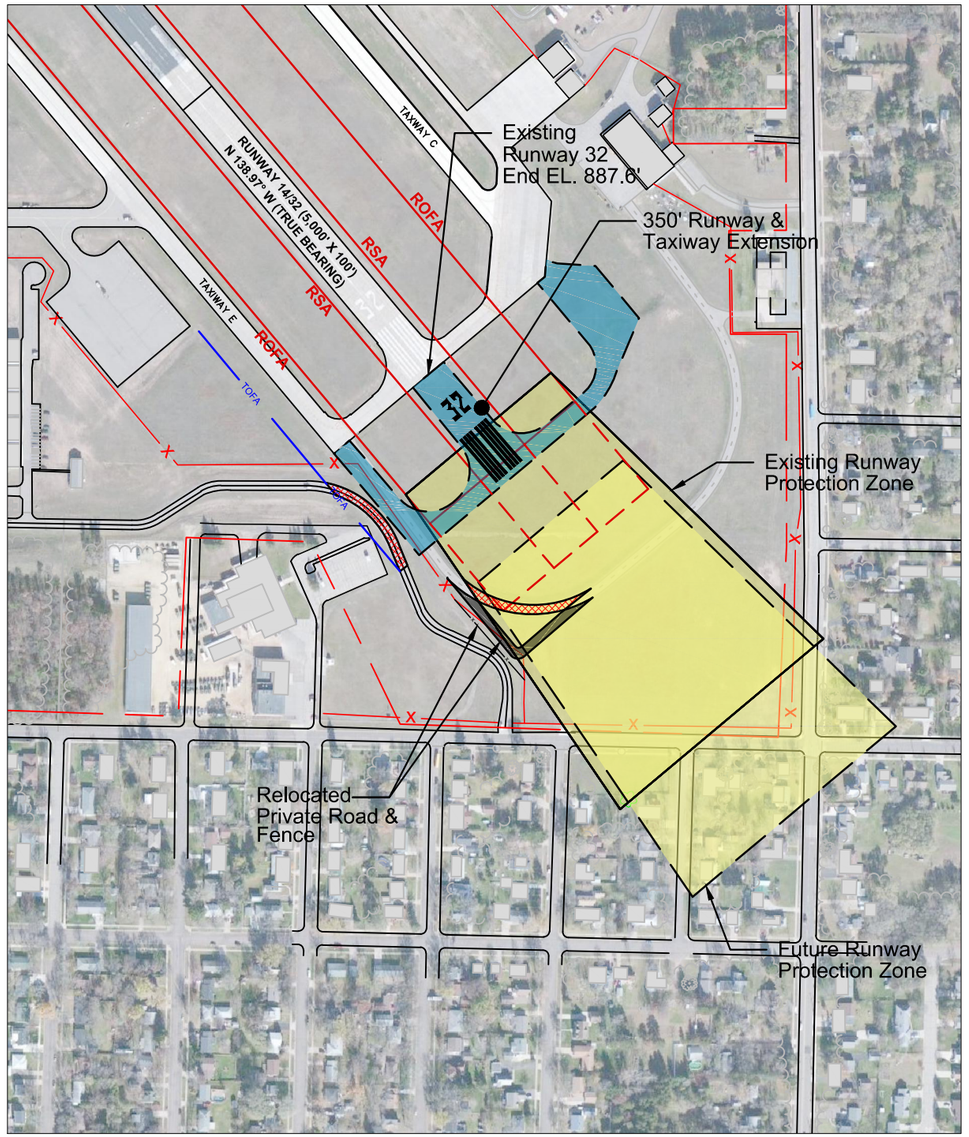
- Minimal Operational Benefit Associated with Additional 250' of Runway Length
- Does Not Allow for Future Non-Precision Instrument Approaches to Runway 14

NORTH

0 150' 300'



RUNWAY 14



RUNWAY 32

FIGURE 4-13A

Runway 14/32 Extension Alternative 3A (850' Extension with 1-Mile Non-Precision Approach Visibility Minimums)

- Total Runway Length = 5,850'

PROS

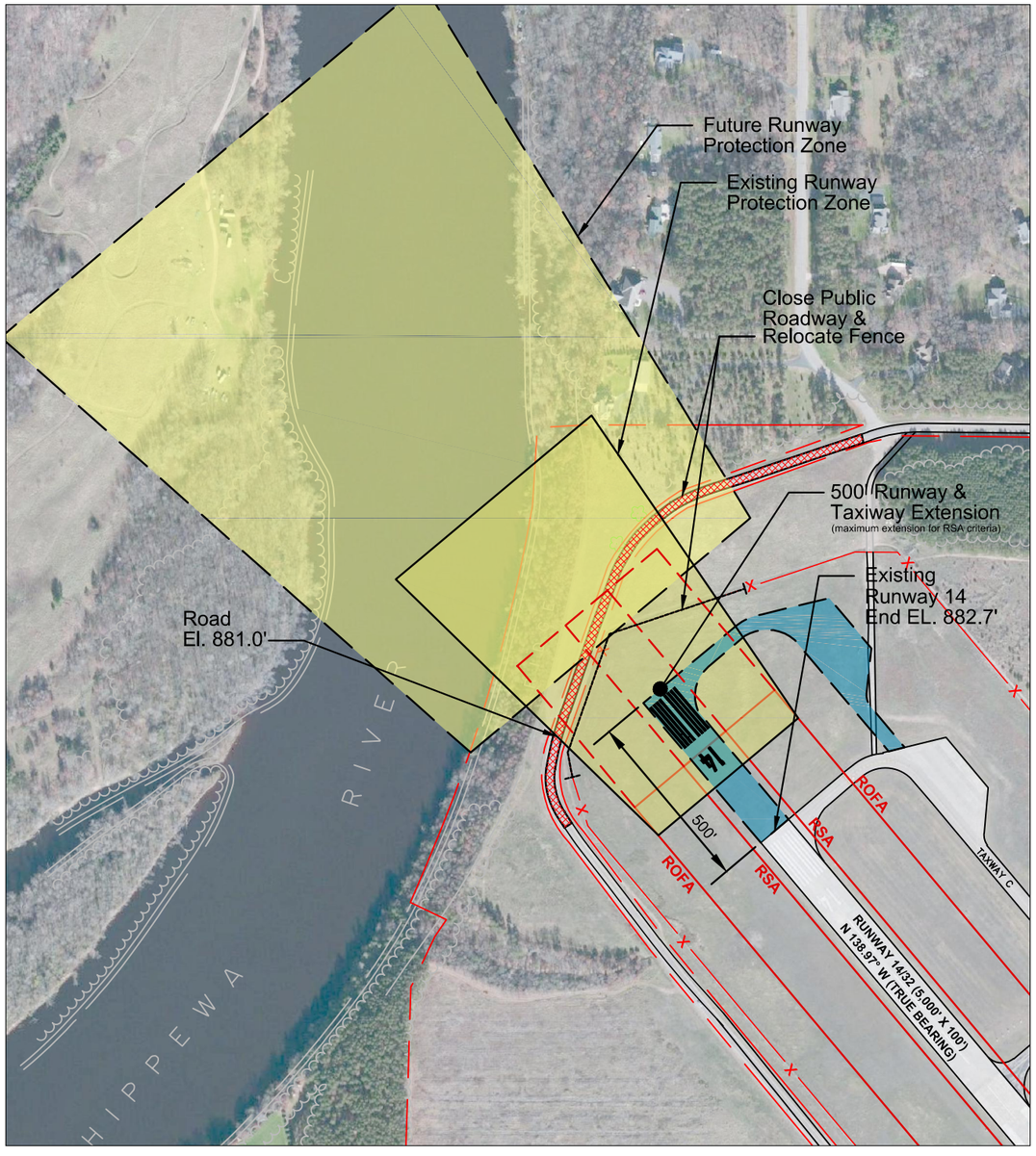
- Maximum Possible Extension without Closing Starr Avenue or North Lane
- Allows for Non-Precision Instrument Approaches to Both Runway Ends (Visibility Not Less than 1-Mile)

CONS

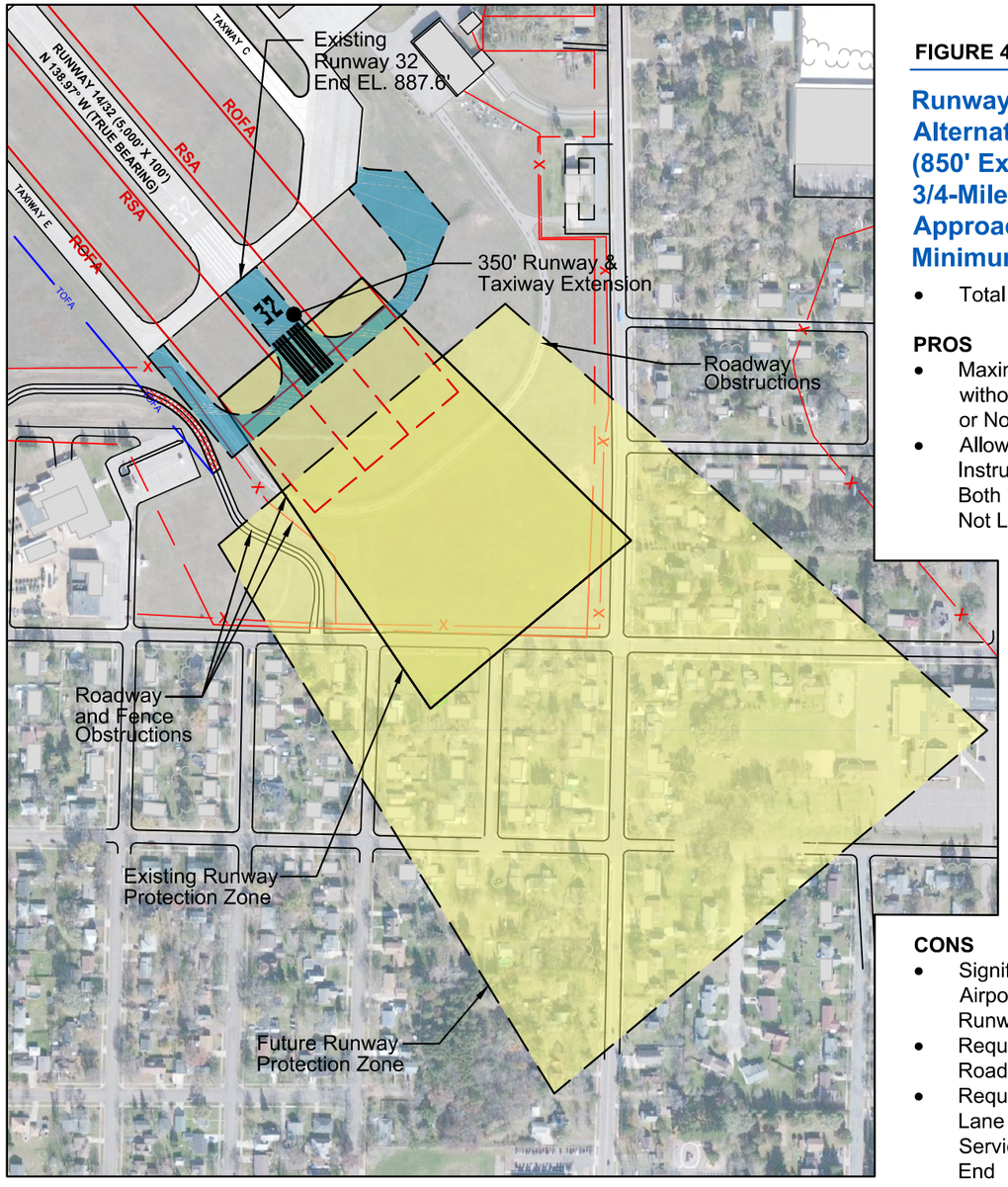
- Significant Adverse Effects to Airport Neighbors Beyond Runway 32 End
- Requires Closure of Airport Road on Runway 14 End
- Requires Relocation of Hallie Lane and Airport-Controlled Service Road on Runway 32 End

NORTH

0 200' 400'



RUNWAY 14



RUNWAY 32

NORTH

0 200' 400'

FIGURE 4-13B

Runway 14/32 Extension Alternative 3B (850' Extension with 3/4-Mile Non-Precision Approach Visibility Minimums)

- Total Runway Length = 5,850'

PROS

- Maximum Possible Extension without Closing Starr Avenue or North Lane
- Allows for Non-Precision Instrument Approaches to Both Runway Ends (Visibility Not Less than 3/4-Mile)

CONS

- Significant Adverse Effects to Airport Neighbors Beyond Runway 32 End
- Requires Closure of Airport Road on Runway 14 End
- Requires Relocation of Hallie Lane and Airport-Controlled Service Road on Runway 32 End

Preferred Runway 14/32 Alternative

Alternatives 1 and 2 have the fewest off-site impacts of the four alternatives, but would provide marginal additional benefits to Airport users in terms of available crosswind runway length and non-precision instrument approach capability. Because these alternatives do not substantially improve on the current crosswind runway length and approach capability, they were removed from further consideration.

Alternatives 3A and 3B both provide the maximum runway extension possible without closing major thoroughfares south of the Airport. The main difference between Alternatives 3A and 3B are the potential instrument approach visibility minimums to each runway end. Based on evaluation of the approach environment for Runway end 32, minimums below one statute mile are not likely to be possible in the foreseeable future (see Section 4.2.2). For this reason, Alternative 3B was removed from further consideration and Alternative 3A was chosen as the preferred alternative. However, discussion with primary Airport users indicates that this potential project should be given a low priority due to infrequent use of Runway 14/32 by the Airport's most demanding aircraft.

4.2 NAVIGATIONAL AID ALTERNATIVES

This section presents alternatives for meeting facility requirements associated with navigational aids (NAVAIDs) at the EAU, as follows:

- Runway 4/22 NAVAID Alternatives
- Runway 14/32 NAVAID Alternatives

4.2.1 Runway 4/22 NAVAID Alternatives

Runways provide maximum utility when they can be used in less than ideal weather conditions, which for runways translate to visibility in terms of the distance required to see and identify prominent unlighted objects by day and prominent lighted objects by night. In order to land during periods of limited visibility, pilots must be able to see the runway or associated lighting at a certain distance from and height above the runway. If the runway environment cannot be identified at the minimum visibility point on approach, FAA regulations do not authorize pilots to land.

Existing instrument approach procedures to Runway 4/22 provide the Airport with a high level of approach capability during inclement weather. However, as discussed in Chapter 3, opportunities exist for lowering instrument approach procedure minimums to both ends of Runway 4/22. This section explores the possibility of implementing a Special Authorization CAT I Approach Procedure to Runway 22, and installing an approach lighting system on Runway 4. Implementation of these improvements could improve existing approach decision heights and visibility minimums, as discussed below.

Runway 22 Special Authorization CAT I Approach Procedure

As discussed in Chapter 3, Runway 22 is equipped with a traditional CAT I Instrument Landing System which allows precision instrument approach and landing with a decision height (DH) not lower than 200 feet above touchdown zone elevation and visibility not less than ½ statute miles. Aircraft cockpit avionics technology has improved significantly over the past few decades. The FAA has been placing a growing emphasis on performance-based approach procedures that allow specially-qualified and certified flight

crews using specific avionics to take advantage of lower approach minimums than those associated with standard CAT I ILS systems, without requiring installation of additional ground navigation equipment.

FAA Order 8400.13D, *Procedures for the Evaluation and Approval of Facilities for Special Authorization Category I Operations and All Category II and III Operations*, establishes authorization criteria for CAT I procedures with minimums below ½ mile visibility and/or 200 foot cloud ceiling. There are two different CAT I approach procedures covered by Order 8400.13D:

- CAT I 1800 runway visual range (RVR) procedures using an aircraft flight director (FD) or autopilot with an approach coupler or head-up display (HUD) to the decision altitude (DA); and
- Special Authorization CAT I procedures with a DH as low as 150 feet and a visibility minimum as low as RVR 1400 using a HUD to DH.

The ILS localizer and glideslope antennas at EAU were originally commissioned in 1972; as a result, it is unlikely that the antenna equipment meets performance requirements for either of the above approaches. Assuming that the localizer and glideslope antenna equipment were replaced with newer compatible equipment, Runway 22 would be a good candidate for one or both types of approaches described above. Different facility and operational requirements apply to these two approach types, as shown in **Table 4-3**.

Table 4-3: Runway 22 Approach Procedure Upgrade Requirements

Requirement	Approach Type	
	CAT I 1800 RVR Approach	**Special Authorization CAT I Approach (as low as 150 foot DH and RVR 1400)**
Single-Pilot Operators	Permitted	Prohibited
Air Traffic Control Tower	No Requirement	Required
Runway Landing Distance	> 5,000 feet	> 5,000 feet
Approach Lighting System	SSALR, MALSR, or ALSF-1/ALSF-2	SSALR, MALSR, or ALSF-1/ALSF-2
Runway Edge Lighting	HIRL	HIRL
Runway Visual Range Facilities	Touchdown Zone RVR Sensor	Touchdown Zone RVR Sensor
Glideslope Angle	No Requirement	Must be 3.0 degrees
Threshold Crossing Height	<= 60 feet	<= 60 feet
Obstacle Free Zones	No Requirement	Must be clear
Approach Light Plane	No Requirement	Must be clear
In-Pavement Lighting	No Requirement	No Requirement
Special Aircrew and Aircraft Certification Required	No Requirement	Yes
Missed Approach Procedure	No Requirement	Must meet CAT II/III Obstacle Clearance

Source: FAA Order 8400.13

Runway 22 meets all of the criteria for a CAT I 1800 RVR approach except it is not equipped with a touchdown zone runway visual range sensor (RVR). An RVR sensor installation consists of a projector unit, known as a transmissometer, and a transmissometer receiver unit, each mounted on short towers either 250 or 500 feet apart. The projector emits a beam of light of known intensity, and the receiver measures the intensity of the light, thereby determining any reduction in visibility occurring due to obscuring matter between the two units such as rain, snow, dust, fog, or smoke. A touchdown zone RVR is located 750 feet to 1,000 feet from the threshold, normally behind the ILS glideslope antenna. Generally, higher category ILS systems with lower visibility minimums require a greater number of RVR facilities.

Additional aeronautical studies would be required to determine whether a Special Authorization CAT I approach (as low as 150 foot DH and RVR 1400) will be possible to Runway 22, as this type of approach requires compliance with TERPS surfaces for CAT II/III missed approaches. If these studies were to find Runway 22 a good candidate for the approach type, the approach would only be available during air traffic control tower hours (7 a.m. to 10 p.m.).

Based on the preceding analysis, the Airport should seek implementation of a CAT I 1800 RVR approach for Runway 22, which will require installation of a touchdown zone RVR sensor.

Runway 4 Approach Lighting System

According to AC 150/5300-13A, an approach lighting system is recommended for runways with non-precision approaches and approach procedures with vertical guidance. Runway 4 currently has both types of procedures, but does not have an approach lighting system. The procedure with the lowest decision height (DH) and visibility minimum is a localizer performance with vertical guidance (LPV) approach with a DH of 200 feet and a visibility minimum of ¾ statute miles. An approach lighting system could potentially reduce the visibility minimum to as low as ½ statute miles, while also providing improved visual guidance to pilots during all weather conditions.

There are three types of approach lighting systems that would allow the Airport to achieve a Runway 4 visibility minimum of less than ¾ statute miles, the most cost-effective of which is a medium-intensity approach lighting system with runway alignment indicator lights (MALSR). A MALSR consists of the following components:

- A steady-burning threshold light bar (green);
- Seven steady-burning five-light bars (white) located on the extended runway centerline, with the first bar located 200 feet from the runway threshold and the remaining bars located at each 200-foot interval out to 1,400 feet from the threshold;
- Two additional steady-burning five-light bars (white) located 1,000 feet from the runway threshold, one on each side of the centerline bar; and
- Five sequenced flashing lights (white) located on the extended runway centerline at each 200-foot interval beyond the seven steady-burning five-light bars.

A conceptual Runway 4 MALSR system is depicted in **Figure 4-14**. The MALSR system shown in Figure 4-14 is aligned with the relocated landing threshold recommended under Hold Bay Alternative 5, would fit entirely on existing Airport property and City-owned property currently governed by aviation easements. However, light fixtures within the outer 1,400 feet of the system would have to be installed on towers of up to 100 feet in height due to a precipitous drop in terrain southeast of Airport Road. These towers would significantly increase the overall cost of the MALSR system compared to a typical installation that does not include towers.

4.2.2 Runway 14/32 NAVAID Alternatives

As discussed in Chapter 3, Runway 14/32 is currently a visual runway, which means it does not have any instrument approach capabilities. This section analyzes FAA guidance related to airfield facilities and airspace surfaces that are required for instrument approach procedures, and applies them to Runway 14/32.

FAA Advisory Circular 150/5300-13A, *Airport Design*, prescribes facility and airspace requirements for new approach procedures. Based on the fleet mix and aviation activity that typically occurs on Runway 14/32, this runway is not likely to be eligible for the installation of a precision Instrument Landing System (ILS) approach within the 20-year planning period. Instead, the requirements for non-precision approaches (NPA) and non-ILS/non-LPV approaches with vertical guidance (APV) were analyzed and applied to Runway 14/32. These requirements are summarized in **Table 4-4**.

Table 4-4: Requirements for Non-Precision Approaches and Approaches with Vertical Guidance

Criteria	Visibility Minimum	
	< 1 statute mile	**>= 1 statute mile**
Glidepath Qualification Surface*	Clear	Clear
TERPS Standard Visual Area (Chapter 3, Section 3)	20:1 Clear	20:1 Clear (or penetrations lighted)
Airport Layout Plan	Required	Required
Minimum Runway Length	3,200 feet (paved)	3,200 feet
Runway Markings	Non-precision	
Holding Position Signs and Markings	Non-precision	
Runway Edge Lights	HIRL/MIRL	MIRL/LIRL
Parallel Taxiway	Required	Recommended
Approach Lights	Required	Recommended
Applicable Runway Design Standards	>= 3/4 statute mile approach visibility minimums	
Threshold Siting Criteria	Table 3-2, row 6	Table 3-2, rows 1-5

Source: FAA Advisory Circular 150/5300-13A, Airport Design

** Only required for approaches with vertical guidance*

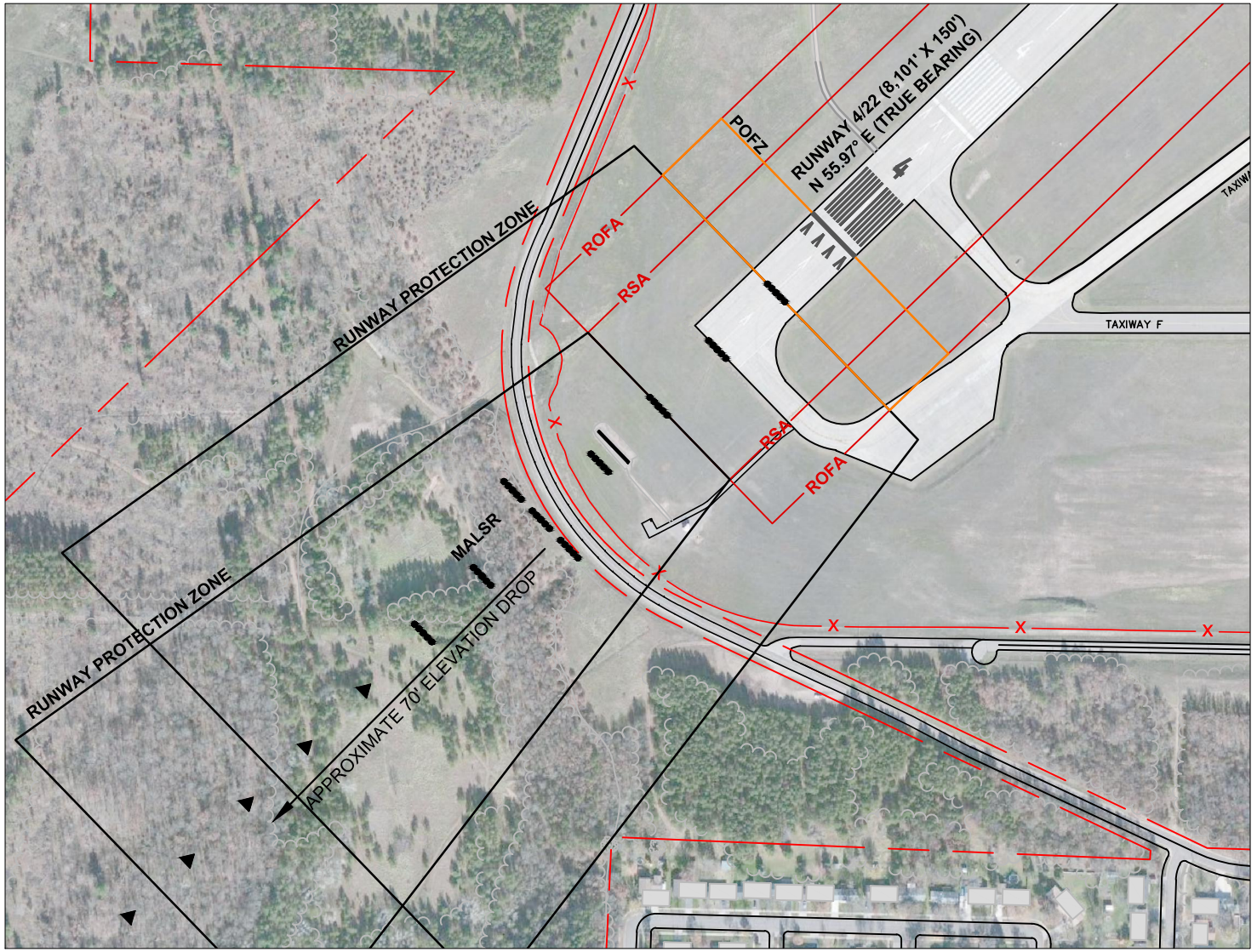


FIGURE 4-14

Runway 4 Approach Lighting System Alternative

PROS

- Allows for Lower Instrument Approach Visibility Minimums to Runway 4
- Provides Enhanced Visual Guidance for Pilots on Approach to Runway 4

NORTH

0 150' 300'

Neither end of Runway 14/32 is equipped with an approach lighting system, which is required for NPA and APV approaches with visibility minimums of less than one statute mile. Runway 14/32 is constrained on either end in terms of available space for an approach lighting system. In addition, visibility minimums below one statute mile would enlarge the runway protection zones (RPZs) beyond each end of the runway, which would likely require the purchase of numerous residential properties. For these reasons, it is expected that the lowest feasible visibility minimum for an approach procedure to Runway 14/32 would be one statute mile or greater. The requirements for an approach visibility minimum of one statute mile or greater are applied to each end of Runway 14/32 in **Table 4-5**.

Table 4-5: Approach Requirements for Runway 14/32

Criteria	Requirements (NPA or APV visibility minimum >= 1 statute mile)	Does the runway meet requirements?	
		Runway 14	Runway 32
Glidepath Qualification Surface*	Clear	Yes	No
TERPS Standard Visual Area (Chapter 3, Section 3)	20:1 Clear (or penetrations lighted)	Yes	No
Airport Layout Plan	Required	Yes	Yes
Minimum Runway Length	3,200 feet	Yes	Yes
Runway Markings	Non-Precision	Yes	
Holding Position Signs and Markings	Non-Precision	Yes	
Runway Edge Lights	MIRL/LIRL	Yes (MIRL)	Yes (MIRL)
Parallel Taxiway	Recommended	Yes	
Approach Lights	Recommended	Yes (approach lights not required)	
Applicable Runway Design Standards	>= 3/4 statute mile approach visibility minimums	Yes	
Threshold Siting Criteria	Table 3-2, rows 1-5	Yes/No**	No

Source: FAA Advisory Circular 150/5300-13A, Airport Design

** Only required for approaches with vertical guidance.*

*** Threshold siting criteria are met for Category A and B aircraft, but not greater than Category B aircraft.*

As shown in Table 4-5, Runway 14 meets all requirements for NPAs and APVs, with the exception of the threshold siting criteria for greater than Category B aircraft. Based on analysis of publicly-available aeronautical survey data, penetrations to the threshold siting surface for greater than Category B aircraft consist of a few trees within 1,000 feet of the Runway 14 threshold. Most of these trees are on Airport property, and those that are not on Airport property could be removed under authority of the Eau Claire County Airport Zoning Ordinance. As a result, Runway 14 is an ideal candidate for a NPA and/or an APV.

Based on correspondence with the FAA Flight Procedures Office (FPO), issues associated with existing obstructions in the approach to Runway 32 are likely to severely limit potential future instrument approach procedures to this runway end for three main reasons. First, there are multiple penetrations to the Glidepath Qualification Surface (GQS) for Runway 32. The GQS is a sloping imaginary surface extending from the runway threshold along the runway centerline extended to the decision altitude (DA) point. Penetrations to the GQS include trees located on a large grouping of residential properties less than 2,000 feet from the Runway 32 threshold, as well as another large grouping of trees on a bluff just over one mile from the Runway 32 threshold. Although the Airport could conceivably remove or cut these

trees under authority of the Airport Zoning Ordinance, the effort required would not likely be worthwhile given other man-made obstacles that penetrate other various airspace surfaces in the approach to Runway 32. Because of existing obstructions to the GQS, Runway 32 is not a good candidate for an APV.

Second, Runway 32 also has multiple penetrations to the TERPS Standard Visual Area obstacle clearance surface, as well as the threshold siting surfaces that must be clear according to AC 150/5300-13A. The aforementioned tree areas result in multiple penetrations to these surfaces. Like the GQS, the Airport Zoning Ordinance provides the Airport the authority to remove or cut most of these trees; however the benefits of doing so may not outweigh the costs.

Third, assuming the Airport were able to remove all of the obstructions to the TERPS Standard Visual Area surface and threshold siting surfaces referenced in the previous paragraph, several other obstructions to other TERPS surfaces would require a higher DH and visibility minimum than otherwise possible. The controlling obstacle would likely be a radio tower located near the extended runway centerline, approximately two and a half miles from the Runway 32 threshold. This obstruction would likely require a DH in excess of 800 feet and a visibility minimum in excess of two miles. These approach procedure minimums would not substantially improve the accessibility of the Airport during inclement weather over the existing condition. For all of the reasons above, Runway 32 is not a good candidate for an NPA.

Based on the preceding analysis, the Airport should plan for implementation of both an NPA and an APV to Runway 14 in the near-term. Establishment of an NPA and/or APV to Runway 14 will require a Non-Vertically Guided Airport Airspace Analysis Survey in accordance with FAA AC 150/5300-18. Although Runway 32 is not currently a good candidate for an instrument approach procedure, the Airport should seek to remove existing obstructions and prevent the establishment of new obstructions in the approach to Runway 32 when opportunities arise.

4.3 PASSENGER TERMINAL ALTERNATIVES

The passenger terminal building is the primary point of interface between landside and airside activities for commercial aviation at the Airport. EAU currently has a single commuter airline serving the Airport on a daily basis. The preferred forecast presented in Chapter 2 predicts an increase in passenger enplanements from 19,062 in 2011 to 34,262 in 2031. This increase in enplanements is likely to include the addition of a second airline operating at the Airport on a daily basis. As a result, the Airport should plan for providing additional ticketing counter, office, and inbound/outbound baggage handling space for a second airline.

Anticipated improvements will not require expansion of the passenger terminal building. As described in Chapter 1, the area located between inbound/outbound baggage and public circulation is currently underutilized. It is primarily used for storage and vending. One alternative was developed for the Master Plan Update that will allow for reconfiguration of this area to meet future demand.

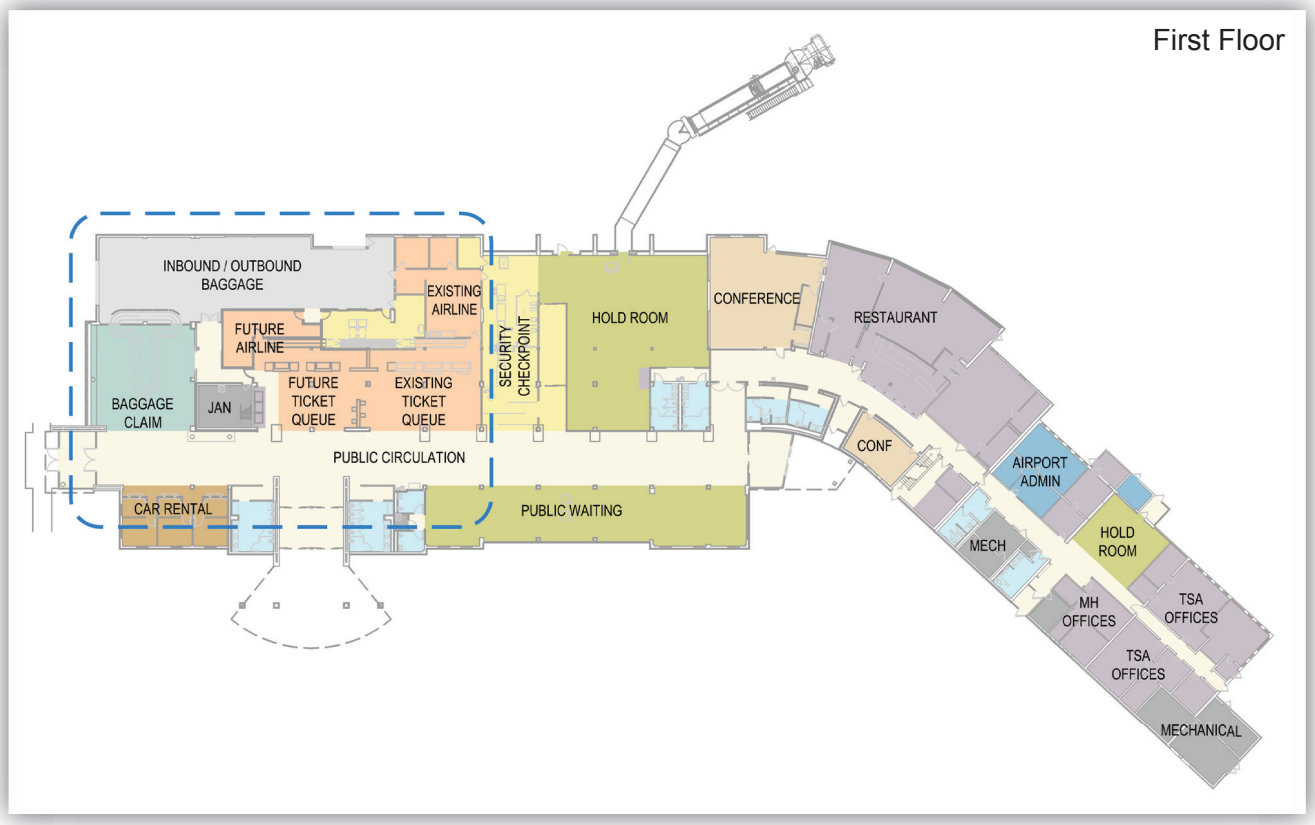
The Passenger Terminal Building Reconfiguration Alternative expands current airline office and ticketing queue space as well as non-public circulation and TSA baggage screening (see **Figure 4-15**). The provided airline office space, ticketing counters, and ticketing queue space is anticipated to accommodate the demand that would occur from one additional airline. The anticipated increase in future passenger activity corresponds with a need for added TSA baggage screening space. The Passenger Terminal Building Reconfiguration Alternative also addresses this need. It should be noted that this alternative does not identify a location for future vending space. Options for vending if deemed necessary should be identified at a later date.

4.4 AUTOMOBILE PARKING ALTERNATIVES

Automobile parking demand at the Airport is primarily driven by passenger enplanements. The Airport currently has 565 automobile parking spaces, approximately 62 percent of which are long-term spaces. As noted in Chapter 3, it is expected that the Airport will require an additional 158 total parking spaces by 2016, 267 additional spaces by 2021, and 451 additional spaces by 2031.

A two-phased automobile parking expansion alternative was chosen as the preferred method to address future needs. Parking Expansion Alternative 1 addresses short-term parking demand and includes an expansion to Short-Term, Long-Term, Rental Car, and Airport Staff Parking areas. This alternative includes a total of 241 additional spaces, which is anticipated to meet demand through 2021 (see **Figure 4-16**). The areas slated for expansion are Airport-owned and are not currently being used for any specific purposes.

Parking Expansion Alternative 2 is designed to satisfy long-term parking demand at the Airport (through 2031). This alternative includes the expansion described in Alternative 1 as well as a long-term parking overflow lot that incorporates 250 additional spaces (see **Figure 4-17**). Alternative 2 will require relocation of an airfield access road in order to bypass the Overflow Lot.



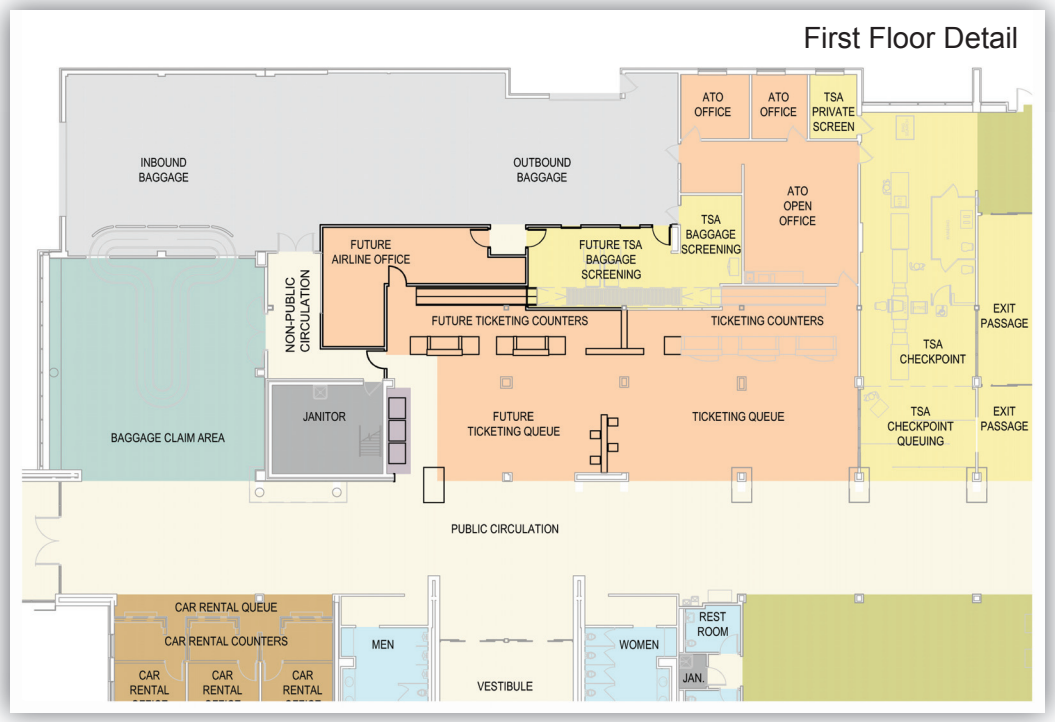


Figure 4-15 Passenger Terminal Building Reconfiguration Alternative

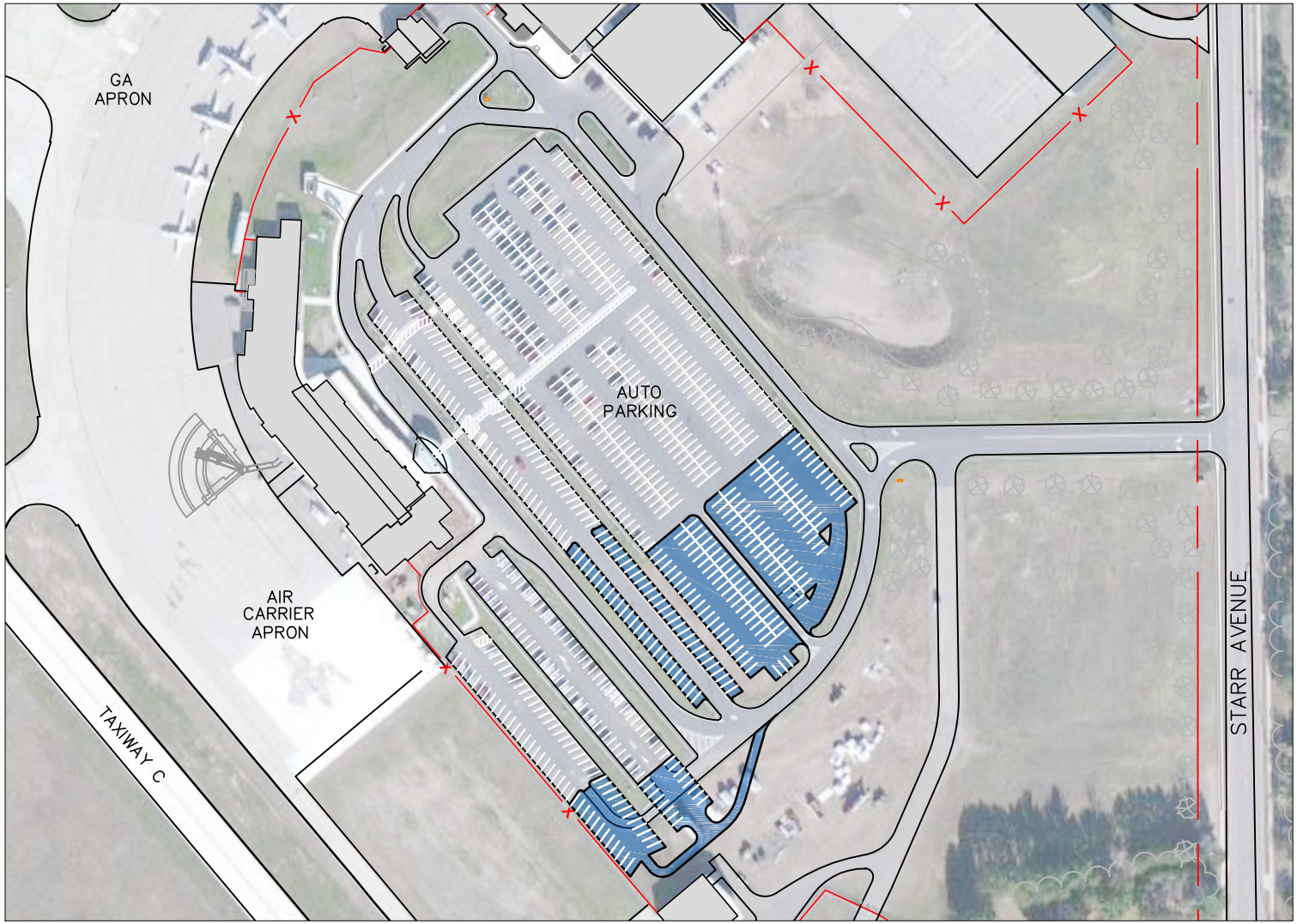


FIGURE 4-16

Airport Parking Expansion Alternative 1

- 241 Spaces - Satisfies Long-Term Parking Forecast

NORTH

0 100' 200'

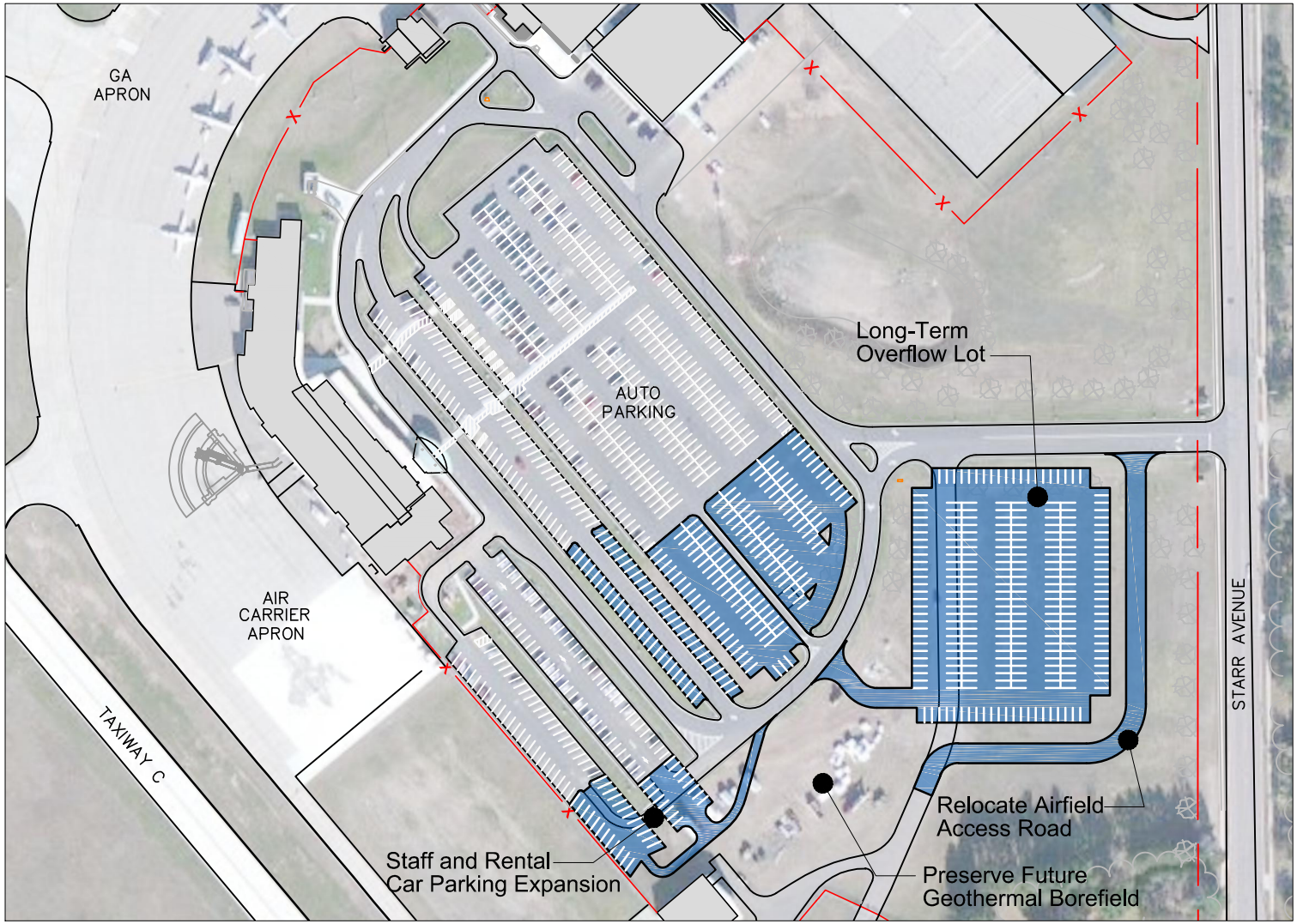


FIGURE 4-17

Airport Parking Expansion Alternative 2

- 491 Spaces - Satisfies Long -Term Parking Forecast

NORTH

0 100' 200'

4.5 FUEL FACILITY ALTERNATIVES

As discussed in Chapter 3, the existing fuel farm location at the Airport raises safety and security concerns related to tanker truck access and space constraints associated with tanker truck turn geometry. In addition, future growth in aircraft operations is expected to result in the need for additional fuel storage capacity that cannot be accommodated at the existing site. Based on these concerns and limitations, four alternative sites were considered for relocation of aircraft fueling facilities (see **Figure 4-18**).

Fuel Facility Alternative Site 1

Site 1 is located to the immediate northeast of the existing fuel farm site, next to the rental car wash facility. Of the sites that were considered, this site is nearest to the GA and commercial aircraft parking aprons. Locating the fuel farm at this site has advantages in not restricting future expansion of other Airport facilities; not requiring extensive new utilities; and not resulting in any land use compatibility issues. However, due to the constrained nature of this site, further expansion of a fuel farm would be difficult in this location.

Fuel Facility Alternative Site 2

Site 2 is located to the immediate northeast of the existing GA hangars on the east side of the Airport. While Site 2 is located further from the GA and commercial aircraft parking aprons than Site 1, it would more easily accommodate future fuel capacity expansion. The site also has advantages in not requiring extensive utility work and not resulting in land use compatibility issues. A fuel farm at Site 2 could restrict future GA facility expansion in this area; however, there is more than adequate space for GA facility expansion in the separate GA area on the south side of the Airport.

Fuel Facility Alternative Site 3

Site 3 is located to the far north of the GA hangars on the east side of the Airport. Of the sites that were considered, this site is the furthest away from the GA and commercial aircraft parking aprons. This site was identified because of its open location, which would allow for future fuel farm growth without imposing restrictions on future growth of other Airport facilities. This site also has the fewest compatibility issues with surrounding land uses. However, the site would require the most utility work and fence and gate modifications, making it much more expensive than any of the other sites considered.

Fuel Facility Alternative Site 4

Site 4 is located south of the passenger terminal area, adjacent to the snow removal equipment (SRE) and maintenance building. This location has advantages in eliminating expensive utility work and allowing for future GA facility expansion in other areas. However, because of its close proximity to the SRE building and an off-Airport single-family residence, this location restricts future expansion of both the fuel farm and the SRE building, and could present land use compatibility issues.

Preferred Fuel Facility Alternative

Ultimately, Alternative Site 2 was identified as the ideal location for the relocated fuel farm, because it requires the least amount of fence and gate modifications while also allowing for future fuel farm expansion. Additionally, natural vegetation at this site will shield the fuel farm and its access road from industrial buildings to the south (see **Figure 4-19**).

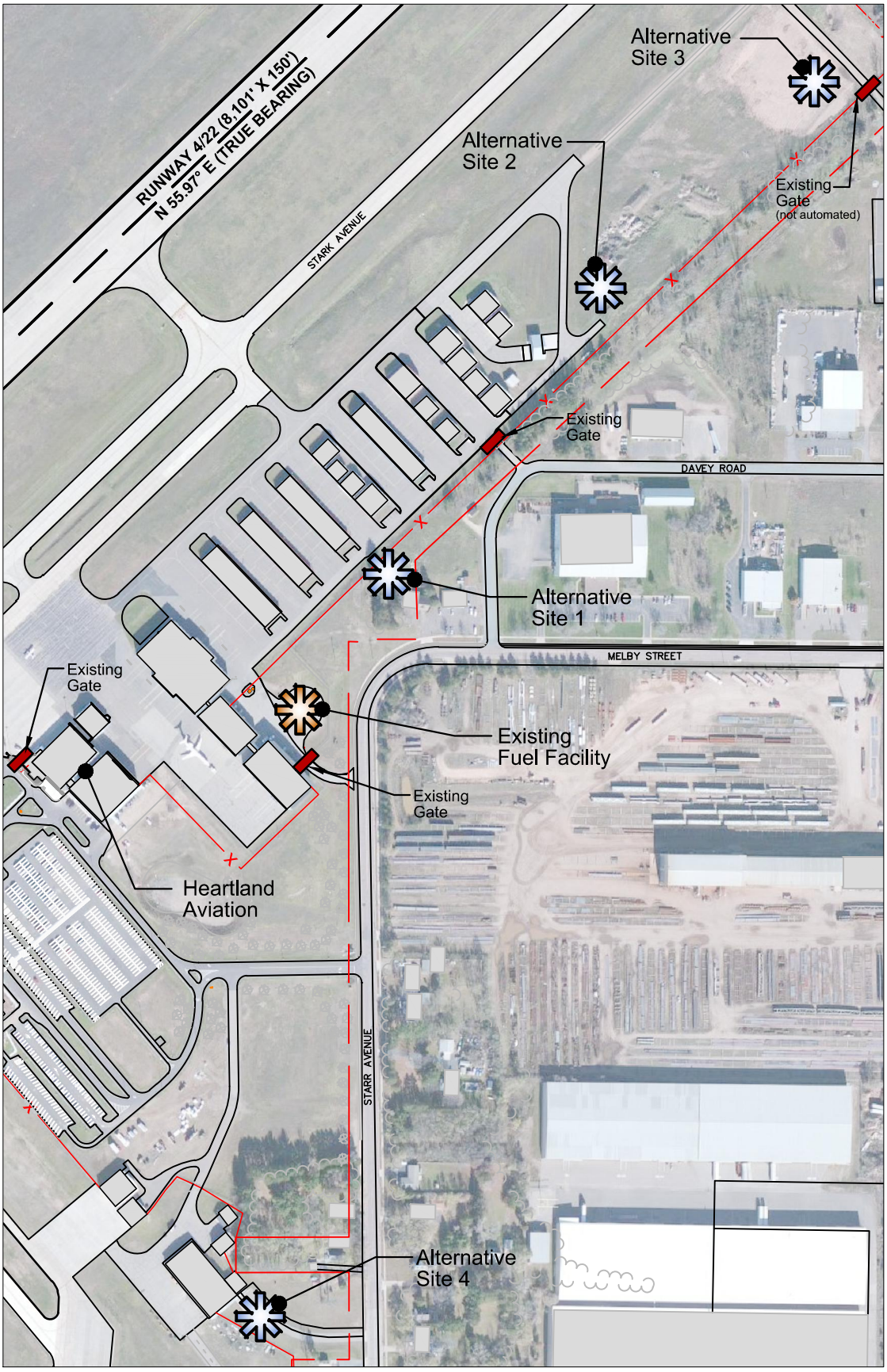


FIGURE 4-18

Overview of Fuel Facility Alternatives Considered

NORTH

0 200' 400'

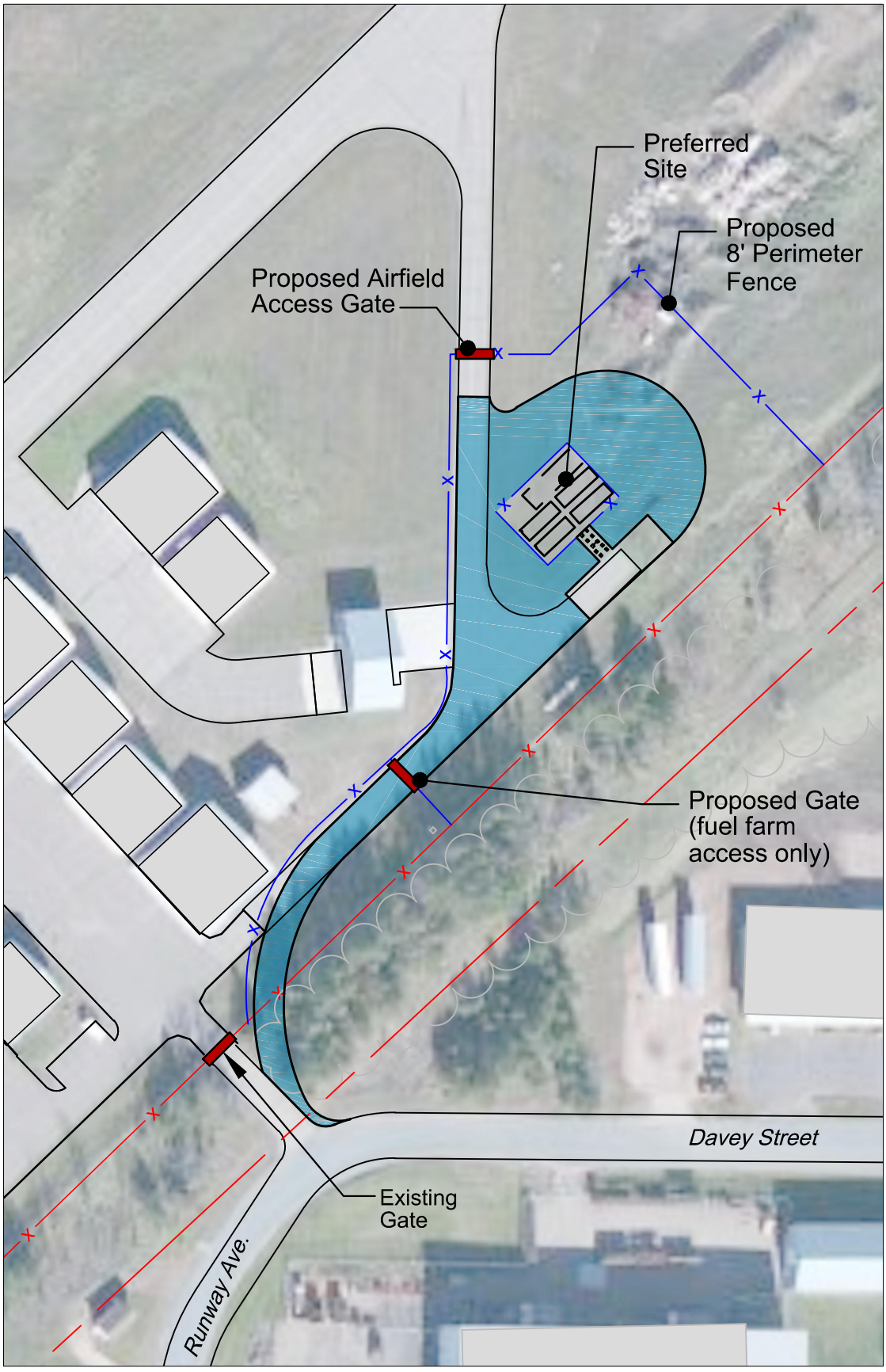


FIGURE 4-19

Preferred Fuel Facility Alternative

PROS

- Provides Controlled Access to the Fuel Facility from Both Public and Airfield Sides of Fence
- Provides Suitable Tanker Truck Turn Geometry
- Does Not Require Recurrent Tanker Truck Driver Training
- Does Not Require Extensive Utility Work for Installation
- Does Not Result in Land Use Compatibility Issues
- Allows for Long-Term Fuel Facility Expansion

CONS

- Approximately 1,500' Further from GA Apron than Existing Fuel Facility

NORTH

0 50' 100'

4.6 AIRCRAFT DEICING FACILITY ALTERNATIVES

In anticipation of the aviation industry's voluntary pollution prevention program (VPPP), several alternative aircraft deicing fluid management practices and facilities were reviewed for this Master Plan Update to assess potential improvements to current deicing processes at EAU. Performance and potential implementation of specific pollution reduction technologies vary across different airports depending on several factors, including but not limited to hydrology, climate, weather, geographic location, environmental conditions, existing infrastructure, and access to publicly-owned treatment works (POTW). Because of the specific conditions at EAU, some improvements may be more feasible or reasonable than others. Potential improvements that may be considered include a centralized deicing facility, an apron collection system, deicing fluid collection vehicles, and block-and-pump systems. The advantages and disadvantages of these different facilities and practices are summarized in **Table 4-6**.

Table 4-6: Aircraft Deicing Fluid Management Options

Option	Description	Advantages	Disadvantages
Centralized Deicing Facility	Construct centralized facility where all aircraft will be deiced when needed	High level of deicing fluid capture	High capital cost
		Low volume of wastewater to be disposed of	May present challenges to both air carrier and general aviation operators
Apron Collection System	Collect all runoff where aircraft deicing occurs	Little to no operational changes for air carrier	May require large storage tanks to hold captured contaminated stormwater
		Minor changes to existing apron drainage system	Relatively high disposal cost
Deicing Fluid Collection Vehicles	Use vacuum sweeper vehicles to sweep up deicing fluid after application to aircraft	Relatively low capital cost	Lowest rate of deicing fluid capture
		Relatively low disposal cost	Increased traffic on apron during deicing operations
Block-and-Pump Systems	Plug storm sewers in deicing areas and pump accumulated stormwater	Relatively low capital cost	Relatively low rate of deicing fluid capture
		Moderate disruption to aircraft operations during deicing	Moderately high operational costs

A centralized deicing facility would provide the highest level of fluid capture and lowest volume of wastewater disposal. However, given the current level of deicing activity at the Airport, the benefits of such a facility are not likely to outweigh its high capital cost. An apron collection system would significantly reduce upfront capital costs but would also increase on-going stormwater disposal costs. This type of system would also require changes in current corporate aviation deicing procedures that may present challenges for their operations.

The options with the lowest capital costs include deicing fluid collection vehicles and block-and-pump systems. Although these are likely to be the most feasible improvements to deicing operations at Chippewa Valley Regional Airport, they also have relatively low rates of deicing fluid capture.

Current FAA guidelines do not require the implementation of any of the deicing fluid management alternatives presented in this section. However, this Master Plan Update recommends that the Airport keep abreast of the latest effluent guidelines, as well as voluntary pollution prevention plan (VPPP) program reports, and seek opportunities to improve current procedures as they arise.

4.7 AIRCRAFT HANGAR ALTERNATIVES

For this Master Plan Update, aircraft hangars were grouped into two categories: corporate and Fixed Base Operator (FBO) hangars, and small general aviation (GA) hangars. Small GA hangars are either small "box" hangars or t-hangars. As described in Chapter 3, it is anticipated that an additional 17,675 square feet of corporate/FBO aircraft hangar space will be required by 2031. In order to meet future small GA aircraft hangar demand, an additional 5 T-hangar units and 3 individual "box" hangars will also be needed. It should be noted that demand for aircraft storage space can fluctuate based on factors that are beyond the control of an airport, therefore, planning for greater than projected demand if possible is advantageous. Three alternatives were developed to accommodate expected future aircraft storage demand, as described below.

Aircraft Hangar Alternative 1: Ultimate South GA Hangar Area Build-Out Concept

Alternative 1 designates the area south of Taxiway F for additional small GA expansion (see **Figure 4-20**). This area is currently occupied by five box hangars, and is equipped with an apron that includes 7 aircraft tie-downs. Alternative 1 provides an ultimate capacity of 25 additional box hangars, 4 T-hangar buildings (eight to ten hangars in each) as well as space for a large corporate hangar adjacent to the GA apron. This alternative is advantageous as it is designed to accommodate projected based aircraft (Aircraft Design Group II), satisfies long-term hangar capacity demand, and has the approval of the Airport Commission. However, this alternative would split GA operations into two separate areas.

Aircraft Hangar Alternative 2: North GA Hangar Area Corporate/FBO Hangar Expansion Concept

Alternative 2 proposes additional corporate/FBO hangar development within the existing North GA area (see **Figure 4-21**). This alternative incorporates an additional FBO hangar and apron, as well as two new corporate hangars. This alternative is beneficial as it allows for expansion in an area already designated for corporate/FBO use and would accommodate projected based jet aircraft demand. Alternative 2 would require removal of one or two existing small GA T-hangar structures and would place constraints on corporate/FBO expansion beyond the proposed structures.

Aircraft Hangar Alternative 3: North GA Hangar Area Small GA Hangar Expansion Concept

Alternative 3 proposes additional small GA development in the existing North GA area (see **Figure 4-22**). This alternative expands upon existing infrastructure and is closer in proximity to the existing FBO than the South GA Hangar area. However, this alternative contradicts the Commission-approved South GA Hangar Area Concept, and would require a significant amount of dirt and debris removal.

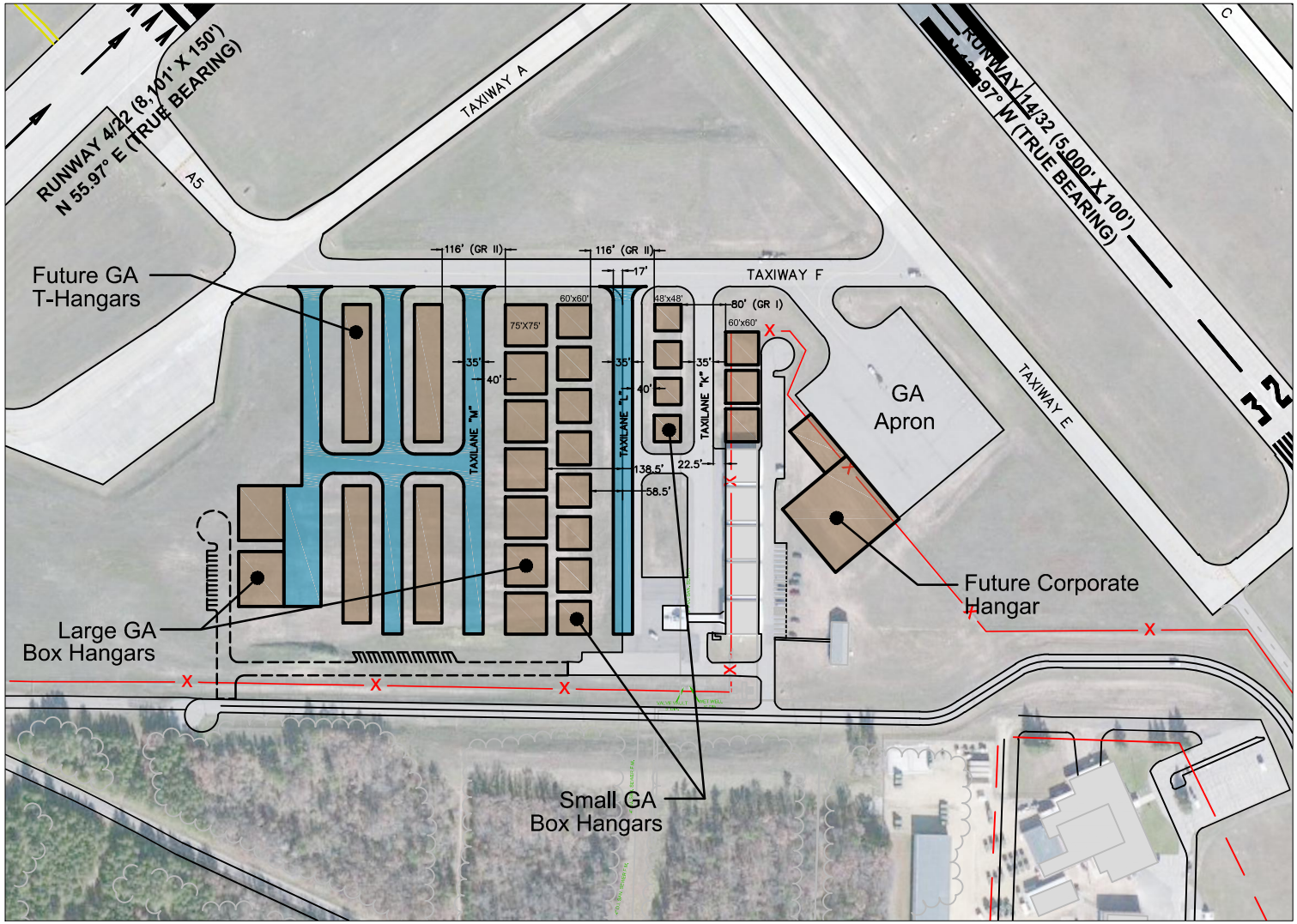


FIGURE 4-20

Ultimate South GA Hangar Area Build-Out Concept

PROS

- Hangar Layout Designed to Accommodate Projected Based Aircraft (Aircraft Design Group II)
- Satisfies Projected Long-Term Hangar Capacity Needs
- Concept Approved by Airport Commission in Spring 2011

CONS

- Would Potentially Split Existing Hangar Operations into Two Separate Areas
- Occupies Prime Real Estate that Could Be Used for Other Potential Revenue-Producing Land Uses

NORTH

0 150' 300'

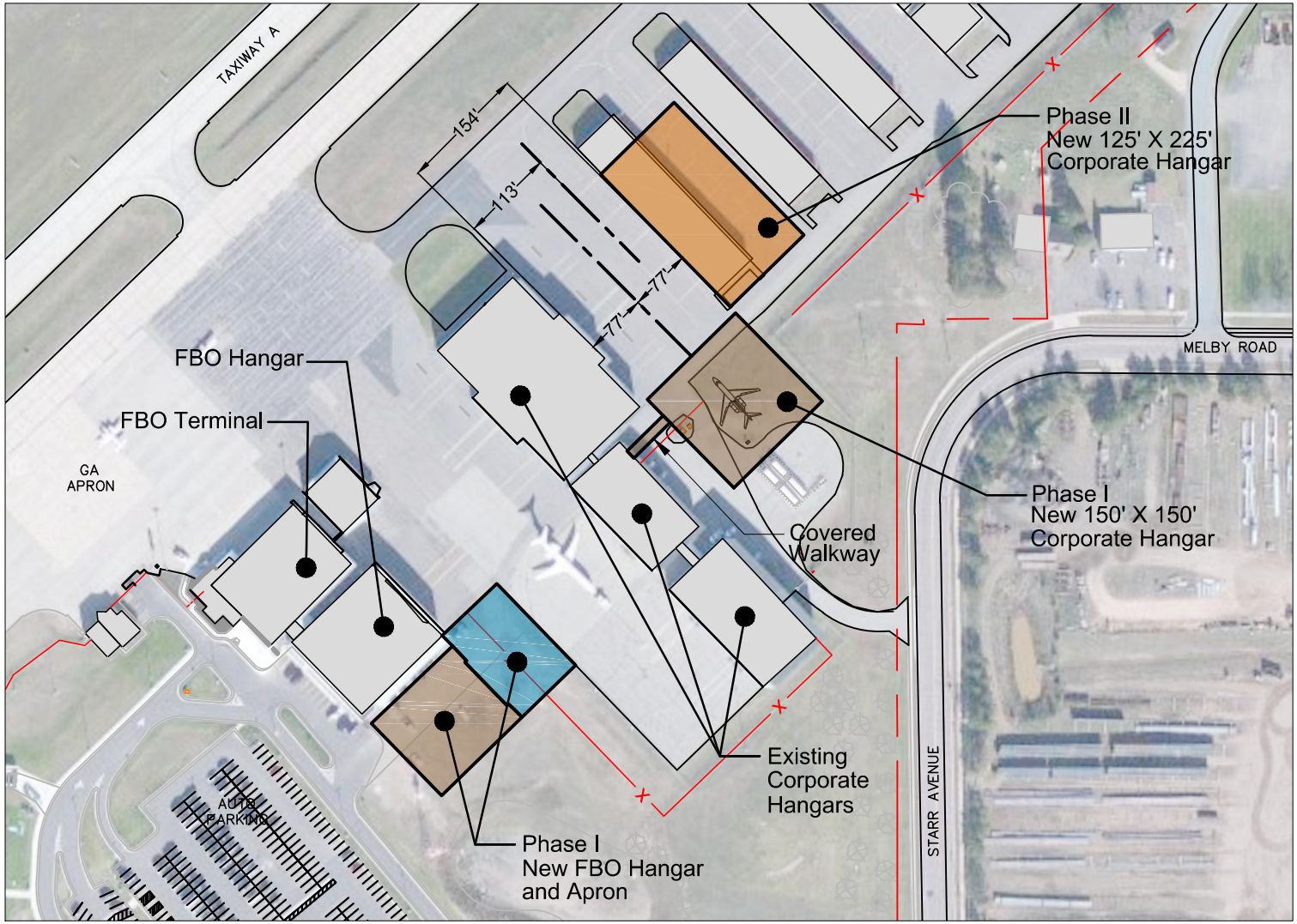


FIGURE 4-21

North GA Hangar Area Corporate/FBO Hangar Expansion Concept

PROS

- Allows for Facility Expansion in Existing Corporate/FBO Area
- Would Accommodate Projected Future Based Jet Aircraft

CONS

- Would Require the Removal of Two to Three Existing Small GA T-Hangar Structures
- Additional Long-Term Corporate/FBO Expansion Potential Limited in this Area

NORTH

0 100' 200'

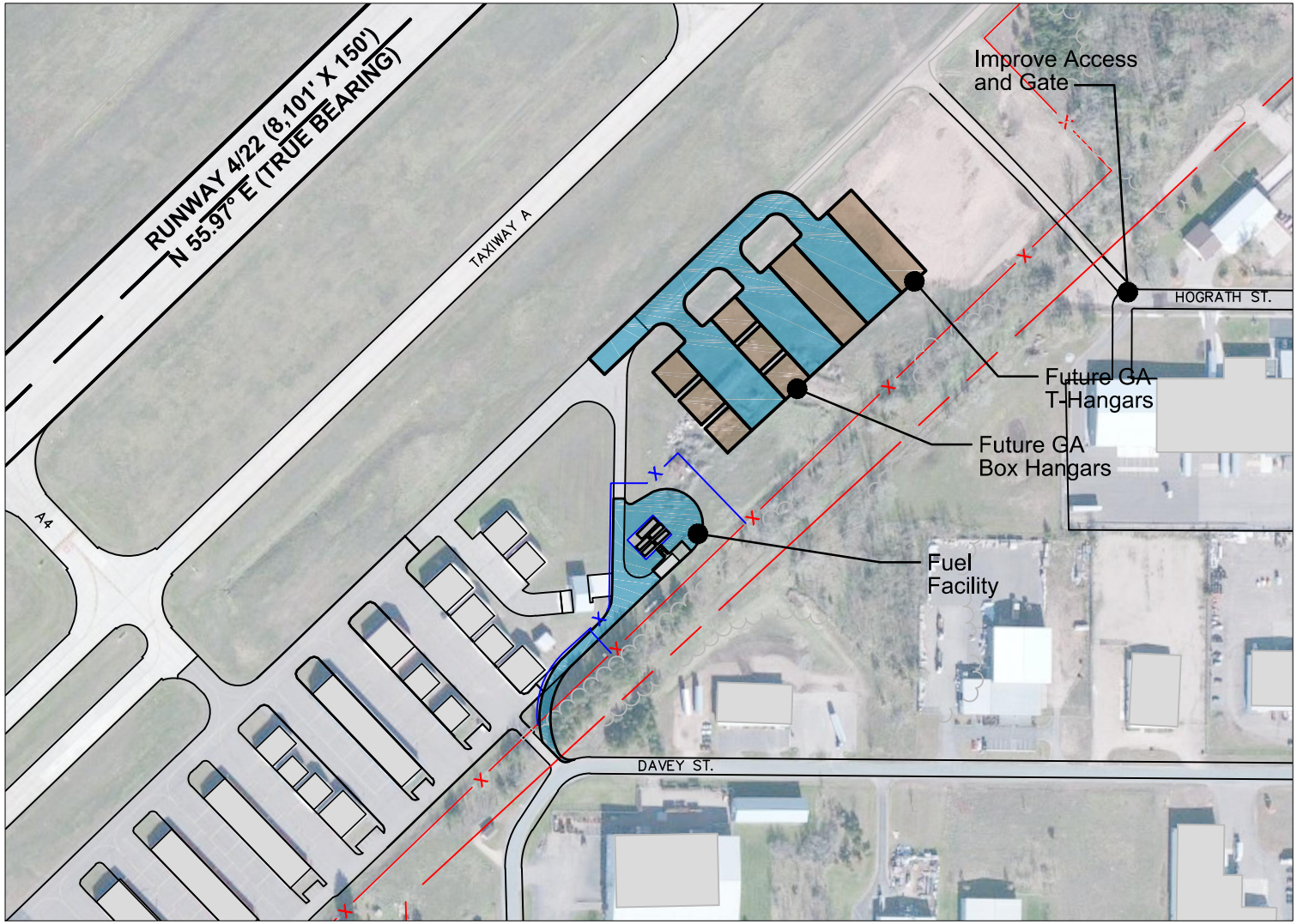


FIGURE 4-22

North GA Hangar Area Small GA Hangar Expansion Concept

PROS

- Expands Upon Existing GA Infrastructure in the North GA Area
- In Closer Proximity to Existing FBO than South GA Hangar Area

CONS

- Contradicts Commission-Approved South GA Hangar Area Concept
- Requires Removal of Large Amounts of Dirt and Debris
- Further Than Existing/Planned Hangars from Takeoff /Landing Surfaces

NORTH

0 150' 300'

Preferred Aircraft Hangar Alternatives

Based on projections of aircraft hangar requirements, the South GA expansion alternative is preferred for small GA use and the North Hangar area is preferred for corporate/FBO use. The South GA build-out concept provides capacity beyond the 20-year planning period, and it is recommended that this area be preserved for GA use in case of unforeseen demand.

4.8 AIRCRAFT RESCUE AND FIREFIGHTING ALTERNATIVES

As discussed in Chapter 3, there are several functional issues with the existing ARFF building and location. First, there is only one vehicle bay in the existing ARFF building, although the Airport owns and operates two separate ARFF vehicles. Second, the existing ARFF vehicle bay does not provide adequate depth for the Airport's vehicles. Third, airport maintenance staff cross-trained in ARFF procedures must be present in the ARFF observation room when air carrier aircraft are operating at the Airport, and as a result must travel from the SRE/maintenance building to the ARFF building each time a commercial aircraft arrives and must remain there until it departs. Three alternatives were developed that seek to resolve these functional issues.

ARFF Alternative 1: Expand Existing ARFF Facility

This alternative would involve expanding the existing ARFF facility by removing the existing ARFF vehicle bay (920 SF) and adding two new vehicle bays (1,500 SF each) with adequate depth for easy ARFF vehicle storage (see **Figure 4-23**). Each vehicle bay would have its own new overhead door opening onto the GA aircraft parking apron, and a third overhead door would be provided to provide access to the other side of the Airport fence. As an optional component, this alternative may include a small 100 SF expansion to the existing observation room, which would further improve visual contact with most areas of the parking aprons, taxiways, and runways.

Conceptual architectural renderings for expanding the existing ARFF facility were developed for this Master Plan Update (see **Figure 4-24**). As shown in these renderings, the expansion project would include improvements to exterior systems and finishes which would allow for a holistic design that integrates architectural features of the recently renovated passenger terminal building. This alternative would allow for renovation of interior systems and finishes as well. Overall costs for implementing this alternative are estimated at $650,000 to $750,000 (2012 dollars).

The existing location provides an ideal view of aircraft parking apron areas, as well as the best emergency response times to most airfield locations. However, this alternative would not resolve current inefficient staff procedures and may restrict long-term expansion of FBO facilities in this area.

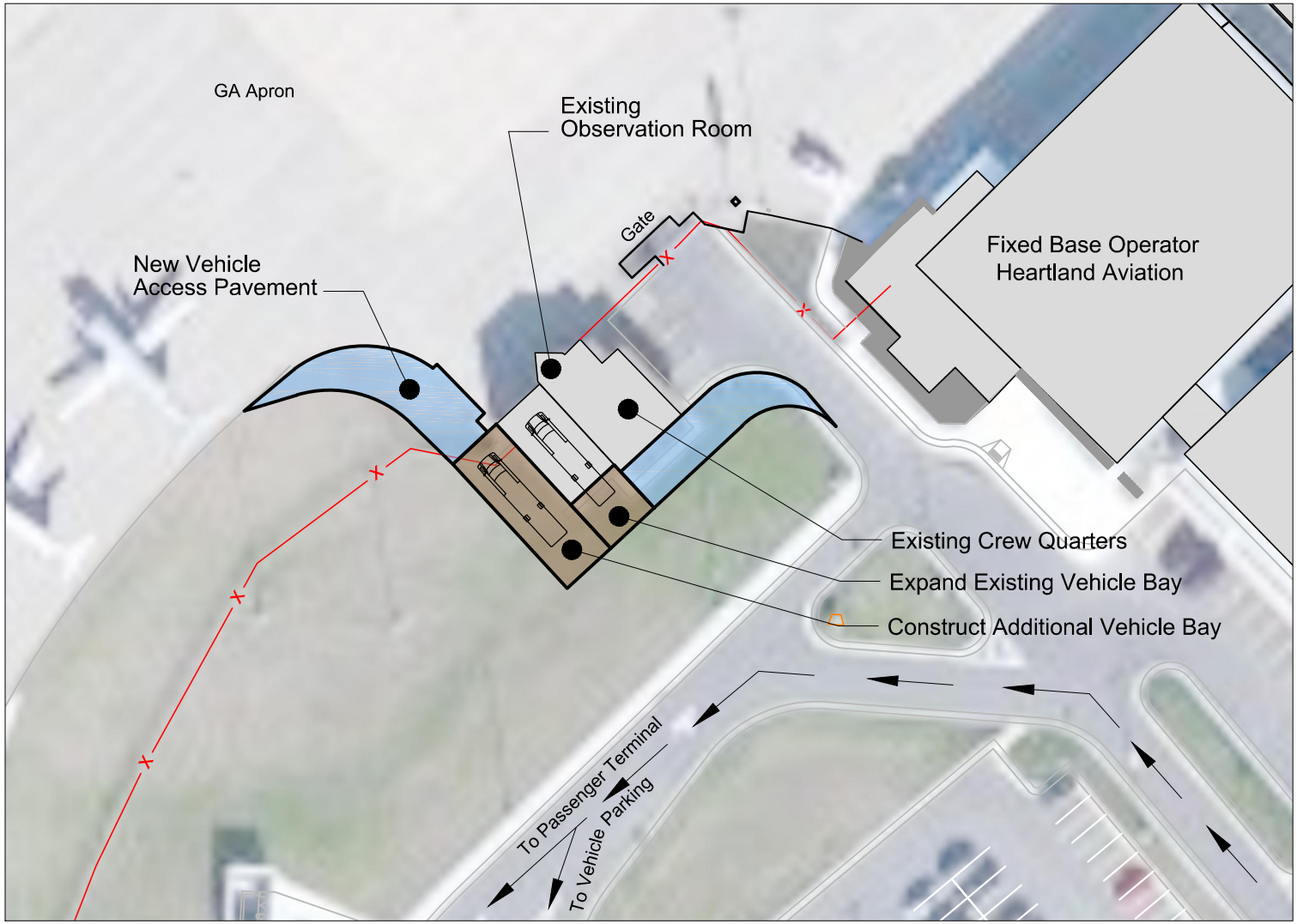


FIGURE 4-23

ARFF Alternative 1

PROS

- Provides Dedicated ARFF Vehicle Storage Area in Expansion to Existing Building
- Provides Ideal View of Apron Areas and Best Accident Response Times to Most Airfield Locations

CONS

- Maintains Inefficient Staff Procedures
- May Restrict Long-Term FBO Expansion

FIGURE 4-24

ARFF Alternative 1 Conceptual Renderings

ARFF Alternative 2: Co-Locate ARFF Functions with SRE/Maintenance Functions

This alternative would involve expanding and reconfiguring the interior of the existing SRE/maintenance building to include an observation room, crew quarters, and two new 1,500 SF ARFF vehicle bays (see **Figure 4-25**). The ARFF vehicle bays would be constructed within the existing SRE/maintenance vehicle wash bay, which would need to be reconstructed within the expanded area of the building. Overall costs for implementing this alternative are estimated at $1.1 million to $1.2 million (2012 dollars).

The location of ARFF Alternative 2 provides a less-than-ideal view of aircraft parking apron areas, would significantly increase emergency response times to most airfield locations, and may restrict long-term expansion of SRE/maintenance facilities in this area. However, this alternative would resolve current inefficient staff procedures by co-locating most Airport maintenance staff functions at one consolidated facility.

ARFF Alternative 3: Construct New ARFF Facility Near Air Traffic Control Tower

This alternative would involve constructing a brand new ARFF facility near the existing Air Traffic Control Tower (see **Figure 4-26**). This facility would provide 7,000 SF of space for ARFF vehicle and apparatus storage, airfield observation, and ARFF crew quarters. Overall costs for the constructing this new ARFF facility are estimated at $2.5 million to $2.7 million (2012 dollars). Required new pavement is expected to be much greater than for the other two alternatives due to the lack of direct vehicle access infrastructure between this proposed location and aircraft movement areas on the airfield.

This location would provide good access to all aircraft movement areas and an adequate view of aircraft parking aprons. It would also separate ARFF operations from the GA aircraft parking apron, which would free up existing apron pavement in front of the existing ARFF vehicle bay that must be clear at all times in the event of an aircraft incident. However, this location is further from the SRE/maintenance building than the existing ARFF facility, which would worsen staff efficiency issues.

Preferred ARFF Alternative

The three ARFF alternatives described above are compared in **Table 4-7**.

Table 4-7: ARFF Alternatives Comparison

Comparison Criteria	Alternative 1	Alternative 2	Alternative 3
Provides Dedicated ARFF Vehicle Storage	Yes	Yes	Yes
Observation Room Visibility (Rank)	2	3	1
Emergency Response Time (Rank)	1	3	2
Staff Efficiency (Rank)	2	1	3
May Restrict Future Expansion of Other Facilities	Yes (FBO)	Yes (SRE)	No
Cost Estimate	$650,000 to $750,000	$1.1 million to $1.2 million	$2.5 million to $2.7 million

FIGURE 4-25

ARFF Alternative 2

PROS

- Provides Dedicated ARFF Vehicle Storage Area in Expansion to Existing Building
- Improves Maintenance/ARFF Staff Efficiency by Consolidating Activities in one Location

CONS

- Does Not Provide Ideal View of Apron Areas
- Would Increase Accident Response Times to Most Airfield Locations
- May Restrict Long-Term SRE Expansion

NORTH

0 30' 60'

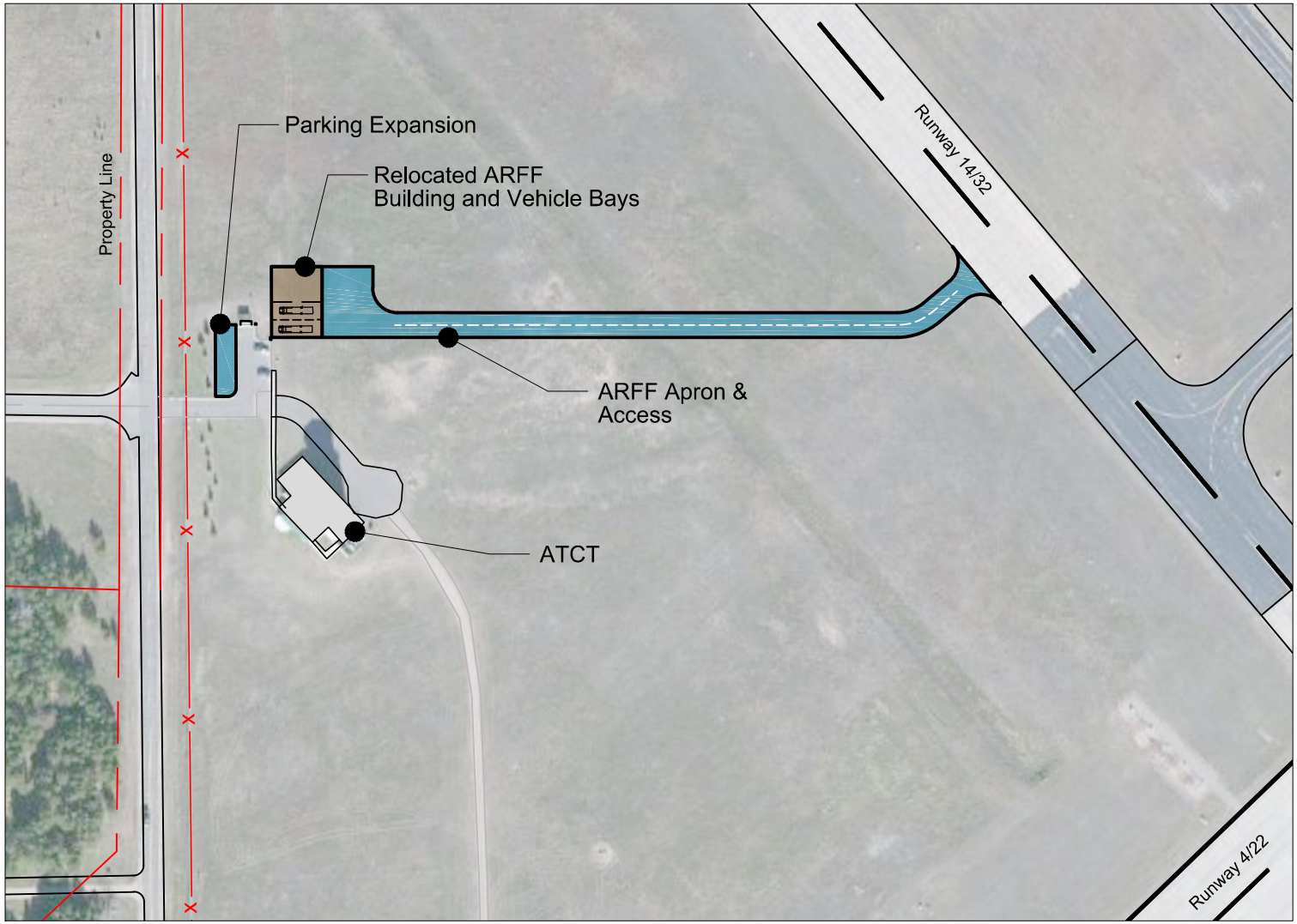


FIGURE 4-26

ARFF Alternative 3

PROS

- Separates ARFF Operations from Aircraft Apron Areas
- Provides Consolidated ARFF Vehicle Storage
- Provides Good Access to All Aircraft Movement Areas
- Provides Adequated View of Apron Areas

CONS

- Location is Further from the Maintenance Building than the ARFF Existing Location, Worsening Staff Efficiency Issues
- Cost is Significantly More than Other Alternatives

NORTH

0 100' 200'

All three ARFF alternatives provide for dedicated ARFF vehicle storage, but beyond that they differ in several ways. Alternative 1 provides the emergency response times; Alternative 2 provides the best staff efficiency; and Alternative 3 provides the best observation room visibility and best physical separation of ARFF operations from other airfield activities. Alternative 1 is the least expensive option, while Alternative 3 is the most expensive option.

Based on balanced consideration of these comparison criteria, this Master Plan Update recommends that the Airport pursue implementing Alternative 1 in the near-term.

4.9 CARGO FACILITY ALTERNATIVES

Chippewa Valley Regional Airport experiences a limited amount of air cargo activity. However, the Wisconsin State Aviation System Plan 2020 designates Chippewa Valley Regional Airport as one of ten air carrier/air cargo (AC/C) airports in the State. Such airports are "designed to accommodate virtually all aircraft up to and, in some cases, including, wide-body jets and large military transports."

Two sites have been identified for long-term air cargo development. Both development alternatives include cargo aircraft parking, a cargo processing facility, and ground vehicle parking/circulation. Alternative 1 identifies the area north of existing general aviation hangars adjacent to Taxiway A for development (see **Figure 4-27**). This area would be accessed via Hogarth St. and would not increase congestion of vehicle activity near the passenger terminal building. Alternative 1 is also situated in an area where additional expansion could occur if necessary.

Alternative 2 identifies the area to the south end of the airfield for long-term air cargo development (see **Figure 4-28**). Access to this area would be provided by 10th Ave. and Airport Road. Reserving this land for air cargo development would limit the potential expansion of general aviation development or other Airport revenue-generating purposes. Additionally, vehicles that access air cargo facilities via Melby Street from Highway 53 would have to travel past the passenger terminal building entrance, which would increase congestion in the area.

Alternative 2 has a more advantageous location on the airfield as well as existing primary vehicle access; however, this area has already been selected by the Airport commission as the preferred future general aviation hangar development site. Because there is less demand for development at the Alternative 1 location, it should be preserved for future non-hangar development, which may include cargo facilities or non-aeronautical land uses.

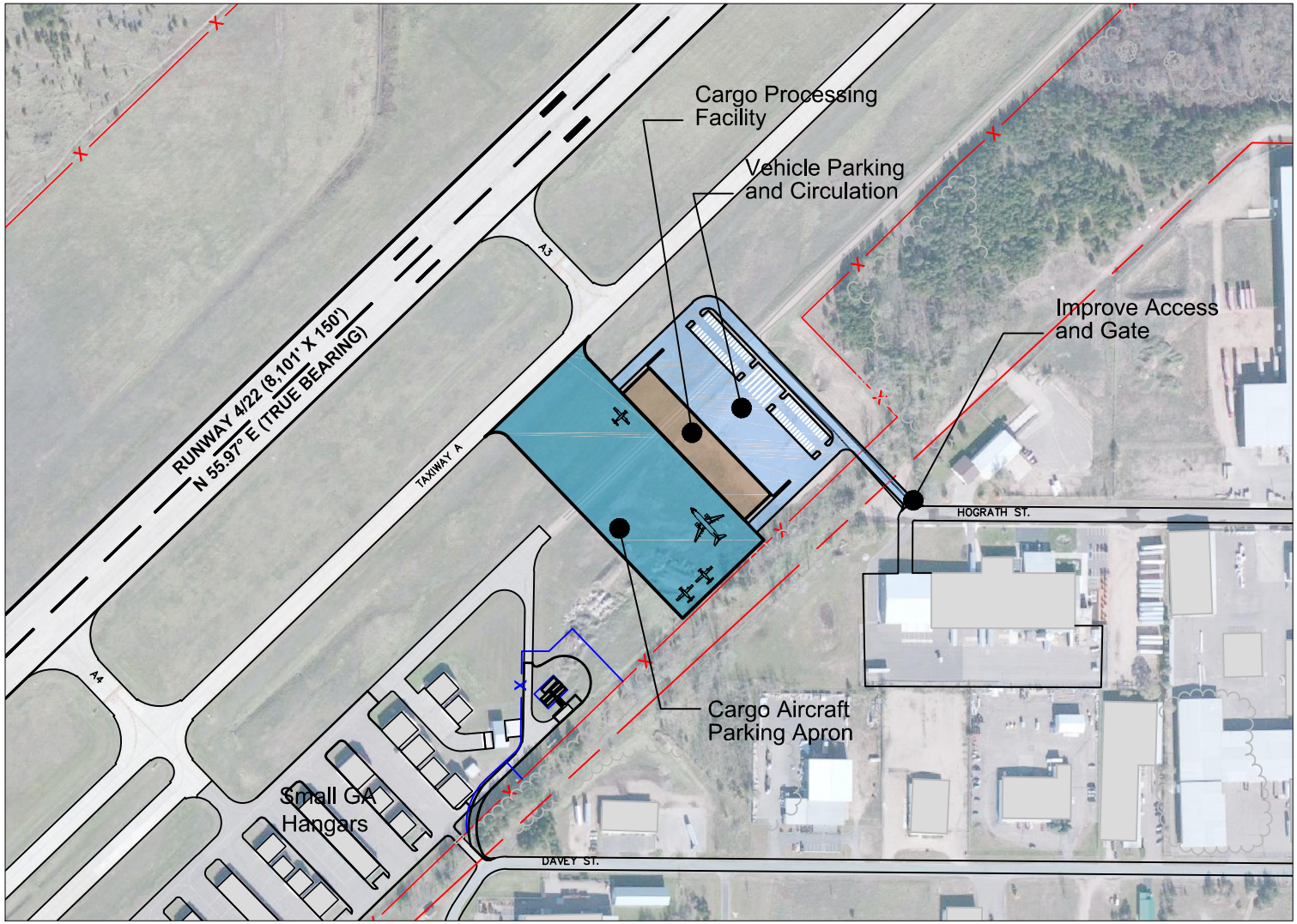


FIGURE 4-27

Long Term Air Cargo Development Site Alternative 1

NORTH

0 200' 400'

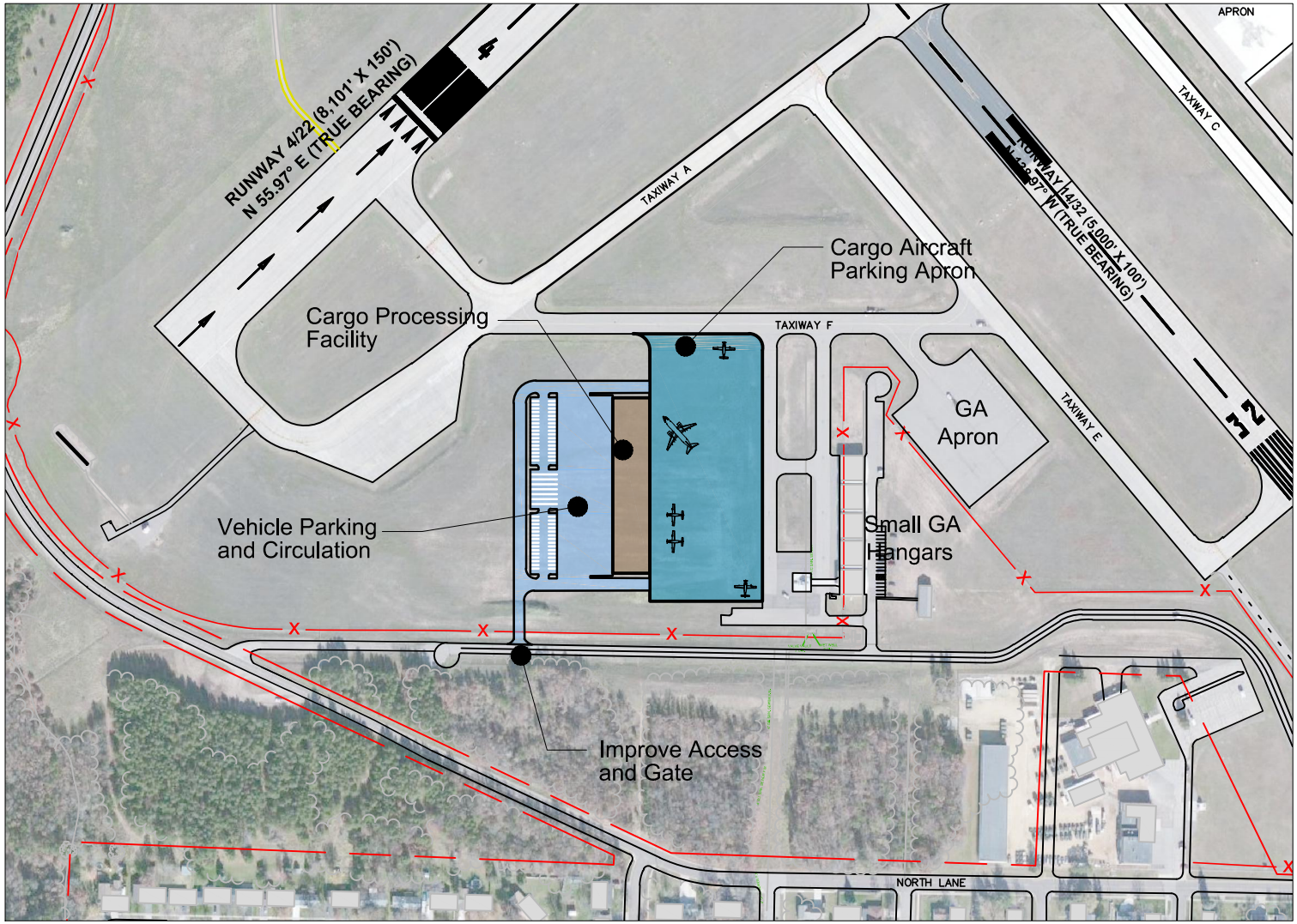


FIGURE 4-28

Long Term Air Cargo Development Site Alternative 2

NORTH

0 200' 400'

4.10 ALTERNATIVES SUMMARY

For the purposes of capital improvement programming, the preferred alternatives for each facility category presented throughout this chapter were assigned high, medium, and low priority status with relation to current needs and projected operational demand. Other projects are assigned to be implemented as demand dictates. High-priority projects should be planned for in the near-term (2014 to 2018); medium-priority projects should be planned for the five- to ten-year window (2019 to 2023); and low-priority projects should be planned for beyond 2023. Project assignments for each priority category are presented in **Table 4-8**.

Table 4-8: Alternatives Summary
High-Priority Projects (2014 to 2018)
Straighten Taxiway 'A' and Close Taxiway 'D'
Relocate Runway 4 Hold Bay and Landing Threshold
Implement Runway 14 Non-Precision Instrument Approach
Relocate Fuel Farm
Expand ARFF Facility
Reconstruct Taxiway ‘C’ North of Runway 4/22
Reconstruct Runway 14/32
Medium-Priority Projects (2019 to 2023)
Implement Runway 22 Special Authorization CAT I Instrument Approach
Install Runway 4 Approach Lighting System
Implement Runway 32 Non-Precision Instrument Approach
Expand Automobile Parking (Phase 1)
Implement Aircraft Deicing Improvements
Reconfigure Passenger Terminal for Second Airline
Low-Priority Projects
Extend Runway 14/32
Expand Automobile Parking (Phase 2)
As Demand Dictates
Expand Corporate/FBO Hangars
Expand Small GA Hangars
Develop Long-Term Air Cargo Site

Chapter 6 will present a funding plan for high-priority development alternatives. Medium- and low-priority projects should be considered for inclusion on the Airport’s capital improvement plan currently on file with WisDOT Bureau of Aeronautics.