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Identification and Evaluation of Development Alternatives

Chapter 4
Identification and Evaluation of Development Alternatives

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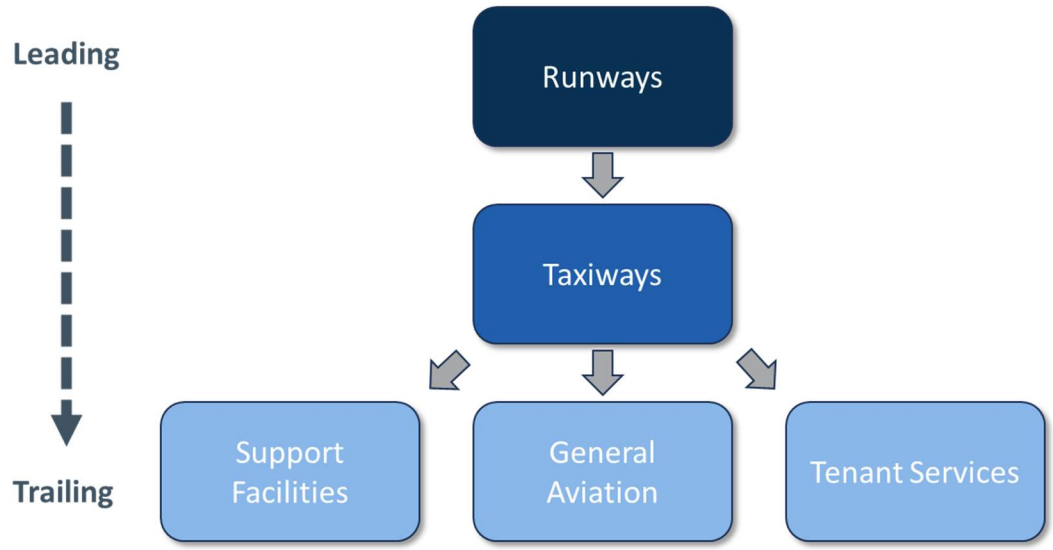
4 Identification and Evaluation of Development Alternatives

4.1 Introduction

This chapter identifies and evaluates facility development alternatives for Sioux Gateway Airport/Brigadier General Bud Day Field (SUX or the airport) based on the operational and growth needs determined in **Chapter 3, Facility Requirements**. The goal of identifying and evaluating various development options is to ensure airport facilities are capable of meeting forecasted activity demand levels, make efficient and effective use of available airport land, meet FAA airfield design standards, and, when applicable, provide adequate return on investment. Development alternatives in this chapter have been thoroughly analyzed, refined, and vetted through stakeholder involvement to establish a preferred development plan which reflects the vision for the airport and the values of the community.

The first step in analyzing potential development options is to define the leading and trailing planning elements. Leading elements include critical airport infrastructure and influence how alternatives for trailing elements are developed. At SUX, the leading elements include airfield facilities such as runways and taxiways. SUX has a distinctive factor affecting its operational layout: the presence of the 185th Air Refueling Wing (ARW) of the Iowa Air National Guard (IANG or the Guard). Although the IANG operates independently, its location at the airport necessitates designing the airfield to support their missions. Trailing elements are those whose placement and configuration are influenced and dependent on the leading elements. Trailing elements at SUX include support facilities (e.g., maintenance hangars, fuel storage), tenant services (e.g., Fixed Base Operators (FBOs)), and General Aviation (GA) development. **Figure 4-1** shows the relationship between leading and trailing planning elements at SUX.

Figure 4-1 Airport Planning Facility Categories



Source: RS&H Analysis, 2024

4.1.1 Alternatives Development Process

Establishing airport development alternatives is grounded in the future vision of the airport, the airport's established role in the NPIAS, and industry trends that may impact airport facility requirements. For these reasons, airport development options in this chapter are initially evaluated based on EONS performance principles (**E**conomic Viability, **O**perational Efficiency, **N**atural Resource Conservation, and **S**ocial Responsibility). These principles, listed and summarized below, form the foundation for establishing more specific evaluation criteria for each proposed development alternative:

- **Economic Viability:** Ensuring financial sustainability and return on investment.
- **Operational Efficiency:** Maximizing the effectiveness and productivity of airport operations.
- **Natural Resource Conservation:** Minimizing environmental impact and promoting sustainability.
- **Social Responsibility:** Addressing community needs and ensuring equitable access and benefits

4.1.2 Alternatives Evaluation Criteria

Once alternatives are developed, the next step process is to define evaluation criteria to assess all facility development concepts. This evaluation process draws on guidance from the airport visioning process, aviation industry research, and established best practices in planning.

For the purposes of this chapter, each facility alternative is evaluated based on the following criteria:

- Operational safety and public safety
- Operational efficiency
- FAA airfield design standards for approved critical aircraft
- Meets the needs of the user
- Resolves current issues and addresses long-term requirements
- Provides an adequate and appropriate level of service (pedestrian and vehicular)
- Ease of implementation
- Costs to implement development
- Flexibility and potential for future expansion
- Environmental impacts and sustainability

Once all relevant facilities are evaluated against the criteria listed above, the outcome is a comprehensive preferred development plan that addresses facility needs. Subsequently, project costs and implementation strategies can be determined.

4.2 Land Use – Existing and Future

Studying existing and future land use is critical before generating airport site plans for several reasons:

- **Safety:** Identifying potential hazards from nearby land uses.
- **Noise Mitigation:** Developing strategies to minimize noise impacts on sensitive land uses.
- **Environmental Impact:** Minimizing disruption to ecosystems and natural resources.
- **Community Relations:** Designing the airport to minimize conflicts with neighboring land uses.
- **Operational Efficiency:** Optimizing the airfield to improve aircraft movements.
- **Growth and Development:** Ensuring each facility can accommodate future increases in airport activity.

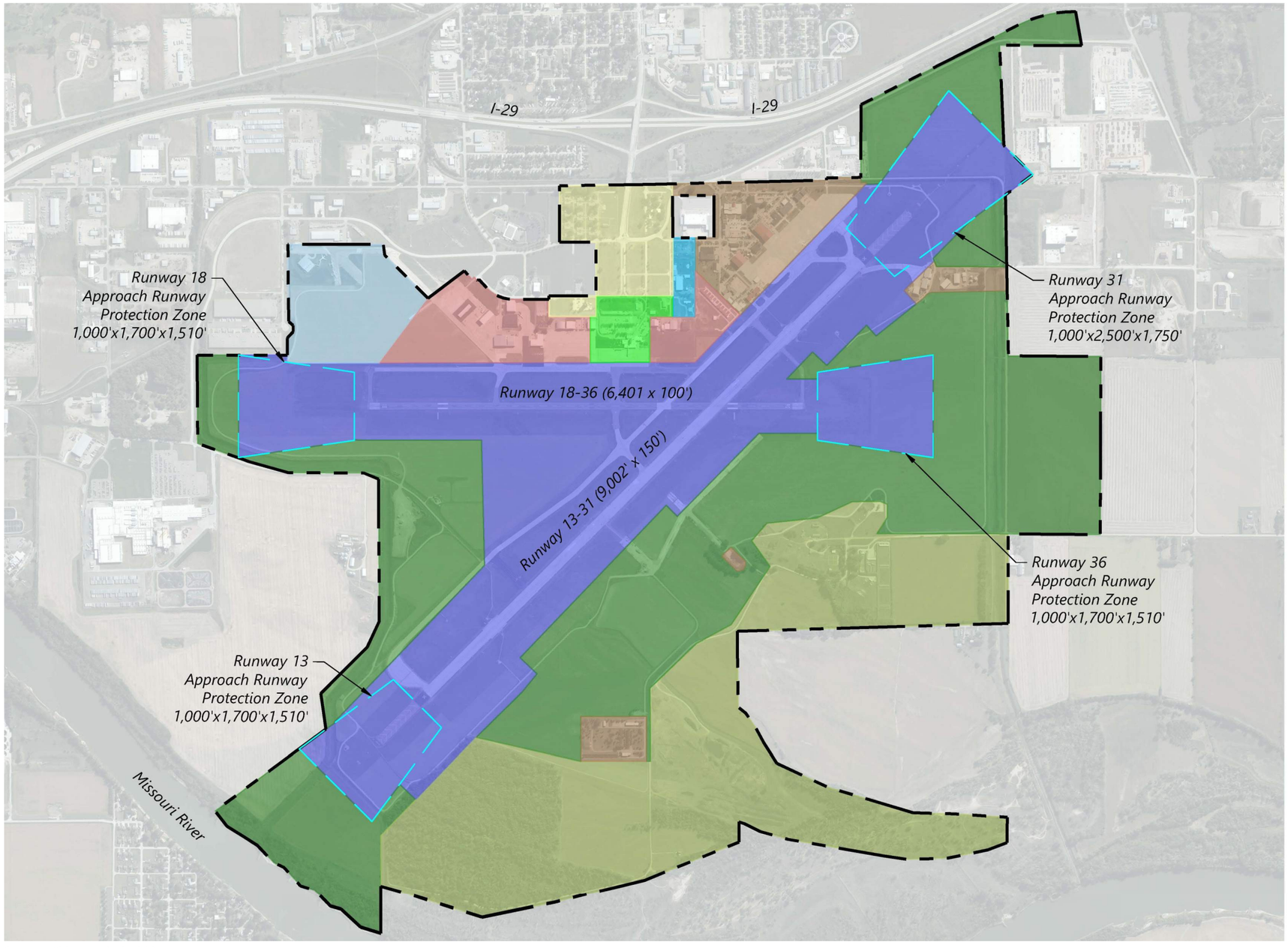
By considering these factors, facilities at SUX can be identified and evaluated to balance operational needs with safety, environmental stewardship, and community relations, while setting the stage for future growth and development.

4.2.1 Existing Airport Land Use

Defining and evaluating existing airport land use patterns began early in the master planning process during the inventory of existing conditions. Existing aeronautical operations and

development opportunities are largely focused on the eastern portion of the airfield that offers the greatest connectivity to the local road network. Commercial, military, and general aviation operators are located in this area with room to grow while the northern and western limits of the airfield are largely preserved for non-aeronautical revenue opportunities compatible with the safe navigation of airspace. **Figure 4-2** depicts the existing land use plan for the airport.

Figure 4-2 Existing Airport Land Use



Sioux Gateway Airport / Brigadier General Bud Day Field Existing Land Use Plan

- Existing Airport Property Line
- Runway Protection Zone

Land Use Categories

- Airport Operations Area
- Revenue Support (Aeronautical)
- Revenue Support (Non-Aeronautical)
- Military
- Agriculture/Open Space
- Park/Recreation/Institutional
- General Aviation
- Commercial Airline
- Airport Support

Notes:
1) Only land uses within existing airport property line depicted.

2) Existing Runway Design Code / Existing Visibility Minimums:
Runway 13: D-II / $\frac{3}{4}$ Mile
Runway 31: D-II / $\frac{1}{2}$ Mile
Runway 18: C-II / $\frac{3}{4}$ Mile
Runway 36: C-II / $\frac{3}{4}$ Mile

N 0' 800' 1,600'

Source: RS&H Analysis, 2024

4.2.2 Future Airport Land Use

Establishing a future airport land use plan requires analyzing the existing land use plan and comparing it to recent development and operational trends. This process also considers forecasted growth as well as industry trends and innovations. Creating a future land use plan supports the overall development alternatives effort by designating regions on the airfield most conducive to each type of aeronautical and nonaeronautical activity, ensuring the highest and best use of available land. Development at SUX has largely followed the blueprint of the existing land use plan and is anticipated to maintain this trend.

The protection of land enabling current and projected growth in aviation activity should be the top priority of the future land use plan. **Chapter 3, Facility Requirements** discusses key development needs on the airfield for consideration to enable growth in both civilian and military operations. An expansion of land protected for the airport operations area (AOA) is included as the first building block of the future land use plan. The surrounding aeronautical development categories, which include *General Aviation*, *Commercial Airline*, and *Airport Support*, are all uniquely "siloed" in their respective regions with adequate space for respective expansion, with the exception of the *General Aviation* region increasing to cover the new development plan. Similarly, military needs at the airport have largely remained consistent, but the military land use footprint has been expanded for the planning period to accommodate future IANG and Army National Guard (ANG) projects critical to their respective missions.

The most significant need not currently addressed in the existing land use plan is accommodations for potential cargo operations at SUX. While cargo operations at neighboring airports (FSD and OMA) have historically reduced the demand for such operations at SUX, the ongoing growth of the Siouxland metropolitan area has led the City to believe it is essential to designate and protect aeronautical land for this type of activity. For the future land use plan, three specific areas around the airfield were classified as *Mixed-Use*, which identifies areas that can accommodate a range of aviation-related developments.

Figure 4-3 depicts the future land use plan, which shows the ongoing growth of *General Aviation* and *Military* land use categories, as well as the newly designated *Mixed-Use* category. Land located in the midfield between the runways and on the southwest side of Runway 13-31 is available but has limited infrastructure, necessitating significant investment for development. The analysis of development alternatives discussed in this chapter, aimed at addressing the forecasted growth needs identified in **Chapter 3**, is grounded in this future land use plan.

Figure 4-3 Future Airport Land Use

Source: RS&H Analysis, 2024

4.3 Airfield Alternatives

The airfield is the key element in facility planning, as it fulfills the primary function of an airport: ensuring the safe movement of aircraft from the ground to the air and back. Additionally, airfield configuration is the most rigid aspect of airport infrastructure, influenced by factors such as terrain, prevailing weather conditions (particularly wind), aircraft performance requirements, the mix of aircraft in use, and FAA design standards, guidance, and best practices. Airfield alternatives for SUX focus on four aspects of improvement:

1) Address known or anticipated operational safety concerns.
2) Comply with established FAA airfield geometry and design standards.
3) Fulfill performance requirements for current and future design aircraft.
4) Support future facility development.

Based on the criteria outlined above, this section focuses on the analysis of runway and airfield standardization alternatives.

4.3.1 Runway Alternatives

The most critical component of airfield elements is the runway system itself. The two-runway system at SUX offers adequate coverage for aviation activities under all wind conditions and facilitates low-visibility operations in both directions relative to historical prevailing winds. A detailed analysis of the individual requirements for each runway to support forecasted aviation activity is provided below.

4.3.1.1 Runway 13-31 Extension Alternatives

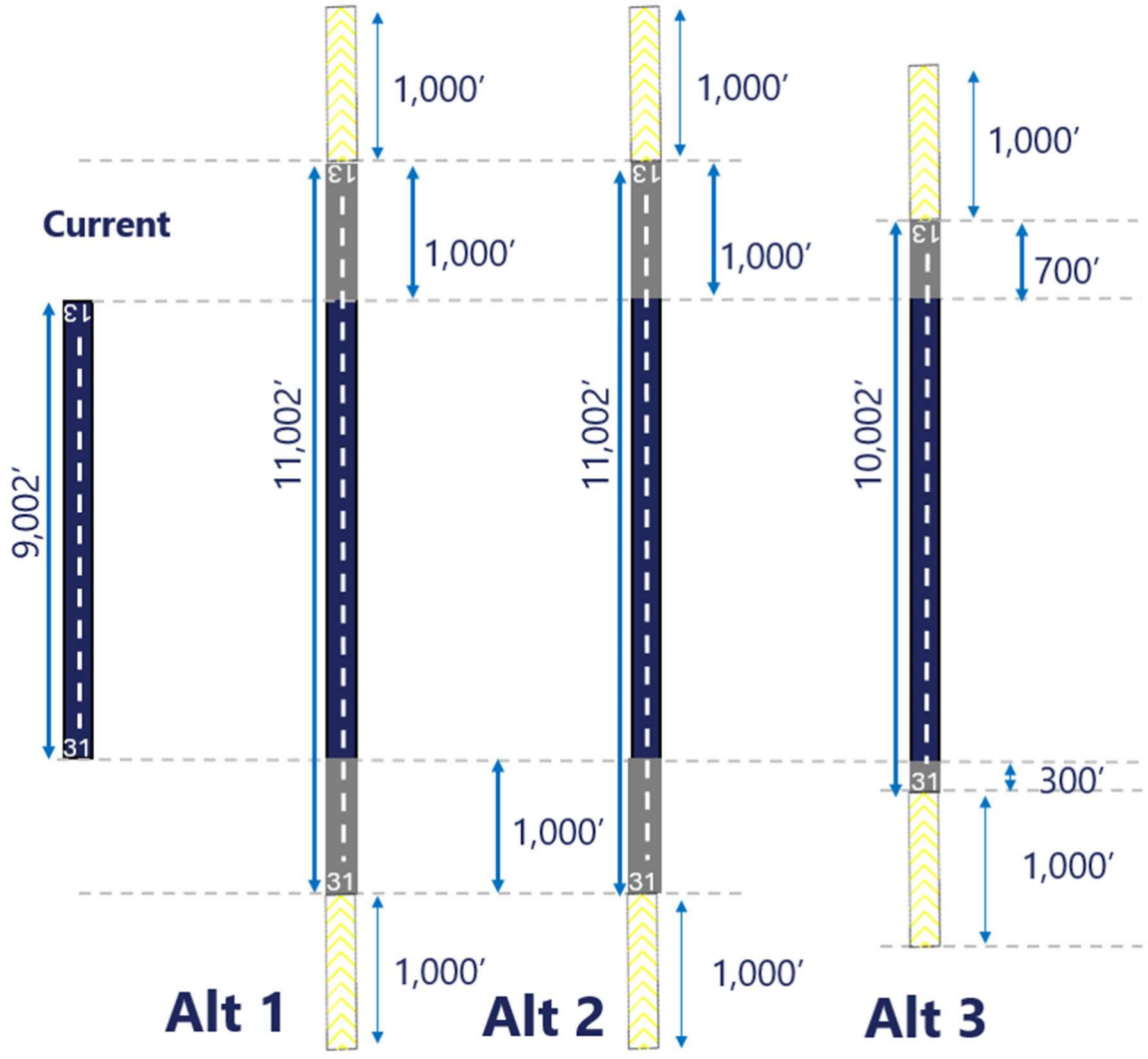
Runway 13-31 serves as the primary runway at SUX, supporting commercial, military, and general aviation activities. It is 9,002 feet long and 150 feet wide, designed to accommodate aircraft weighing up to 220,000 pounds with a dual tandem gear configuration. According to the analysis conducted in **Chapter 3, Facility Requirements**, this length is anticipated to be adequate for forecasted civilian aircraft operations throughout the planning horizon. However, the current length and pavement design strength restrict the IANG's KC-135R air refueling missions, often leading to reduced fuel payloads. To address these critical operational needs, an advanced runway alternatives analysis was performed as part of the Siouxland Nexus program (see **Section 4.5.7.2, Siouxland Nexus**) to determine the most feasible and preferred solution for meeting the IANG's mission requirements.

Three development alternatives were examined for their capacity to support the following IANG operational requirements:

- **9,000 feet** of Landing Distance Available (LDA)[1]
- **10,000 feet** of Takeoff Run Available (TORA)[1] / Takeoff Distance Available (TODA)[1]
- **11,000 feet** of Accelerate Stop Distance Available (ASDA)[1]

A summary of the findings is presented below, along with **Figure 4-4**, which details the alternatives analyzed. An in-depth analysis of the extension program for Runway 13-31 can be found in **Appendix D**.

Figure 4-4 Runway 13-31 Extension Alternatives



Source: RS&H Analysis, 2024

[1] Refer to FAA AC 150/5300-13B, *Airport Design - Change 1*, Appendix H, Declared Distances for definition.

- **Alternative 1 (Public Use Extension)**
  Alternative 1 proposes extending Runway 13-31 on both ends by 1,000 feet and using displaced thresholds and declared distances to prevent altering the existing location of either threshold. Alternative 1 includes a standard FAA displaced threshold marking scheme that features white arrows painted on the extended pavement that direct towards the existing thresholds. Additionally, 1,000-foot blast pads would be constructed behind the runway extensions on both ends.

- **Alternative 2 (Military Use Only Extension)**
  Alternative 2 proposes the addition of 1,000 feet to both ends of Runway 13-31 while retaining the current position of the runway thresholds and implementing 200-foot blast pads adjacent to the extended runway pavement to mitigate the erosive effect of jet blast and propeller wash. Alternative 2 employs a different marking scheme than Alternative 1 that would include painted chevrons on the new pavement leading up to the existing thresholds. These chevroned areas on both ends of the runway would be exclusively designated for use by the IANG.

- **Alternative 3 (Combined 1,000 Foot Extension)**
  Alternative 3 would involve an extension of Runway 13-31 by 1,000 feet. This would be accomplished by shifting the Runway 13 threshold 700 feet northwards and the Runway 31 threshold 300 feet southwards. In addition, paved overruns measuring 1,000 feet behind each threshold would be constructed and marked with yellow chevrons. The paved overruns would not be intended for use during takeoff but instead designed to be utilized only in the event of an overrun of a military aircraft, thereby providing the IANG with 11,002 feet of ASDA.

4.3.1.1.1 Runway 13-31 Extension Alternatives Evaluation

The evaluation of each runway alternative preceded the alternatives derived for airport development and used a different set of evaluation criteria than the rest of the focus areas in this chapter as the development was precedented on resolving existing shortfalls to the IANG's mission operation. The preceding analysis of runway alternatives and performance metrics is summarized in the evaluation matrix presented in **Table 4-1**. Following a comparison of the three alternatives and extensive stakeholder input, Alternative 2 was selected as the preferred option. This alternative proposes military-use-only pavement extensions on both ends of Runway 13-31. Both Alternatives 1 and 2 allow the runway thresholds to remain, introduce minimal new obstructions, and align with the implementation timeframe for the Guard's mission. However, Alternative 2 was chosen for its ease of implementation within the IANG's timeline, helping to address the implications of declared distances for civil-use operations. Although Alternative 3 does not involve displaced thresholds and declared distances, it was ultimately ruled out due to the significant impacts of relocating the runway thresholds, increased risks

related to obstructions, and the lack of property control in areas designated for future Runway Protection Zones (RPZs).

Table 4-1 Runway 13-31 Extension Alternatives Evaluation

Evaluation Criteria	Alternative 1 (Public Use Extension)	Alternative 2 (Military Use Only Extension)	Alternative 3 (Combined 1,000' Extension)
Aircraft Performance			
ROM Costs & Timeframe			
Facility Integration			
Land Use & Airspace Integration			
FAA Preferences			
Pilot Familiarity			

Performance Legend:

Good

Fair

Poor

Source: RS&H Analysis, 2024

4.3.1.2 Runway 18-36 Extension Alternatives

The analysis of Runway 18-36 in **Chapter 3, Facility Requirements**, concluded that the existing runway length is expected to be sufficient throughout the planning period. However, airport staff has identified the potential for extending the runway and installing an Instrument Landing System (ILS) to enhance support for civilian aircraft operations. Additionally, the IANG has expressed a potential need for a similar extension to provide redundancy for the ARW's mission. Since no timeline has been established for either development, extension alternatives for Runway 18-36 were not analyzed in this chapter. Nevertheless, all airport-owned land adjacent to the runway extension needs at either end was preserved during the analysis of other airfield development alternatives discussed later in this chapter.

4.3.2 Airfield Standardization

Outside of the runway system at SUX, the remaining airfield elements, consisting of taxiways, taxilanes, and aircraft aprons, were also analyzed for safety and operational challenges. This analysis revealed several existing nonstandard and operationally unsafe conditions within the taxiway system, as well as opportunities for reducing or reconfiguring paved apron areas to minimize pilot confusion and mitigate sources of Foreign Object Debris (FOD). The following sections provide a detailed examination of airfield safety enhancements aimed at addressing these issues.

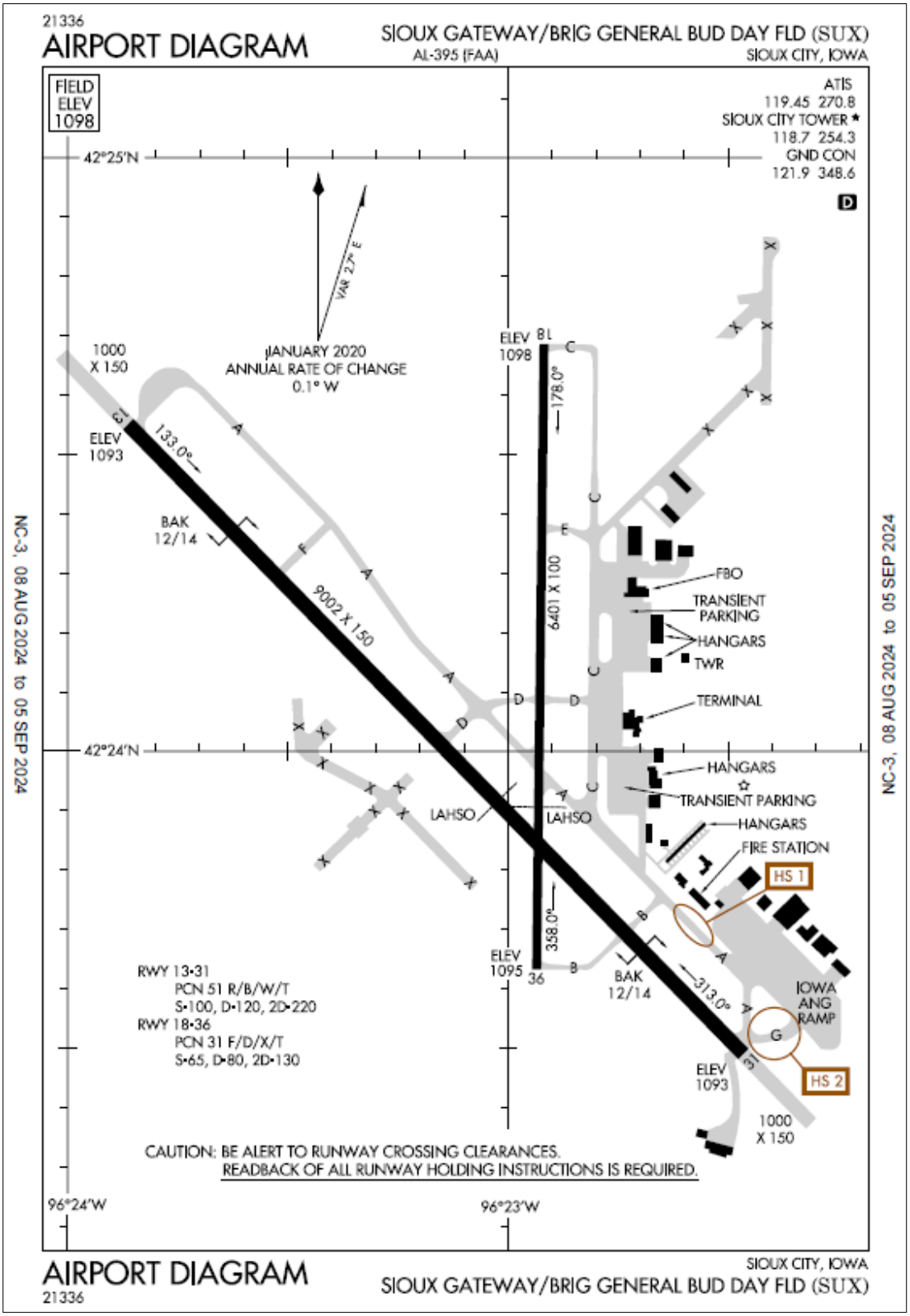
4.3.2.1 Hot Spot Mitigation Alternatives

As shown in **Figure 4-5**, SUX has two FAA-identified hot spots, which alert airport users to areas on the airfield that may be confusing to pilots and pose a higher risk of runway incursions. Hot Spot 1 (HS 1) is situated on Taxiway A near the Aircraft Rescue and Firefighting (ARFF) facility. This hot spot presents a Line-of-Sight (LoS) issue, as the ARFF facility obstructs visual contact between the Airport Traffic Control Tower (ATCT) and aircraft/vehicles operating on this segment of Taxiway A. Hot Spot 2 (HS 2) is located on Taxiway G near the IANG's ramp. Similar to HS 1, HS 2 poses a LoS issue, with the IANG's fuel cell hangar blocking visual contact between the ATCT and aircraft/vehicles on Taxiway G.

HS2 only affects military operations given the location on Taxiway G and the IANG ramp. Based on airfield traffic patterns and the taxiway systems, it is only anticipated that HS1 on Taxiway A will impact large commercial aircraft landing on Runway 13 and circling back towards the terminal area, or aircraft using Taxiway A to depart on Runway 31. Military operations affected primarily include those landing on Runway 31 and taxiing back to the IANG ramp via Taxiway A. Using activity data available from fiscal year 2023, these operational scenarios amount to an average of 2,215 operations per year or six operations per day taking place within the area of HS1 and 1,250 annual or 3.5 daily operations for HS2[2]. The LoS issues tied to either hotspot location are only considered adverse to airfield safety during the operational hours of the ATCT (0500-2200 local time) given the controller's vision in the tower cab. As such, any operations occurring within the off-hours of ATCT staffing would further reduce the frequency of hotspot activity.

[2] Source: FAA OPSNET; RS&H Analysis, 2024

Figure 4-5 SUX Airport Diagram



Source: Federal Aviation Administration, 2024

Several alternatives were proposed to mitigate the existing airfield hot spots at SUX, including:

- **Alternative 1 (No Action)**
  This option would maintain the current condition if the cost of mitigation is determined to exceed the operational hazard posed by the hot spot.

- **Alternative 2 (Operational Measures)**
  Enhancing safety through operational methods could substitute for addressing areas with limited visibility from the ATCT. Possible measures include remote camera surveillance of hot spot locations, use of "follow-me" escort vehicles, and additional pavement markings

- **Alternative 3 (Impeding Facility Relocation)**
  This involves evaluating the feasibility of relocating the facility causing the line-of-sight issue. Factors such as the facility's remaining useful life, cost, operational impact, capacity for future growth, and compatibility with the airfield must be considered.

- **Alternative 4 (Relocate ATCT)**
  If neither changing the airfield conditions nor relocating the obstructing facility is feasible, the cost and practicality of relocating the ATCT should be examined. The existing ATCT, completed in 1992, manages over 15,000 operations annually and operates daily from 6:00 AM to 9:30 PM CST (7:00 AM to 10:30 PM CDT).

4.3.2.1.1 Hot Spot Mitigation Alternatives Evaluation

The analysis of development solutions addressing visibility issues at both hot spots, based on the four mitigation measures outlined earlier, is presented below in **Table 4-2**.

Table 4-2 Hot Spot Mitigation Alternatives Evaluation

Evaluation Criteria	Alternative 1 (No Action)	Alternative 2 (Operational Measures)	Alternative 3 (Impeding Facility Relocation)	Alternative 4 (Relocate ATCT)
Operational/Public Safety	Poor	Good	Good	Good
Operational Efficiency	Poor	Fair	Good	Good
Meets FAA Design Standards	Poor	Poor	Good	Good
Effectively Serves Target User	Poor	Fair	Good	Good
Resolves Current Issues	Poor	Good	Good	Good
Meets Long-Term Facility Needs	Poor	Poor	Good	Good
Appropriate Level of Service	Good	Good	Good	Good
Ease of Implementation	Good	Good	Poor	Poor
Cost to Implement	Good	Fair	Poor	Poor
Flexible/Future Expansion	Good	Good	Good	Good
Environmental Impacts	Good	Good	Fair	Fair
Supports Sustainability Principles	Good	Good	Good	Good

Performance Legend:

- Good
- Fair
- Poor

Source: RS&H Analysis, 2024

The "no action" option is the least preferable, as it does not resolve any existing conflicts. Implementing operational restrictions or installing secondary measures (Alternative 2) to ensure continuous LoS for the ATCT in all movement areas could effectively address the challenges of monitoring pavement segments that are blind to the tower. However, preliminary feedback from FAA ATCT personnel suggests that some of these methods may not be suitable for long-term traffic monitoring.

Relocating the ARFF and IANG hangar facilities (Alternative 3) or the ATCT (Alternative 4) would eliminate the issues associated with both hot spots, but this would incur significant costs related to design, construction, and demolition. A cost-benefit analysis should be conducted, and a Safety Risk Management (SRM) panel should be held to determine whether the costs of short-term (operational) versus long-term (building relocation) mitigation measures are justified by the anticipated operational and safety risks. Relocating airfield facilities can be complex due to various factors, including grant assurances, the useful life of the structures, funding support, and phasing. Consequently, the analysis for the recommended long-term solution to mitigate both HS 1 and HS 2 depends on the feasibility of implementing each facility. Detailed long-term plans for each facility are further discussed in **Section 4.5, Aviation Support Facilities**.

However, given the extended timeline associated with program planning, design, and implementation of these solutions, it is advisable to proceed with Alternative 2 in collaboration with key stakeholders.

4.3.2.2 Taxiway Alternatives

Chapter 3, Facility Requirements, identified several areas of the airfield that do not comply with the current design standards set forth by FAA Advisory Circular 150/5300-13B, *Airport Design - Change 1*. These areas include:

- Taxiways A, D, G, and M, which provide direct access from an apron to a runway.
- Taxiways A, E, G, and M, which form a nonstandard angle entering a runway.
- Taxiway D, which crosses over the middle third of Runway 18-36.
- Taxiways A and G, which form a Y-shaped intersection with Runway 13-31.

The following sections provide a detailed taxiway alternatives analysis, assessing these identified issues and exploring potential solutions to enhance safety and compliance with FAA standards.

4.3.2.2.1 Taxiway A Analysis

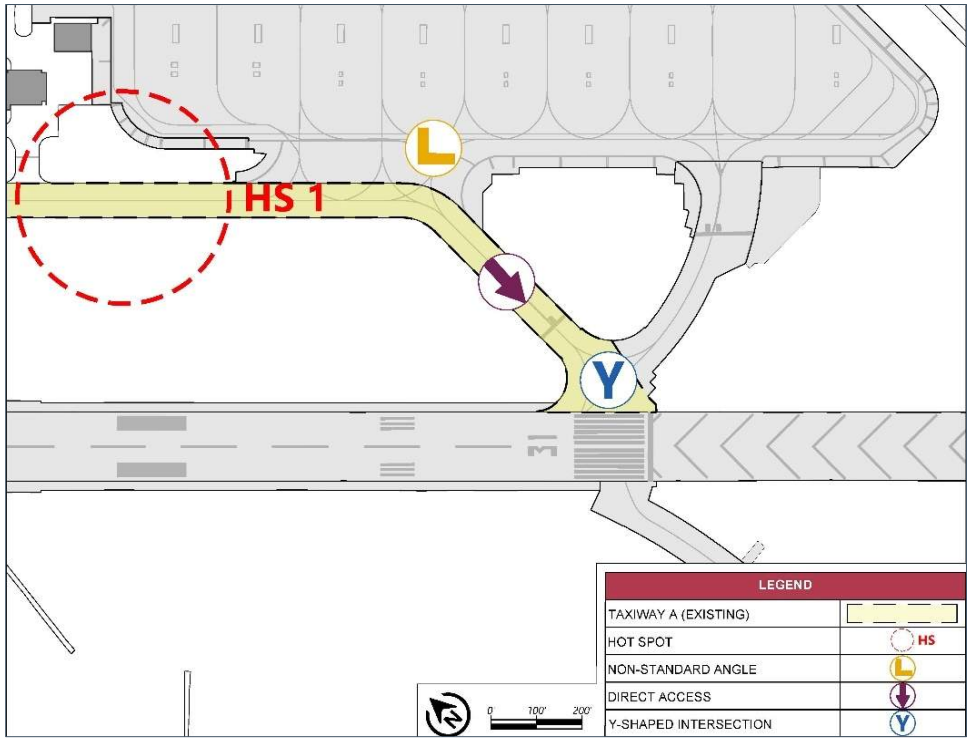
The southern end of Taxiway A, which is the parallel taxiway for Runway 13-31, connecting to the threshold of Runway 31 (shown in **Figure 4-6)** is considered nonstandard due to the following conditions:

- Direct apron to runway access
- Nonstandard angle taxiway entering a runway
- Y-shaped intersection

As detailed in **Section 4.5.7.2, Siouxland Nexus**, simultaneous airfield improvements currently in the engineering design phase have provided a solution to the nonstandard configuration of Taxiway A by realigning the connector to create a perpendicular intersection with the runway threshold (see **Figure 4-7**). This project, nearing the conclusion of its preliminary design phase as part of this master plan, effectively resolves the previous nonstandard angle and the Y-shaped intersection with Taxiway G.

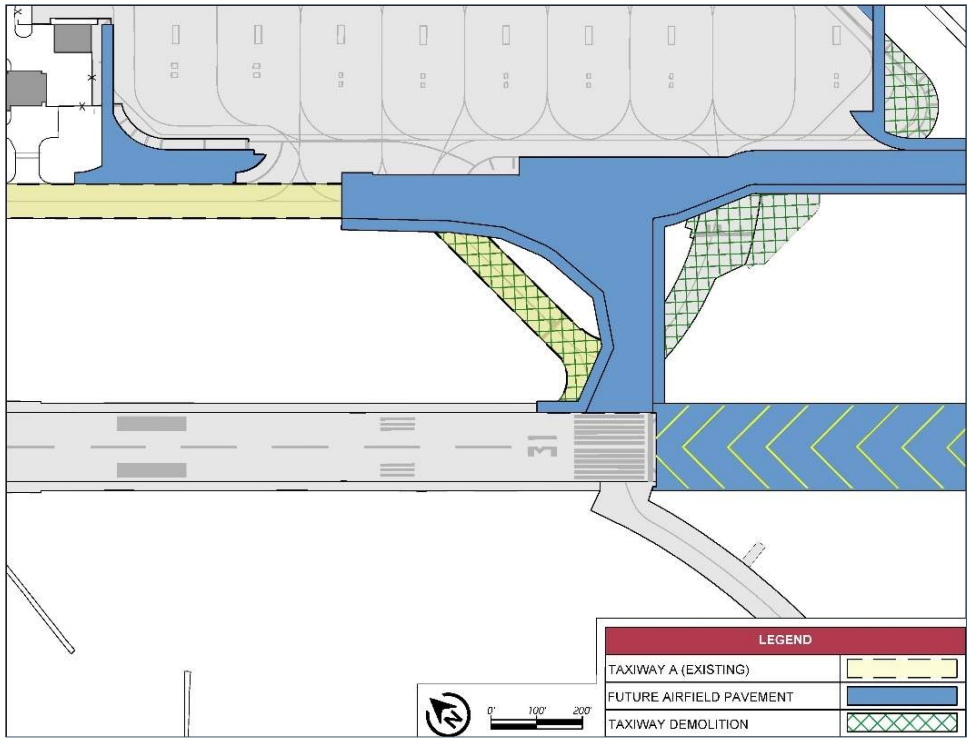
Additionally, the realignment improves the direct apron-to-runway access by introducing new pavement markings and operational requirements. Since the apron is exclusively designated for use by the IANG and is fully funded and managed by the Department of Defense (DoD), the FAA does not oppose this direct access, provided it is governed by appropriate operational procedures. Therefore, no further modifications to Taxiway A are required.

Figure 4-6 Taxiway A (Existing Condition)



Source: RS&H Analysis, 2024

Figure 4-7 Taxiway A (Proposed Solution)



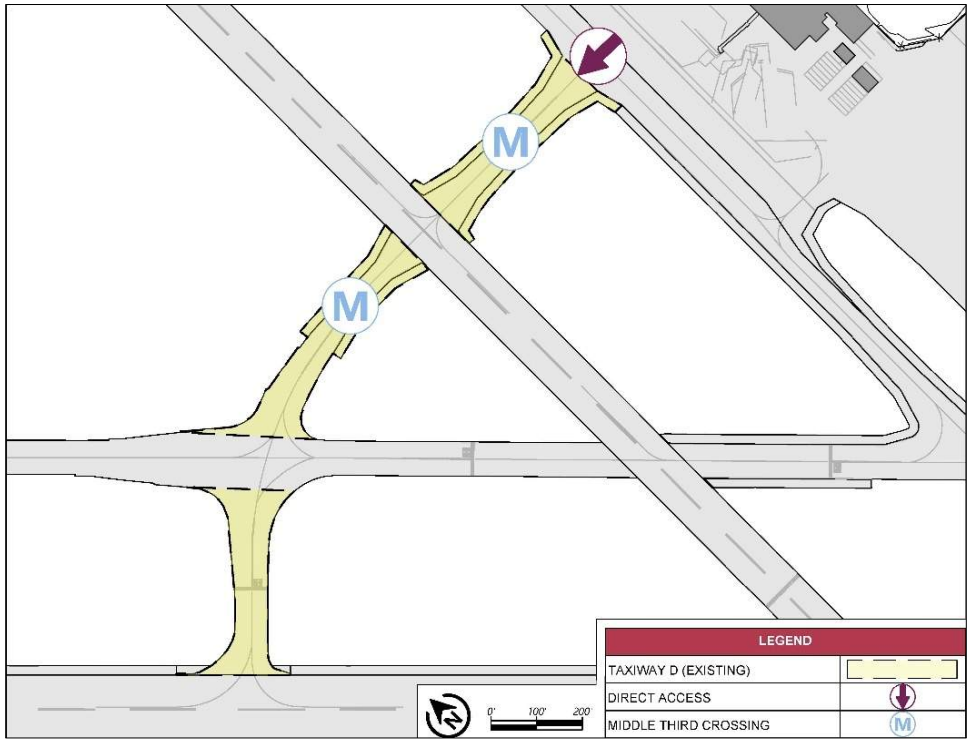
Source: RS&H Analysis, 2024

4.3.2.2.2 Taxiway D Analysis

Taxiway D, located in the middle of the airfield and extending from the terminal apron to Runway 13-31, currently violates two FAA design standards: it allows direct access from the terminal apron to a runway and features a runway crossing in the middle third "high-energy" zone, where pilot deviations are more challenging in the event of an incursion (see **Figure 4-8**).

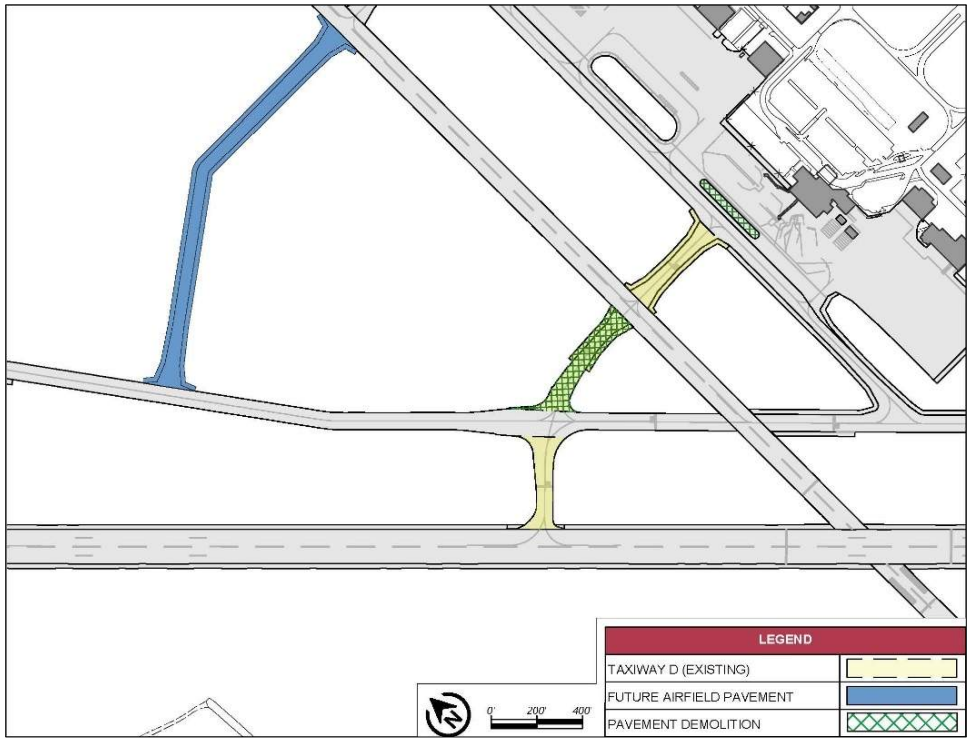
To address these issues, the recommendation for reconfiguring the direct apron-to-runway access includes the installation of a turf island between the terminal apron and Taxiway C. This solution aligns with FAA guidance by requiring pilots and drivers to make a minimum of two steering movements to reach the runway from the non-movement area. Unlike a painted island, a turf island would enhance pilot navigation and provide a permeable surface to facilitate snow melt during snow removal operations. Additionally, it is recommended that the middle segment of Taxiway D, located between Runway 18-36 and Taxiway A, be removed. This change would alleviate the nonstandard middle-third crossing issue. The recommended solutions for both nonstandard conditions of Taxiway D are illustrated in **Figure 4-9**.

Figure 4-8 Taxiway D (Existing Condition)



Source: RS&H Analysis, 2024

Figure 4-9 Taxiway D (Proposed Solution)



Source: RS&H Analysis, 2024

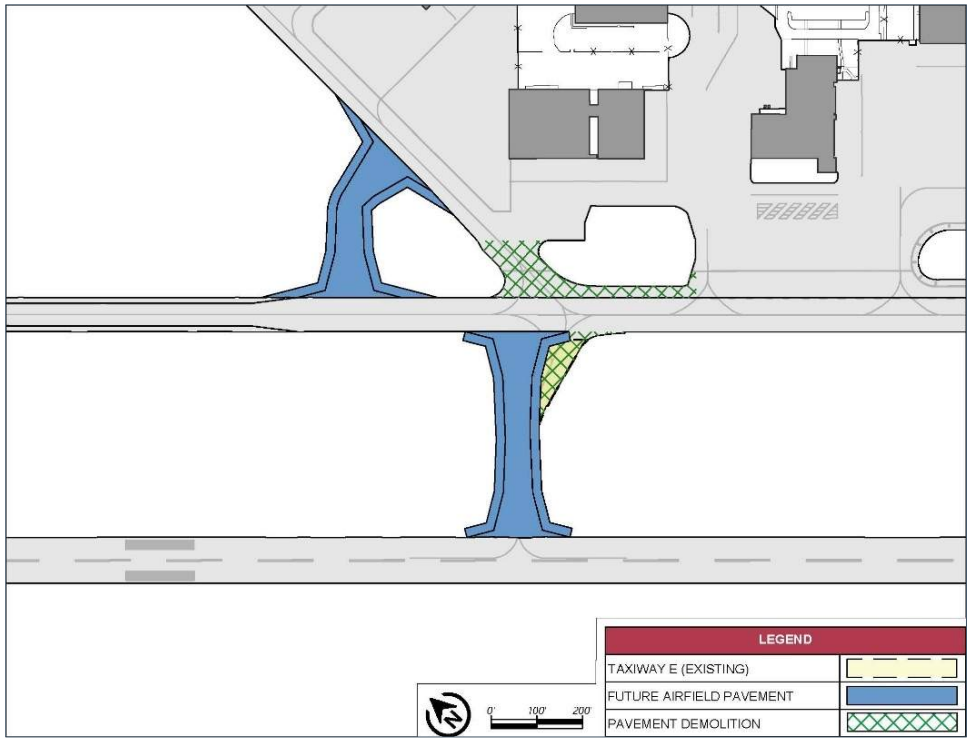
4.3.2.2.3 Taxiway E Analysis

Taxiway E serves as a connector between Runway 18-36 and the apron. As part of the recent reconstruction of Runway 17-35 (later redesignated as Runway 18-36), the segment of Taxiway E within the Runway Safety Area (RSA) of Runway 18-36 was realigned to form a 90-degree intersection with the runway centerline. However, the section of Taxiway E between Taxiway C and the runway safety area still remains at a nonstandard angle (see **Figure 4-10**). It is recommended that this segment also be realigned to create a continuous taxiway connector that is perpendicular to both Runway 18-36 and Taxiway C. This modification, as shown in **Figure 4-11**, can enhance pilot awareness when navigating the airfield, though it may also introduce another direct access point from the apron to the runway. To address this, relocating the connector between the apron and Taxiway C further north would ensure safe operations for aircraft of all sizes in this area.

Figure 4-10 Taxiway E (Existing Condition)

Source: RS&H Analysis, 2024

Figure 4-11 Taxiway E (Proposed Solution)

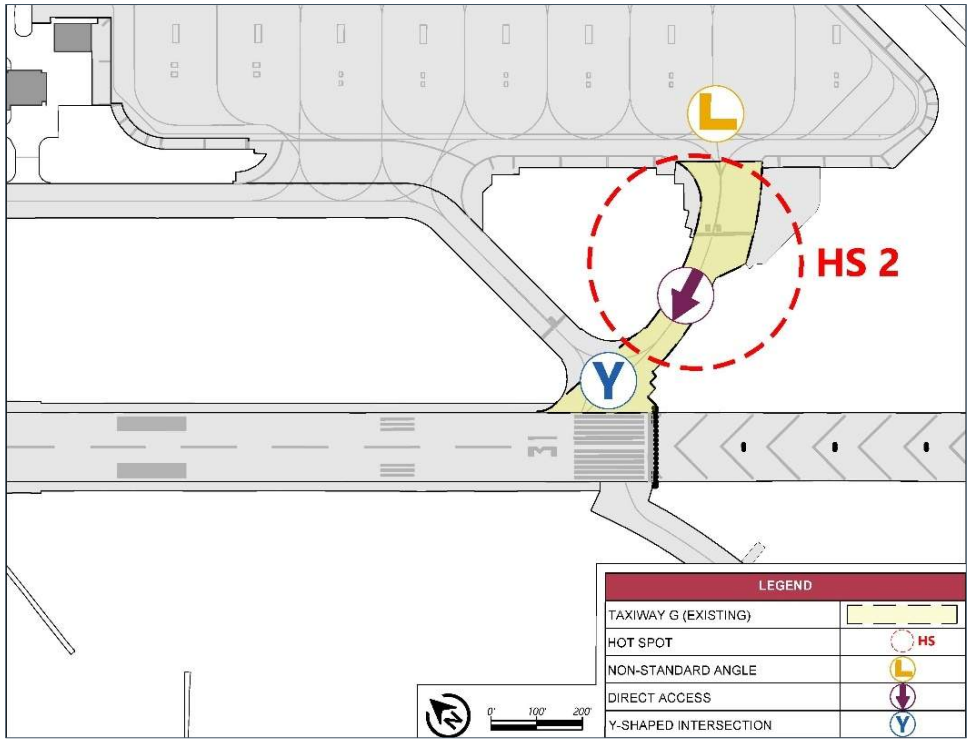


Source: RS&H Analysis, 2024

4.3.2.2.4 Taxiway G Analysis

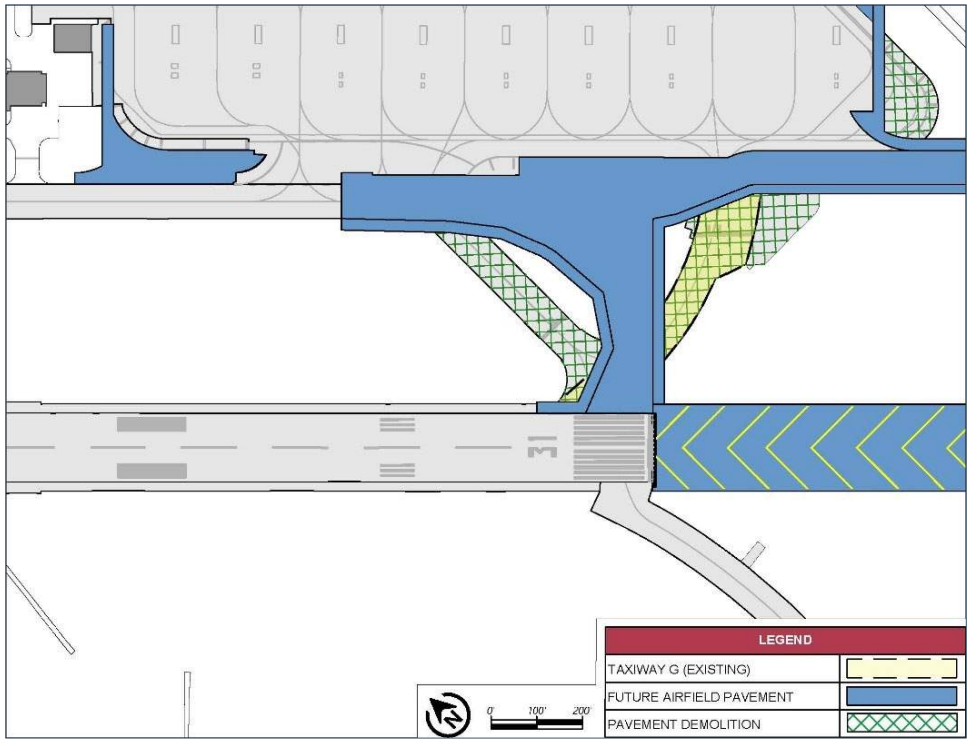
The geometric design of Taxiway G currently creates the same nonstandard conditions as Taxiway A with both converging on the Runway 31 threshold (see **Figure 4-12**). The recommendation for mitigation is also the same and is addressed in the ongoing Siouxland Nexus improvements program. The combination of Taxiways A and G into one connector perpendicular to Runway 13-31 mitigates both the nonstandard angle and Y-shaped intersection issues. While this new connector does feature direct apron to runway access, this new nonstandard condition is considered safer when paired with new pavement markings and operational requirements. **Figure 4-13** depicts the recommended solution for Taxiway G as planned under the Siouxland Nexus program.

Figure 4-12 Taxiway G (Existing Condition)



Source: RS&H Analysis, 2024

Figure 4-13 Taxiway G (Proposed Solution)

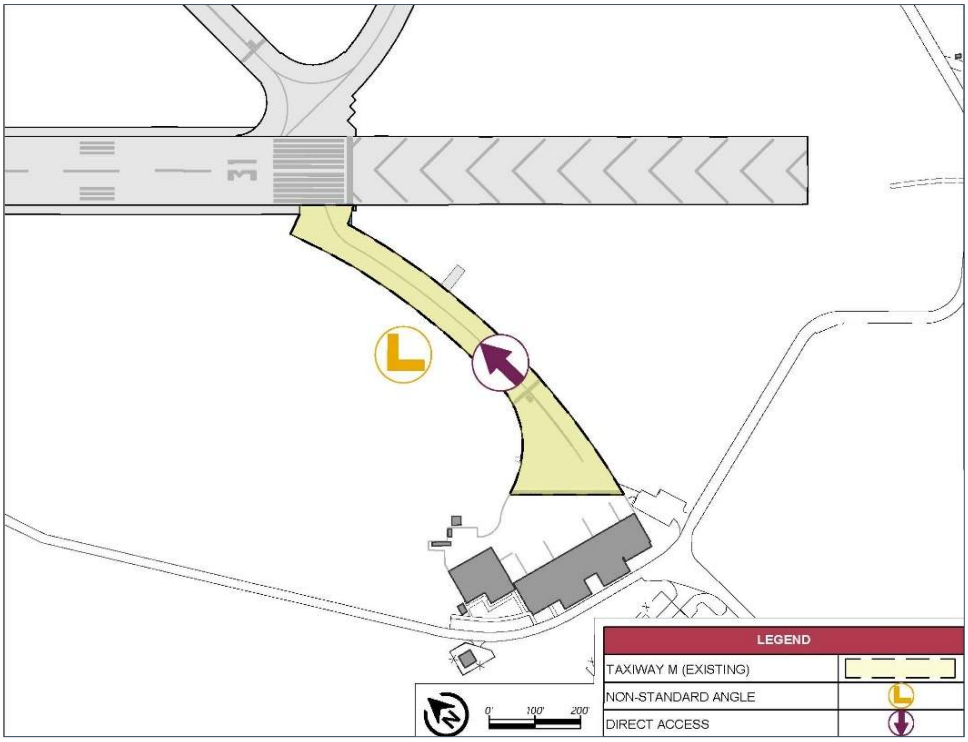


Source: RS&H Analysis, 2024

4.3.2.2.5 Taxiway M Analysis

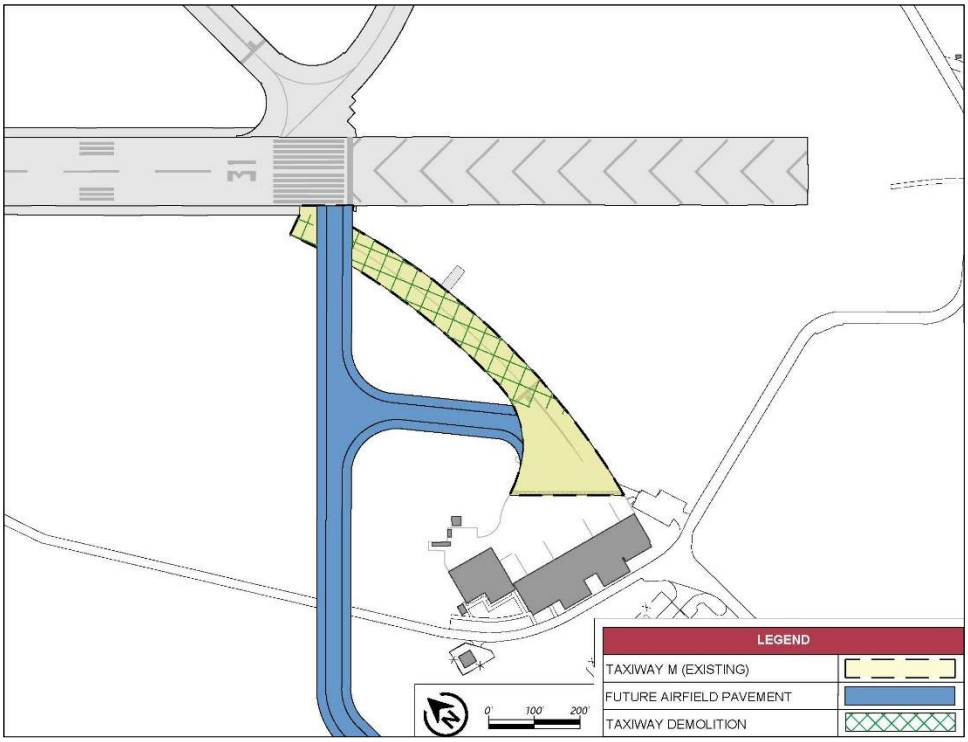
Connecting existing IANG aeronautical facilities to the southside of the Runway 31 threshold is Taxiway M, forming a nonstandard runway entry angle and providing direct access to the runway from the apron (see **Figure 4-14**). The current Airport Layout Plan (ALP) proposes solving these issues both by realigning the taxiway to a perpendicular intersection with the runway and incorporating a bend that requires pilots to make turning movements. However, this portion of the airfield is also located with the Runway 31 glideslope critical area and thus has additional operational restrictions during low-visibility conditions. Based on the layout of existing aircraft facilities and the apron, aircraft are not able to move or taxi without ATCT clearance during these low-visibility conditions. This issue cannot be resolved without significant impacts to facilities, none of which are included in the IANG's current development plan. As a result, the solution of the current ALP, shown in **Figure 4-15**, is still considered sufficient because it is concurrent with FAA design standards and therefore carried forward as the recommended mitigation plan for Taxiway M.

Figure 4-14 Taxiway M (Existing Condition)



Source: RS&H Analysis, 2024

Figure 4-15 Taxiway M (Proposed Solution)



Source: RS&H Analysis, 2024

4.4 Passenger Terminal Alternatives

The passenger terminal building is vital to maintaining commercial service at SUX and serves as the central element of the airport's design, around which both landside and airside facilities are organized. The space analysis from Chapter 3 and the proposed solutions for growth focus not only on the terminal building itself, but also on the aircraft ramp, taxiways, parking lots, and landside access roads. This chapter analyzes solutions for the following facility needs:

- **Terminal Building:** The commercial passenger terminal, renovated in 2016, currently provides a level of service that meets both current and forecasted demand under the base forecast scenario. However, if larger regional aircraft begin operating commercially at SUX, there is a potential shortfall in baggage claim and public circulation space to accommodate the increased passenger throughput during peak hours.
- **Terminal Apron:** Depending on the parking configuration, the tails of aircraft parked on the commercial service apron may obstruct the Transitional Surface of Runway 18-36. The tail height of the Boeing 737-800, which is used for charter activity, is 41.4 feet, and its length is 130 feet. Consequently, parking a Boeing 737-800 at either gate without infringing upon the transitional surface is not operationally feasible. Additionally, parked aircraft on the commercial ramp could create line-of-sight issues with the ATCT and the terminal ramp, as well as adjacent Taxiway C.
- **Vehicle Parking:** The current vehicle parking capacity at SUX meets present demand and is expected to remain adequate throughout the planning period, albeit by a narrow margin. It is recommended that airport staff continue to monitor parking levels during the forecast period to facilitate timely planning and implementation of parking lot expansions if necessary, particularly in the event of terminal expansion, reconfiguration, or relocation.

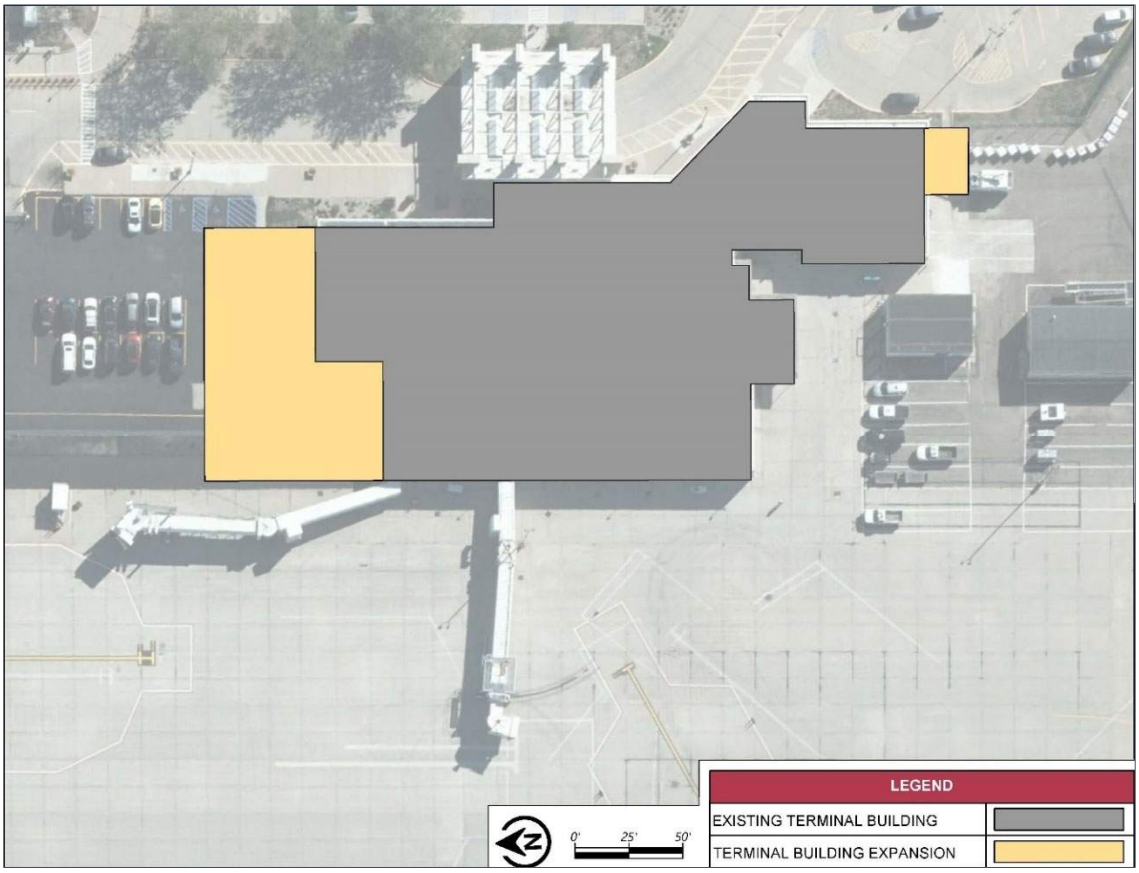
Based on the forecasted growth, two development cases have been assembled to illustrate the expansion needs of the existing facilities necessary to sustain operations throughout the planning period. Additionally, an "ultimate" case has been proposed that involves relocating the terminal area further away from the airfield. The future and ultimate development cases are detailed for each facility below.

4.4.1 Terminal Building

The commercial passenger terminal building at SUX is expected to adequately accommodate forecasted passenger growth throughout the planning period, with a few exceptions. If passenger service continues to increase at the projected rate and airlines upgrade to larger aircraft, the airport will need to enhance available public circulation and baggage claim space by Planning Activity Level (PAL) 3, which is projected to occur in more than 10 years. Given that the facility was recently renovated and currently provides a sufficient level of service for commercial passenger operations, it is recommended that the airport plan to expand the terminal facility to

the north to create additional circulation space, as well as to modify the hold room and passenger boarding bridge layouts. Additionally, expansion to the south is recommended to increase baggage claim space. This expansion, which is shown in **Figure 4-16**, can be achieved with minimal impact on other airport facilities and addresses the needs identified for the forecast period.

Figure 4-16 Terminal Building Expansion

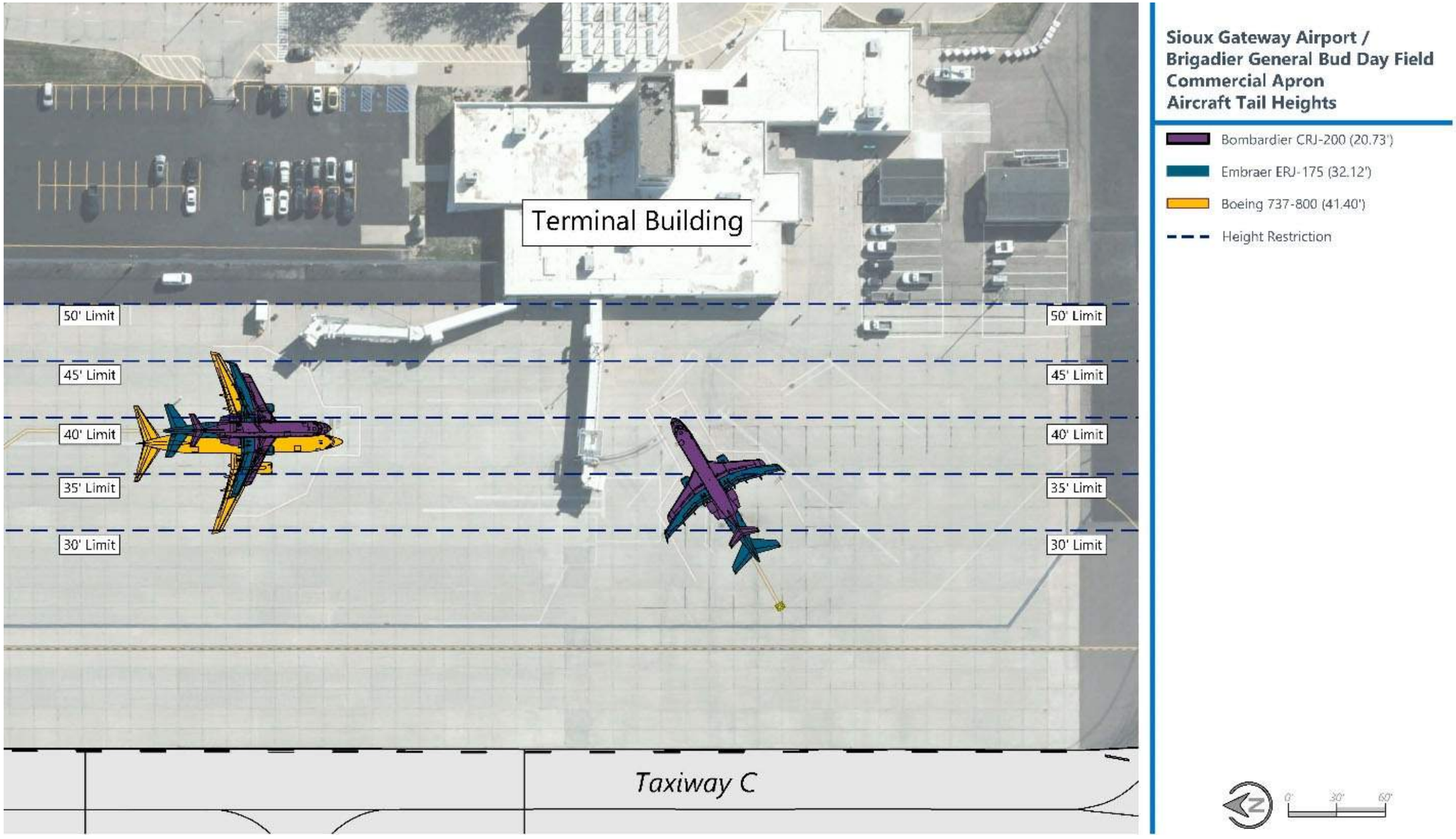


Source: RS&H Analysis, 2024

4.4.2 Terminal Apron

According to the analysis in **Chapter 3, Facility Requirements**, there are current airspace penetrations on the terminal apron that depend on the parking configuration and the size of commercial aircraft accessing the terminal. Given the terminal's proximity to the airfield, there is limited opportunity to add more space that meets the requirements for large aircraft to avoid penetrating the Federal Aviation Regulations (FAR) Part 77 surfaces. **Figure 4-17** illustrates the existing parking configurations and the typical aircraft operating at the terminal, along with the corresponding Building Restriction Lines (BRLs) derived from the FAR Part 77 Transitional Surface.

Figure 4-17 Terminal Apron Airspace Analysis



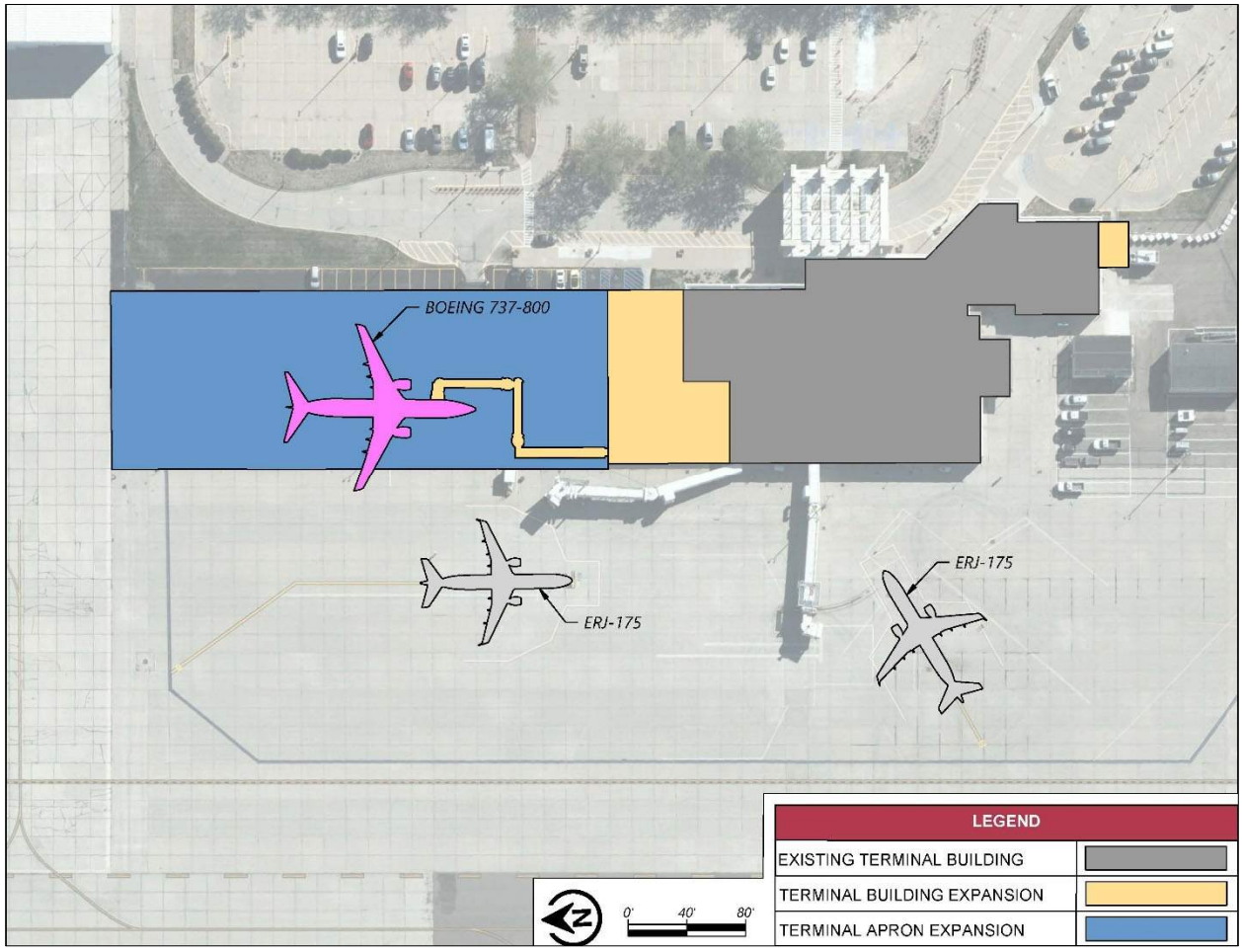
Source: RS&H Analysis, 2024

There is sufficient space on the apron to reconfigure parking positions as an operational solution if airspace obstruction issues begin to impact airfield activity, particularly the operation of Runway 18-36. This reconfiguration would involve modifications to pavement markings, potential enhancements to the passenger boarding bridges, and likely require ground handling crews for aircraft, thus prohibiting the use of power-in/out operations. These modifications would help alleviate airspace-related issues in the short to mid-term period (0-10 years) until the recommended future buildout of the terminal area is completed.

As previously discussed in **Section 4.4.1**, **Terminal Building**, the existing terminal at SUX will require a small expansion project to meet the capacity needs identified for supporting forecasted growth. Expanding the facility to the west is not feasible due to existing airspace constraints, while expansion to the east is obstructed by public roadways. To achieve the necessary capacity, expanding the building to the north and south will allow the facility to remain otherwise unaffected throughout the planning period. Given this outward expansion, a reconfiguration of the terminal apron is also recommended to enable large aircraft to operate at the terminal without the operational constraints imposed by the short to mid-term mitigation plan.

Figure 4-18 illustrates the proposed terminal apron improvement plan. By expanding the terminal apron north of the existing terminal building over the existing administrative parking lot and either realigning or adding a new passenger boarding bridge and terminal gate, large aircraft, such as the Boeing 737-800, can park without airspace concerns. This will allow for the continuation of the existing power-in/out operations without impacting any other airport facilities, aside from the need to relocate the administrative lot which is discussed in the next section. Reconfiguration of the aircraft parked on the west side of the terminal will still be necessary to ensure proper airspace clearance. This proposed reconfiguration of the apron is the most cost-effective and implementable solution, effectively addressing the capacity needs outlined in the aviation forecast and is therefore recommended as the preferred solution for terminal apron expansion.

Figure 4-18 Terminal Apron Expansion



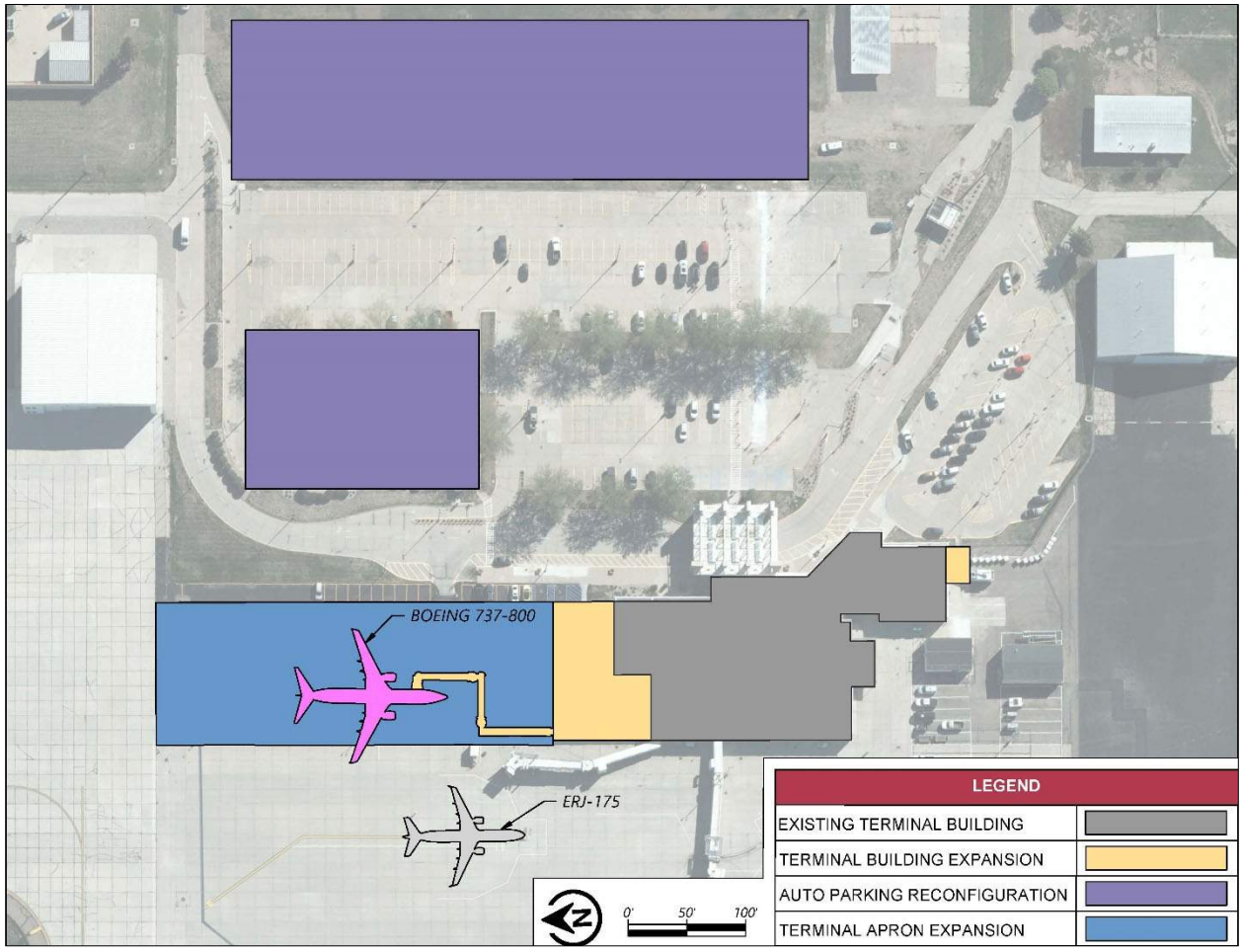
Source: RS&H Analysis, 2024

4.4.3 Vehicle Parking

The forecasted commercial passenger growth at SUX is expected to be supported by the existing parking lot capacity. However, the proposed expansion of the terminal building and apron will displace the airport administration parking lot currently located adjacent to the north side of the building. Given the regular use by airport personnel, it is important for the administration lot to remain in close proximity to the facility. Therefore, it is recommended that the northwest corner of the existing long-term parking lot be repurposed for administrative needs.

This repurposing will reduce capacity for long-term parking, necessitating a parking lot expansion project to the east, between the existing lot and Aviation Boulevard, to ensure that the level of service for passengers is maintained throughout the planning period. **Figure 4-19** illustrates the recommended parking lot reconfiguration to accommodate the terminal building and apron expansion needs.

Figure 4-19 Parking Lot Reconfiguration and Expansion



Source: RS&H Analysis, 2024

4.4.4 Terminal Area Relocation (Ultimate Development)

While the expansion of the terminal is expected to safely accommodate the forecasted growth of commercial passenger service at SUX, it is also recommended that a plan is prepared for a new or relocated terminal facility capable of accommodating atypical growth needs, such as multiple airlines, multiple flights during peak hours, and larger aircraft. Although aviation industry trends indicate that these atypical growth scenarios are not currently prevalent at airports like SUX, proactive planning for these needs ensures the protection of land suitable for such development.

As detailed in **Section 4.4.2, Terminal Apron**, the entire terminal area (including the building, apron, and landside parking and roadways) would need to shift eastward toward the entrance of the airport at Aviation Boulevard for airspace compliance reasons. Consequently, an ultimate development should be protected for that needs to include a terminal building sized to accommodate the highest forecast growth scenario. The prospective ultimate plan would move

all terminal area facilities approximately 200 feet to the east, into the area currently designated as the short-term parking lot, to alleviate existing terminal ramp airspace issues. This relocation would necessitate the reconstruction of the adjacent terminal apron and the reconfiguration of landside parking and public roadways.

The ultimate development plan for relocating the terminal is not expected to significantly impact any other aviation facilities at the airport. The availability of land between the terminal and Discovery Boulevard, located at the airport's main entrance, provides considerable flexibility, potentially allowing for this ultimate development without necessitating major modifications to the terminal loop.

With no apparent roadblocks to this ultimate development or negative effects on adjacent operations, it is recommended that this area is protected through land use planning (see **Section 4.2.2, Future Airport Land Use**). Furthermore, it is advisable not to commit additional resources to the terminal relocation until the forecast growth of activity levels indicates a clear need for such action.

4.5 Aviation Support Facilities

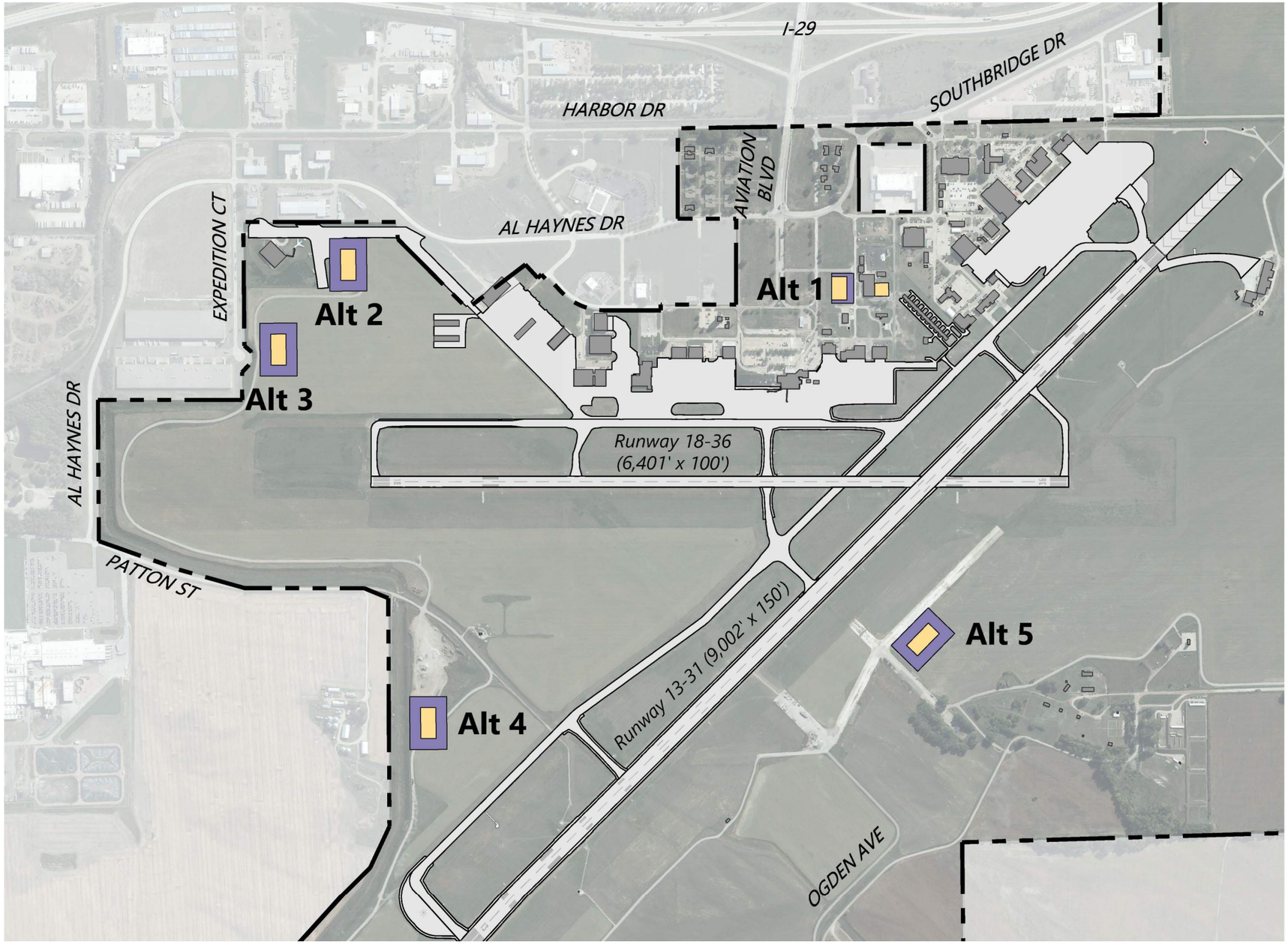
The configuration of airport support facilities is influenced by the airfield layout and the availability of land for airport development. This analysis will evaluate alternative development options for various support facilities, including maintenance areas, aircraft rescue and firefighting services, ATCT siting, aircraft washing facilities, electrical vaults, and solar energy harvesting systems. The assessment will be conducted within the framework of applicable land use, operational, financial, and environmental constraints.

4.5.1 Airport Maintenance Facility Alternatives

The existing airport maintenance and equipment storage facilities, collectively referred to as the airport maintenance area, are located south of the terminal area, adjacent to the IANG base near the primary access gate for the airfield (Gate #1). As detailed in **Chapter 3**, the airport maintenance area consists of four buildings totaling nearly 30,000 square feet of covered storage space, along with approximately 2,000 square feet of administrative space. Currently, much of the equipment is stored outside, exposed to the elements. Therefore, the analysis of development alternatives encompasses two key solutions: first, the near-term construction of additional storage space to protect equipment from the elements; and second, a long-term solution that allows for the expansion of facilities. This expansion would accommodate a greater quantity of equipment and/or less maneuverable equipment, such as multi-tasking snow removal equipment (SRE), while also facilitating expanded maintenance operations.

Five alternatives were analyzed to support both the immediate operational needs and future growth of the airport. For this analysis, the airfield maintenance building and the storage space for maintenance and SRE were considered together to closely align with the existing conditions, as preferred by airport staff. One alternative focuses on the current site and its potential for expansion, while four additional alternatives evaluate new sites featuring a centralized building large enough to accommodate all current needs in a single facility, estimated at approximately 40,000 square feet. **Figure 4-20** illustrates the five alternatives analyzed, which are further detailed in this section.

Figure 4-20 Airport Maintenance Facility Alternatives



Sioux Gateway Airport / Brigadier General Bud Day Field Airport Maintenance Facility Alternatives

- Existing Airport Property Line
- Existing Airfield Pavement
- Existing Building
- Future Building
- Future Roadway / Auto Parking

N

0' 500' 1,000'

Source: RS&H Analysis, 2024

- **Alternative 1 (Existing Site Expansion)**

  The existing location of the airport Maintenance area is well-suited to the airport's needs; however, it lacks adequate space for the proper storage of all equipment. The first alternative proposes a short-term expansion of the existing facility within the current campus to provide covered storage for all equipment. For long-term expansion, a parcel adjacent to the current facility, across the street and currently not reserved for aeronautical use, is identified for future development, which could also create revenue-generating opportunities.

  The current site is advantageous due to its easy access via the public road network, primary airfield access through Gate #1, and close proximity to the majority of airport facilities. However, the main drawback is the relatively limited development space, particularly with the completion of the proposed Iowa Air National Guard Entry Control Point (ECP) relocation (see **Section 4.5.7.3, Entry Control Point Relocation**). Despite this constraint, with only minor operational impacts during implementation and expansion, the existing site is expected to adequately support growth throughout the planning period.

- **Alternative 2 (North Airfield, Site A)**

  The first new location analyzed for the airport maintenance facility, identified as Alternative 2 in **Figure 4-20**, proposes to site the new facility adjacent to the airport perimeter road in an undeveloped area currently leased to the Mid America Museum of Aviation and Transportation. This site was primarily selected due to its accessibility to public and airport service roads, as well as its proximity to airport facilities.

  There are several drawbacks to this location. It lacks existing infrastructure to support the proposed development, and both the initial construction and any future expansion could negatively impact revenue generation due to a reduction in the land lease. While the location is suitable for general facility maintenance, it is not ideal for airfield snow removal operations, as it is situated farthest from priority pavement areas such as Runway 13-31 and the terminal apron.

- **Alternative 3 (North Airfield, Site B)**

  Alternative 3 builds upon the location identified in the north airfield for Alternative 2, relocating it away from land currently used for other non-aeronautical purposes to minimize implementation impacts. This site, referred to as Site B on the north airfield, avoids interfering with existing revenue-generating agreements and offers greater flexibility for future expansion. However, it still incurs high initial infrastructure costs. Like

Alternative 2, this location is conveniently situated near airport facilities and public roads, but it remains the farthest from priority pavement areas for snow removal operations.

- **Alternative 4 (Midfield)**

  The airport has a surplus of undeveloped space in the west and south airfield regions. Alternative 4 proposes locating the facility in the midfield between the two runways, near the existing FAA Remote Transmitter/Receivers (RTR) used for air traffic communication. While this area remains untouched and offers ample room for operations and future growth, it would require significant investment in infrastructure and access improvements. Among the five alternatives, the midfield location is the least suitable for facilitating access between the airport maintenance facility and other airport facilities or airfield surfaces necessary for snow removal operations.

- **Alternative 5 (West Airfield)**

  Located in the south airfield, Alternative 5 offers another potential site for the airport maintenance facility, characterized by minimal existing infrastructure and development, yet providing few constraints for future growth. Situated adjacent to Runway 13-31, this location would facilitate easy access to primary airfield pavement surfaces during snow removal operations. However, it is farther away from commercial and general aviation facilities, which may pose challenges for maintenance and snow removal activities.

  Similar to Alternative 4, developing roadside access to the facility would incur additional costs. This investment would be justifiable if undertaken alongside other compatible developments, such as additional aviation support facilities or large aeronautical projects that could help absorb the substantial costs of infrastructure installation.

4.5.1.1 Airport Maintenance Facility Alternatives Evaluation

Table 4-3 summarizes the analysis of all five alternatives selected for the airport maintenance facility. Due to the high construction costs and limited accessibility to both landside and airside facilities compared to other options, Alternatives 4 and 5 are not recommended for further consideration. While Alternative 2 shares the same benefits as Alternative 3, it also presents additional negative impacts, notably affecting an existing land lease; therefore, it is similarly not recommended for advancement.

The highest-scoring option that effectively combines operational efficiency with improvement costs is the expansion of the facility within the existing footprint suggested in Alternative 1. Consequently, Alternative 1 is recommended as the preferred development plan for the airport maintenance facility.

Table 4-3 Airport Maintenance Facility Relocation Evaluation

Evaluation Criteria	Alternative 1 (Existing Site Expansion)	Alternative 2 (North Airfield, Site A)	Alternative 3 (North Airfield, Site B)	Alternative 4 (Midfield)	Alternative 5 (West Airfield)
Operational/Public Safety					
Operational Efficiency					
Meets FAA Design Standards					
Effectively Serves Target User					
Resolves Current Issues					
Meets Long-Term Facility Needs					
Appropriate Level of Service					
Ease of Implementation					
Cost to Implement					
Flexible/Future Expansion					
Environmental Impacts					
Supports Sustainability Principles					

Performance Legend:

Good

Fair

Poor

Source: RS&H Analysis, 2024

4.5.2 Airport Traffic Control Tower Alternatives

The existing ATCT is situated northeast of the commercial passenger terminal and was originally constructed in 1992. As discussed in **Section 4.3.2.1, Hot Spot Mitigation Alternatives**, there are two areas of potential safety concern, referred to as airfield "hot spots," on Taxiways A and G. These hot spots arise from two facilities that obstruct the ATCT controllers' view of aircraft on segments of each taxiway.

The height and location of the ATCT contribute to several airfield line-of-sight concerns, and the structure is nearing the end of its intended useful life, being 30 years old in a program that anticipates a lifespan of 40 years. Therefore, it is recommended that a long-term solution be planned that either modifies the existing tower site or relocates the facility to a location on the airfield that complies with ATCT siting criteria and accommodates future airport development.

FAA Order 6480.4B, *Airport Traffic Control Tower Siting Process* offers guidance on the siting process for new ATCT facilities at airports. This order delineates the necessary steps for the sponsor to follow during the early stages of program implementation, which includes engaging the Technical Operation Services Air Traffic Organization (AJW) in the siting, evaluation, and all subsequent design phases of the ATCT project. Since the project is currently in the preliminary planning phase, this effort will adhere to the order's requirements for inclusion in the ALP, while stopping short of any phases requiring supplemental FAA line of business involvement.

The following preliminary siting guidelines suggested in FAA Order 6480.4B for a modified or relocated ATCT were used to identify and evaluate potential development sites to determine suitable relocation alternatives:

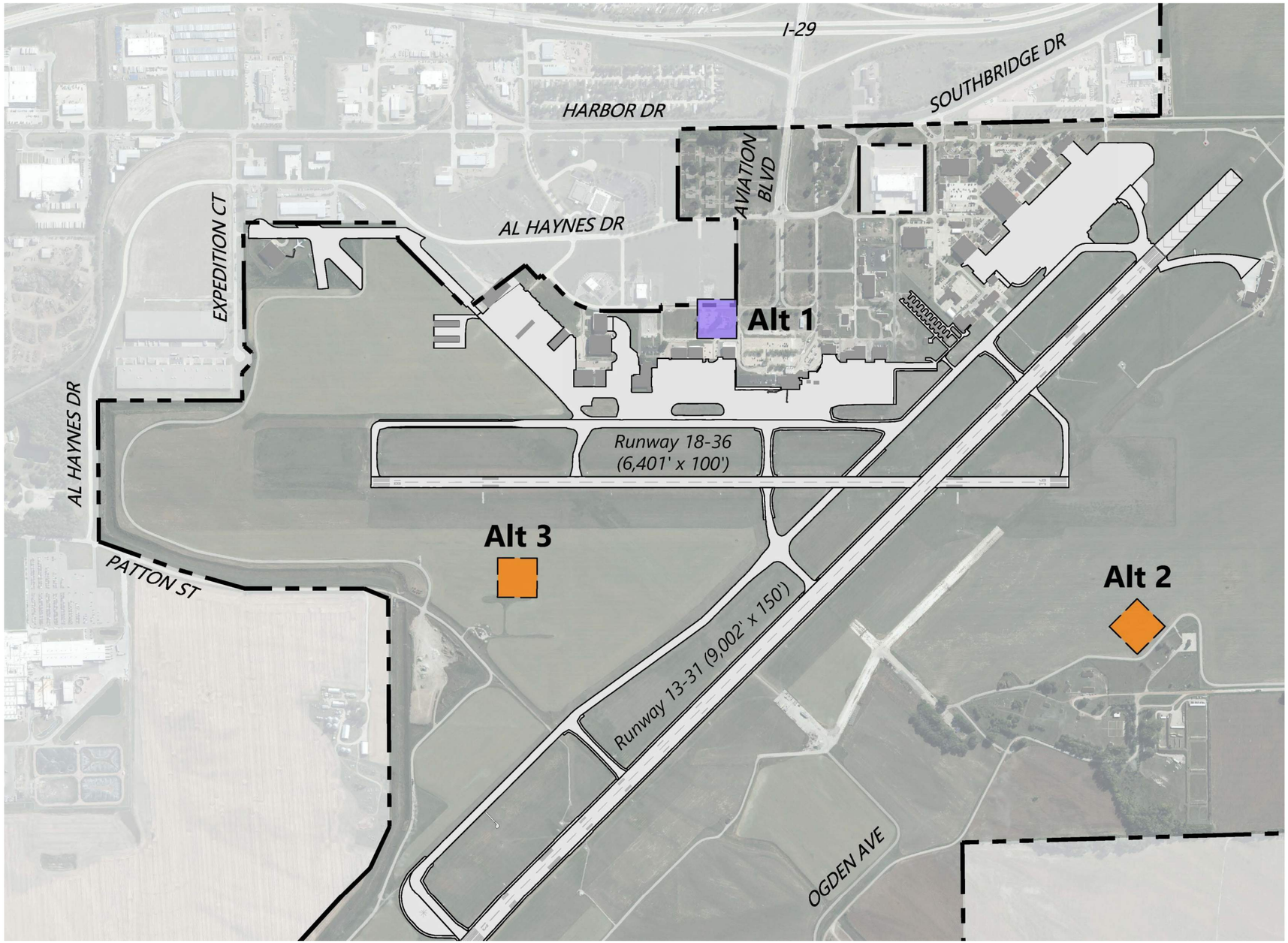
- **Impacts to Terminal Instrument Approach Procedures (TERPS)**
  - The potential effects that a new ATCT may have on the TERPS at SUX must be assessed. It is crucial that the ATCT is located in a manner that does not negatively affect any existing or planned terminal instrument procedures.

- **Impacts to Communication, Navigation, and Surveillance Equipment**
  - The ATCT must be sited in a manner that does not degrade or affect the performance of existing or planned facilities and equipment, unless deviations are necessary to meet other siting criteria, in which case appropriate mitigation strategies must be implemented.

- **Visibility Performance**
  - The central operating area (or cab) of the ATCT must provide an unobstructed view of all controlled movement areas of the airport, including runways, other landing areas, and air traffic in the vicinity of the airport.
  - Visibility from the ATCT cab should provide an unobstructed view of all taxiways and ramp areas
- **Operational Requirements**
  - Consideration must be given to factors such as direct and indirect sun glare, night-time lighting glare, external light sources, and thermal distortion when determining the orientation of the ATCT. The preferred orientation for the ATCT in the northern hemisphere is to have the primary operational view facing north, with east, west, or south as alternate options. However, southern orientation should be avoided in areas with snow accumulation, or where the site is surrounded by sand or large bodies of water.
  - Access to the ATCT must be designed to avoid crossing areas of aircraft operations. It should also steer clear of roads or bridges that could be impacted by high traffic volume, flash floods, snow, landslides, falling rocks, or other potential hazards.
  - The ATCT must ensure visibility of all airport surface areas to effectively monitor ground operations of aircraft and airport ground vehicles on ramps, aprons, tie-down areas, and test areas. This visibility is critical for maintaining operational safety and efficiency.

Three locations for a future ATCT were identified on the airfield and evaluated against the guidance provided above. **Figure 4-21** illustrates the three proposed development locations, further discussed in this section.

Figure 4-21 Airport Traffic Control Tower Alternatives



Source: RS&H Analysis, 2024

- **Alternative 1 (Existing Site)**

  The existing ATCT is located just north of the terminal loop and stands roughly 120 feet tall. Hot Spots 1 and 2 located on the airfield result from a loss of visual contact between the ATCT and aircraft on Taxiways A and G when passing behind the ARFF and IANG hangars, respectively. As the existing structure is in the final quarter of its useful life, any contributions to improving the existing site should be focused on the construction of a new tower.

  According to the requirements listed in Order 6480.4B, the current site for the ATCT is adequate, but does have a few shortcomings. Primary Runway 13-31 and the terminal area are located to the south and west of the tower, presenting a potential for sun glare or light reflection off of other airport facilities and most notably, snow in the winter. Most hangars at SUX sit between the ATCT and adjacent aircraft aprons and, in some cases, these buildings block views of the ramp area for controllers. Like both hot spot locations, the cab height of the ATCT limits the view over the top of these buildings, but constructing a tower that is tall enough to have a largely unobstructed view from the existing location may prove to be cost prohibitive.

  The existing site is located in an accessible location, with moderate room to grow, and is also the source of all airfield communication infrastructure that would require relocation if the tower were moved elsewhere.

- **Alternative 2 (South Airfield)**

  The airfield south of Runway 13-31 is largely undeveloped and would suit the needs of a new ATCT. Located southwest of the airfield and aircraft aprons, controllers would not be as susceptible to sun glare and reflectance of light off of other buildings, objects, and snow. The controllers would have a nearly unobstructed view of all airfield pavement, current and future, and would be located away from the majority of airport traffic. Due to this unobstructed view, the ATCT design could potentially be shortened and more cost effective. Relocation of the tower to an area largely undeveloped and not as attractive for aeronautical use could free up land near the terminal area for revenue-generating opportunities.

  The Alternative 2 location does suffer in the cost of implementation category. As explained before, the southside of the airport features little development and does not have even the supporting infrastructure necessary to support the ATCT facility. In addition to the initial cost of construction and operation of the tower, added cost for road improvements accessing the new location as well as a complete reconfiguration of airfield communication lines to the new tower would be significant.

- **Alternative 3 (Midfield)**

  As the existing ATCT is located on the east side of the airfield near the terminal area, Alternative 2 is located on the south side, and airspace protection for the two-runway system requires a large amount of otherwise ideal locations for the ATCT, a midfield site was considered for Alternative 3. Similar to the south airfield site, this location features little development outside of an FAA-owned RTR facility and similarly has little infrastructure network to support new construction. However, the prospective tower location would require controllers to face east and south for nearly all operations, bringing potential for glare and reflectance interference.

  Like Alternative 2, a midfield ATCT would have full, unobstructed views of almost all airfield movement and nonmovement areas, likely reducing the height of the structure and the cost to construct and operate it. However, also like Alternative 2, the cost of access road improvements, and the reconfiguration of airfield NAVAID communication lines would be significant. Additionally, the presence of the RTR would require advanced analysis into potential signal interference by the new ATCT on aircraft communications.

4.5.2.1 Airport Traffic Control Tower Alternatives Evaluation

Of the three alternatives analyzed, Alternative 3 scored the lowest from both an operational efficiency and cost of implementation perspective and is not recommended for further analysis (see **Table 4-4**). While the existing location in Alternative 1 has been adequate to date, reconstructing a new ATCT on or near this site would require a much taller structure to yield the same operational efficiency as Alternative 2 on the south airfield. This taller structure would incur a much higher cost of construction and operation and still may not achieve the same level of service as a south tower would. Alternative 2 is the ideal location for an ATCT operationally, but the high principal cost of infrastructure, road access, and NAVAID communication network reconfiguration needs to be considered. For the purposes of this master plan, the recommended location of the ATCT is where the facility operational efficiency and function is at its highest, therefore Alternative 2 is carried forward as the recommended future location for the ATCT.

Table 4-4 Airport Traffic Control Tower Alternatives Evaluation

Evaluation Criteria	Alternative 1 (Existing Site)	Alternative 2 (South Airfield)	Alternative 3 (Midfield)
Operational/Public Safety			
Operational Efficiency			
Meets FAA Design Standards			
Effectively Serves Target User			
Resolves Current Issues			
Meets Long-Term Facility Needs			
Appropriate Level of Service			
Ease of Implementation			
Cost to Implement			
Flexible/Future Expansion			
Environmental Impacts			
Supports Sustainability Principles			

Performance Legend:

Good

Fair

Poor

Source: RS&H Analysis, 2024

4.5.3 Aircraft Rescue and Firefighting Alternatives

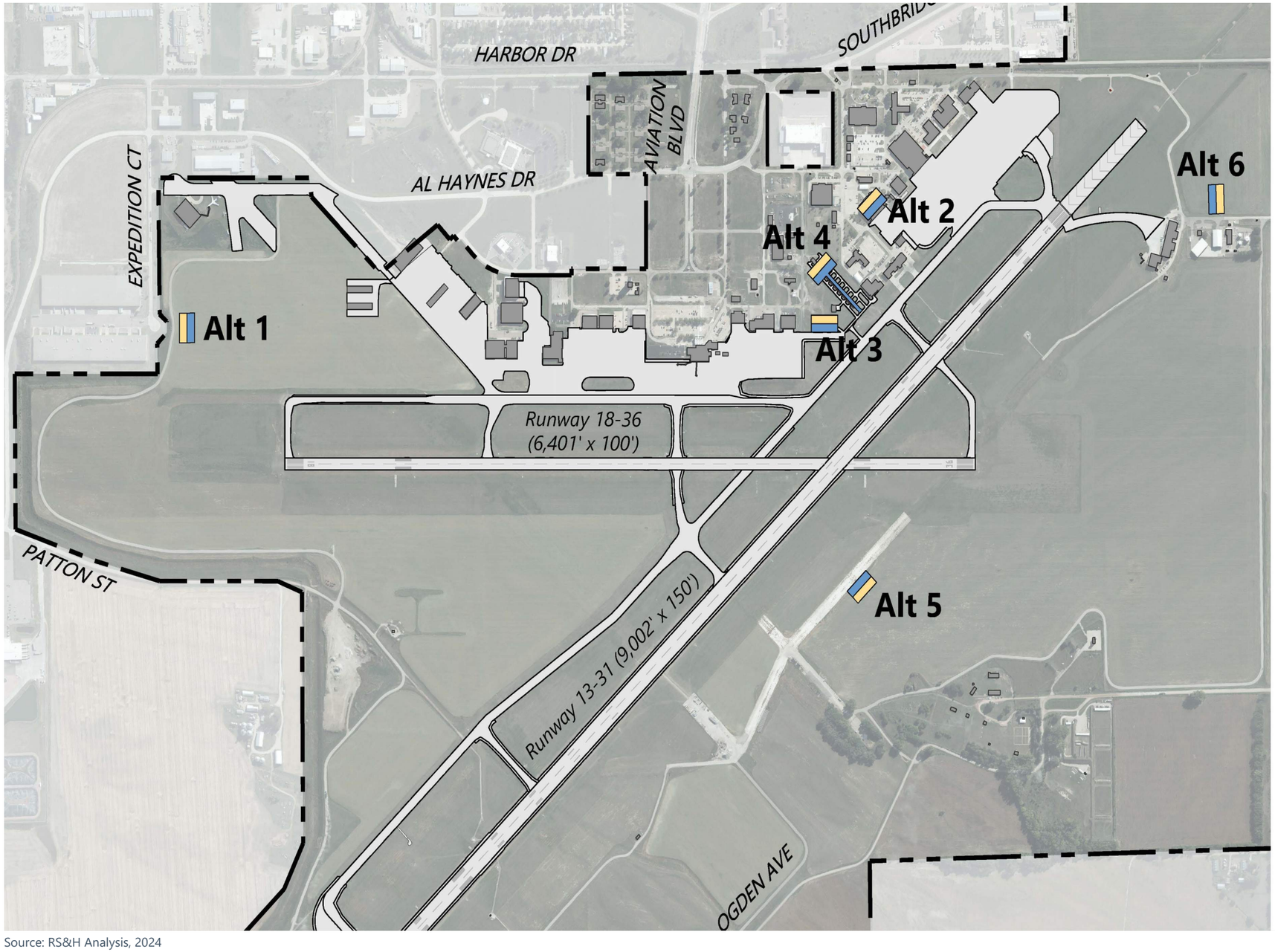
The Aircraft Rescue and Firefighting (ARFF) facility, located on the IANG base, was constructed in 2006 and is both owned and operated by the IANG. Under an agreement with the airport, the IANG provides ARFF services for Index B commercial civilian operations, in addition to its own operations (Index E upon request).

The current facility creates a line-of-sight issue between the ATCT and aircraft on a small section of Taxiway A, identified as Hot Spot 1 (refer to Section **4.3.2.1**, **Hot Spot Mitigation Alternatives**). Since the facility still fulfills the operational requirements and will remain within its useful lifespan by the end of the planning period, it is recommended that the line-of-sight issues be addressed through operational adjustments, allowing the ARFF facility to remain in its current location.

Although the IANG has no current plans to expand or relocate the ARFF facility, its proximity to future development areas on the IANG base makes it prudent to identify an alternative location that could meet operational needs if relocation becomes necessary. To ensure compatible land use for future scenarios, six potential sites for a new ARFF facility of equivalent size with room for growth around the airfield were analyzed. Each site (shown in **Figure 4-22**) was assessed in terms of its ability to meet National Fire Protection Association (NFPA) standards for airfield response times (three minutes to the midpoint of the furthest runway)[4] and ease of access for IANG personnel. A detailed evaluation of these alternatives is provided in this section.

[4] Title 14 of the Code of Federal Regulations, Part 139 Certification of Airports, Subpart D §139.319 Aircraft rescue and firefighting: Operational requirements

Figure 4-22 Aircraft Rescue and Firefighting Alternatives



Aircraft Rescue and Firefighting (ARFF) Alternatives

- Existing Airport Property Line
- Existing Airfield Pavement
- Existing Building
- Future ARFF Building
- Future Airfield Pavement

0' 500' 1,000'

Source: RS&H Analysis, 2024

- **Alternative 1 (North Airfield)**

  In the northeast corner of the airfield, there is surplus land designated for future general aviation development. This area, which has already been incorporated into the general aviation hangar development plan for the airport (see **Section 4.5.5, General Aviation**), includes a large portion of uncommitted land that was analyzed as the first alternative site for ARFF development. This location offers quick access to public roadways and helps to keep ARFF vehicle traffic separate from high-density aviation activity. Additionally, it provides ample space for potential future expansion.

  However, there are two significant drawbacks to Alternative 1. Firstly, the proposed facility would be positioned on the opposite side of the airfield from the IANG base, which is less ideal since the ARFF team is staffed by IANG personnel who also perform routine military exercises in addition to airport-related duties. Secondly, the proposed location would not meet the minimum NFPA airfield response time requirements without improvements to the vehicle service roads.

- **Alternative 2 (IANG Hangar)**

  The IANG operates several hangars adjacent to their aircraft apron. One of these, the fuel cell hangar, is scheduled for eventual replacement as it has exceeded its useful life and does not maximize the aviation potential of the site. If this facility is relocated, the site could serve as a new location for the ARFF station. This would allow the ARFF facility to remain contiguous with IANG operations, stay within NFPA response time requirements, and maintain clear distinctions between airport and IANG ownership responsibilities.

  However, relocating the ARFF to this site is dependent on the full removal of the existing facilities, and the IANG currently has no set timeline for the relocation of these buildings, making it difficult to plan the ARFF project. Additionally, the new ARFF facility would incur extra costs due to the necessary demolition of any remaining structures. Moreover, there may be a need for significant environmental investigations to ensure the site is clean before programming can proceed, further complicating and potentially delaying the project.

- **Alternative 3 (South of Terminal)**

  Located immediately south of the commercial passenger terminal, the south general aviation ramp offers space for aircraft storage or potential facility expansion, making it a candidate for ARFF development under Alternative 3. This site has the advantage of immediate availability, proximity to IANG operations, and sufficient room for future growth.

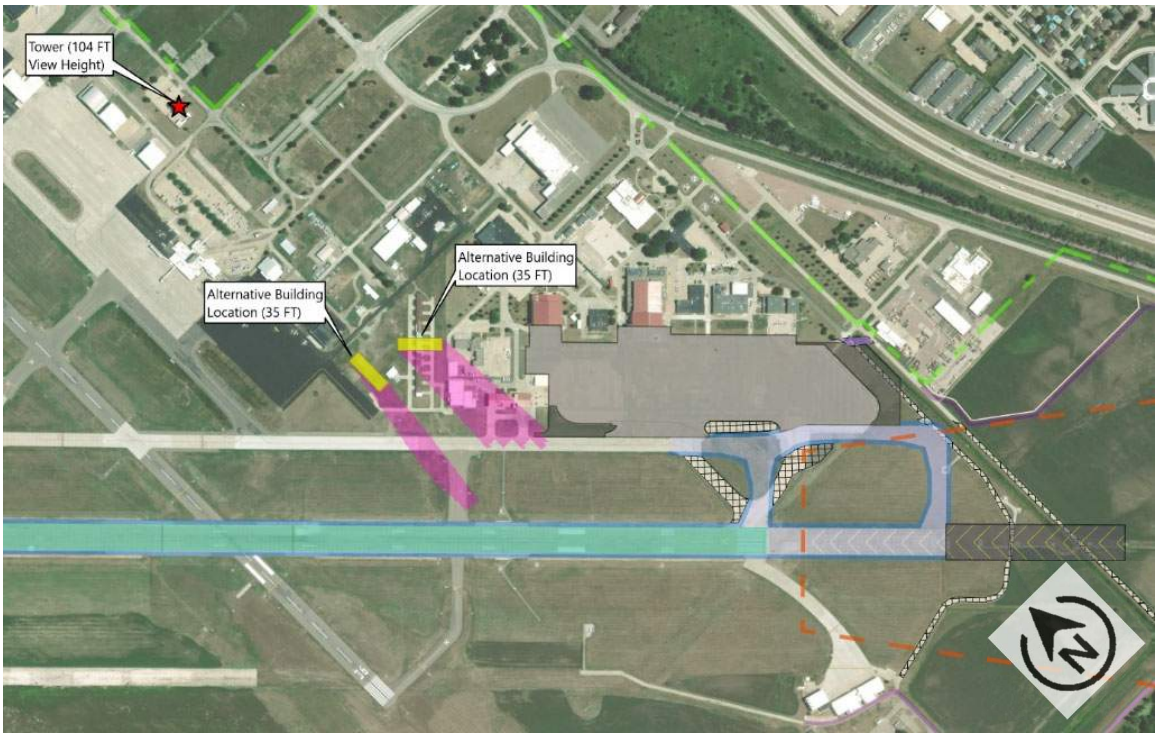
However, a line-of-sight analysis was conducted for Alternative 3 due to its proximity to the airfield movement area and the ATCT). This analysis, which was also performed for Alternative 4 (see **Figure 4-24**), revealed similar line-of-sight issues as those found at the current ARFF facility. Specifically, the proposed location would obstruct the ATCT's view of certain movement area pavements, which could negatively impact the safe operation of the airfield. Therefore, this alternative does not present an improvement in terms of airfield safety with the proposed development.

- **Alternative 4 (T-Hangars)**

  The site for Alternative 4 is located between the south general aviation ramp and the IANG base, on the current site of a 20-unit T-hangar building. The T-hangar is scheduled for demolition, with tenants relocating to new storage facilities on the north side of the airfield. Adjacent to the IANG base, this location is ideal for ARFF operations, with room for growth and good access to public roads. Although construction would require demolishing the existing buildings and utilities, it is not expected to conflict with other airport or IANG initiatives.

  Similar to Alternative 3, this location is positioned near airfield movement areas and the ATCT, requiring a line-of-sight analysis to ensure no new visual obstacles are created. **Figure 4-24** shows the prospective locations of Alternatives 3 and 4 and the potential visibility shadows from each building on ATCT sightlines. As indicated, Alternative 4 is not expected to block visual contact between the ATCT and runways, taxiways, or aprons if the facility is built with a height similar to the current ARFF building (35 feet).

Figure 4-23 ARFF Relocation LoS Analysis



Source: RS&H ArcGIS Analysis, 2024

- **Alternative 5 (West Airfield)**

  Alternative 5 analyzed the large area of unobligated land on the west side of the airfield. This site is mostly unconstrained and not earmarked for other aeronautical development, but it would require a substantial upfront investment for site preparation and utility extensions. The location is ideal for ARFF response to airfield incidents, being near the midpoint of Runway 13-31 and offering ample space for future expansion. However, it is not conveniently located for IANG staffing.

  Development in this area could become more viable if combined with other planned projects, such as a new airport maintenance facility (see **Section 4.5.1**) or a new ATCT (see **Section 4.5.2**), allowing shared investment in preparing the site for development.

- **Alternative 6 (South Airfield)**

  The final alternative analyzed for relocating the ARFF facility is situated on the south airfield near the existing IANG aircraft paint facilities. This site, located between IANG facilities and the RPZ, is too limited in size for other aeronautical development but provides sufficient space for current ARFF needs and future expansion. As it is an undeveloped piece of land that has not been built on previously, there would be no obstacles to immediate development. However, this location scores poorly due to its

distance from the IANG base, which affects operational efficiency, and it does not meet the NFPA minimum response time requirements.

4.5.3.1 Aircraft Rescue and Firefighting (ARFF) Alternatives Evaluation

Of the six alternatives analyzed, Alternatives 1, 3, and 6 were eliminated for failing to meet minimum NFPA requirements or for not addressing the current airfield line-of-sight issues. Similarly, Alternative 5 was dismissed due to the high initial costs associated with preparing a site that is not ready for development, especially when more suitable alternatives are available.

Given the uncertainty surrounding the IANG's timeline for relocating the fuel cell hangar, it is recommended that Alternative 4 be carried forward as the preferred option for the ARFF facility relocation. Coordination with the IANG and their base master plan will be essential to secure the site for this development.

Table 4-5 Aircraft Rescue and Firefighting Alternatives Evaluation

Evaluation Criteria	Alternative 1 (North Airfield)	Alternative 2 (IANG Hangar)	Alternative 3 (South of Terminal)	Alternative 4 (T-Hangars)	Alternative 5 (West Airfield)	Alternative 6 (South Airfield)
Operational/Public Safety	Fair	Good	Good	Good	Good	Good
Operational Efficiency	Poor	Good	Good	Good	Fair	Fair
Meets FAA Design Standards	Good	Good	Good	Good	Good	Good
Effectively Serves Target User	Fair	Fair	Good	Good	Good	Poor
Resolves Current Issues	Poor	Good	Poor	Good	Good	Good
Meets Long-Term Facility Needs	Good	Good	Good	Good	Good	Good
Appropriate Level of Service	Good	Good	Good	Good	Good	Good
Ease of Implementation	Good	Poor	Good	Fair	Good	Good
Cost to Implement	Good	Fair	Good	Fair	Poor	Good
Flexible/Future Expansion	Poor	Fair	Good	Good	Good	Good
Environmental Impacts	Good	Good	Good	Good	Good	Good
Supports Sustainability Principles	Good	Good	Good	Good	Good	Good

Performance Legend:

- Good
- Fair
- Poor

Source: RS&H Analysis, 2024

4.5.4 Electrical Vault Relocation

The airfield electrical vault at SUX currently meets existing and anticipated future capacity; however, it is aging and situated in an area that would be better utilized for revenue-generating activities. Due to operational requirements for access and the significant amount of existing infrastructure, alternative sites for vault relocation are limited.

All airfield power, including lighting, NAVAIDs, and other equipment, currently passes through this vault. Additionally, it houses the generator for emergency backup power, which is essential for maintaining operations at SUX in the event of an electrical outage on the main supply line. Should airport staff seek to upgrade approaches on any of its runways to achieve lower minimums, enhancements to the emergency backup power system may be necessary, indicating that the future site of the electrical vault should allow for expansion.

Figure 4-24 shows the preferred location for the electrical vault relocation. This site is not expected to be suitable for future revenue-generating opportunities, making it the closest available option to the current location while minimizing the need for extensive extensions or new cable runs for power and communications to both the airfield and the ATCT.

Figure 4-24 Electrical Vault Relocation

Source: RS&H Analysis, 2024

4.5.5 General Aviation Hangar Development Plan

Chapter 3, Facility Requirements highlighted that existing general aviation facilities are expected to meet the forecasted demand in the near-term; however, to accommodate increasing demand throughout the 20-year planning period, many facilities will likely need expansion, reconfiguration, and/or upgrades. Discussions with airport staff indicate that current tenants are interested in constructing their own hangars rather than leasing from the existing FBO.

The number of based aircraft at SUX is forecasted to increase by approximately 30% by the end of the planning period, primarily consisting of small single-engine piston and jet aircraft (see **Table 4-6**). Given this growth and the interest from existing tenants in building private hangars, the demand for general aviation storage will vary, requiring a mix of large corporate-size hangars that can accommodate multiple aircraft, as well as more economical T-hangar units for individual small aircraft.

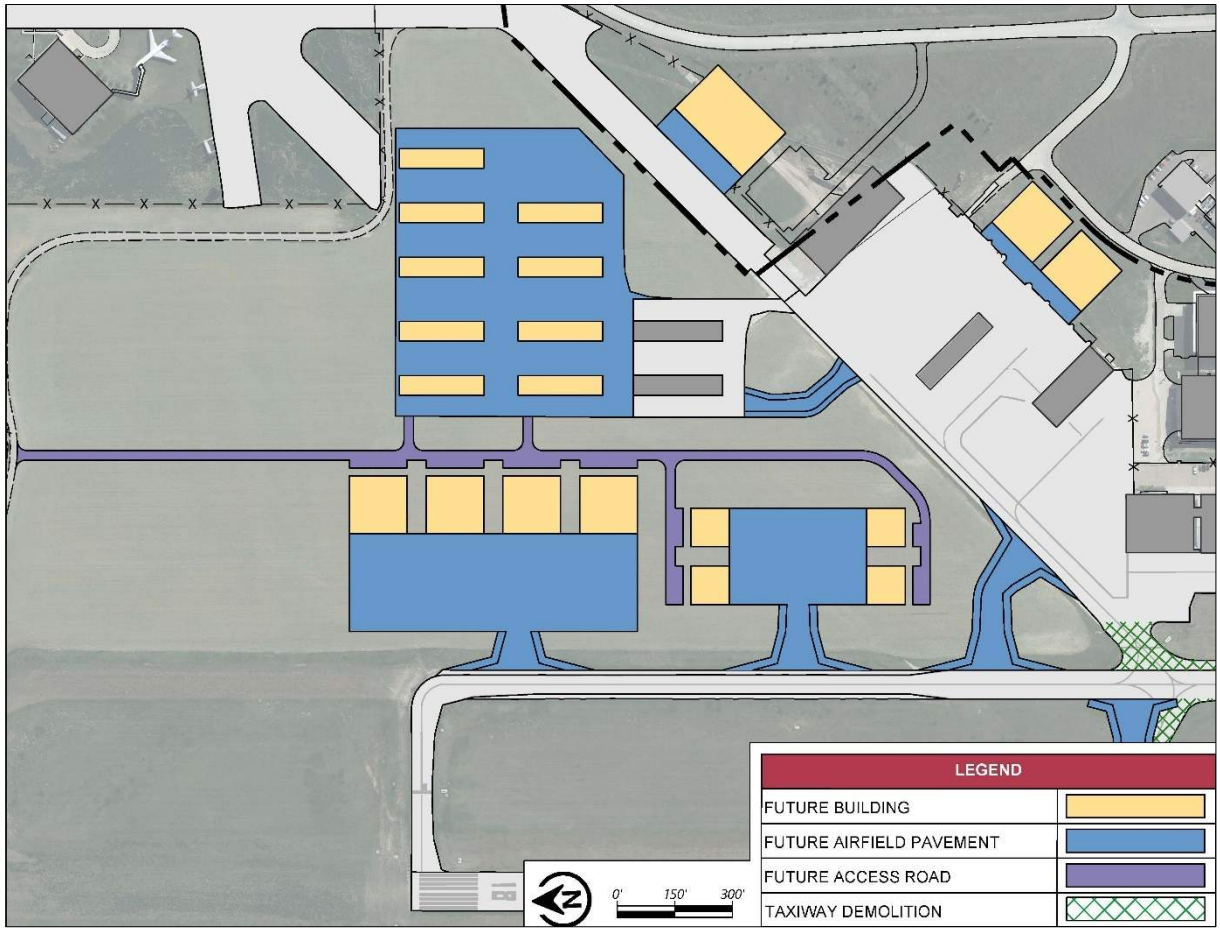
Table 4-6 Based Aircraft Forecast

	Base Year	Milestone Years		
	2023	2028 (PAL 1)	2033 (PAL 2)	2043 (PAL 3)
Single-Engine Piston	41	51	51	51
Multi-Engine Piston	3	3	3	3
Turboprop	0	0	0	0
Jet	11	11	13	17
Helicopter	2	2	2	3
Total	**57**	**67**	**69**	**74**

Notes: Military based aircraft not forecasted; PAL = Planning Activity Level
Source: RS&H, 2024

In 2018, a general aviation hangar development plan was established for the north airfield at SUX. This plan included various storage options for aircraft, consisting of six 22,500 square foot corporate hangars, four 10,000 square foot conventional hangars, and a total of 114 T-hangar units. The plan was reevaluated in light of the needs identified in this master plan and was found to adequately support the forecasted growth and beyond. Since the original development, 20 T-hangar units have been constructed to replace aging facilities on the south side of the airfield, and a new FBO has been built adjacent to the hangar development site. **Figure 4-25** shows the preferred development plan for general aviation hangar development.

Figure 4-25 General Aviation Hangar Development Plan (North Airfield)



Source: RS&H Analysis, 2024

4.5.6 Aircraft Maintenance Facility Alternatives

The airport currently has an on-site maintenance provider that contracts aircraft maintenance services for SkyWest Airlines operating out of SUX. While the existing facility is adequately sized for current operations, plans should be developed to accommodate growth or to relocate to an area on the airfield better suited for large aircraft traffic. The existing facility comprises roughly 34,000 square feet of hangar storage, but it faces limitations due to restricted ramp space for parking aircraft and a hangar door height of only 30 feet. A new location for a hangar capable of supporting Maintenance, Repair, and Overhaul (MRO) operations for large commercial aircraft needs to be safeguarded to ensure this service continues at the airport.

Based on traffic patterns and existing infrastructure, four site alternatives were identified and evaluated for their potential to accommodate an MRO facility (see **Figure 4-26** for alternative locations). Given that this facility must accommodate large aircraft, the hangar's location is closely associated with larger taxiways and aprons to minimize investment in airfield upgrades and to reduce the mixing of large aircraft with general aviation activities in uncontrolled areas.

Figure 4-26 Aircraft Maintenance Facility Alternatives

Source: RS&H Analysis, 2024

- **Alternative 1 (Al Haynes Drive)**

  The first site alternative analyzed for aircraft MRO development is located adjacent to Al Haynes Drive and the recently completed FBO hangar operated by Oracle Aviation. This location is a brownfield site, which is a property where expansion, redevelopment, or reuse may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant.[6] This site formerly served as a taxiway and hangar storage during previous airfield configurations. Currently, there is no proposed use for the site, which is sufficiently large and positioned to accommodate larger aircraft and the MRO facility itself. The impact on existing airport operations and facilities is minimal due to the site's placement on the fringe of the airport operations area.

  However, the site presents some constraints for future development due to its proximity to existing airfield pavement to the north, Oracle's hangar to the west, and public roadways to the east and south. Additionally, the location requires large aircraft to taxi through the north airfield general aviation development area, which includes the new FBO and multiple T-hangars. Although the analysis found that this site does not create unsafe operating conditions, it does not provide optimal efficiency due to the limited airfield access and nearby operations involving similarly sized aircraft.

- **Alternative 2 (Joliet Avenue)**

  Alternative 2 is located southwest of Alternative 1, adjacent to the Oracle FBO hangar and accessible from the south via Joliet Avenue. Like Alternative 1, this site is also a brownfield site, having previously served as the location for a second IANG alert hangar, which has since been demolished and replaced with a T-hangar structure.

  The site is not currently reserved for other uses; however, to facilitate large aircraft activity, the T-hangar structure and its tenants immediately adjacent to the site would need to be relocated, which would impact both the development timeline and costs. Additionally, the location is constrained in its potential for future expansion due to the surrounding airfield pavement and public roadways.

- **Alternative 3 (Former Alert Hangar)**

  Further west of Alternative 2, on the site of the only remaining former IANG alert hangar, is Alternative 3 for analyzing large aircraft MRO operations directly on the existing general aviation ramp. This site can easily accommodate the anticipated facility size and allows for future growth.

[6] United States Environmental Protection Agency. (n.d.). *Brownfields*. Retrieved from https://www.epa.gov/brownfields/about

The development site is in proximity to existing small general aviation activities, including T-hangar storage and FBO operations. The proposed MRO facility can be designed to minimize the need for relocating the smaller GA operations, although it would likely result in a mix of aircraft activity on the ramp. However, the site is currently occupied by the former IANG alert hangar, which would need to be demolished before construction can commence, introducing operational and financial impacts to the development timeline. Additionally, much of the concrete apron pavement in this area is deteriorating. While replacing it is not essential for development, it is strongly recommended to ensure safe operations for large aircraft and to minimize FOD generation, further increasing development costs.

- **Alternative 4 (South of Terminal)**

  The fourth site analyzed for an MRO facility is the same location considered for potential ARFF relocation. Situated on the south general aviation ramp, this site would require some site preparation to facilitate construction but would otherwise efficiently meet the immediate needs of the MRO operation. Its location provides easy access to both public roadways and the airfield, promoting the safe movement of large aircraft within the terminal area.

  However, similar to the analysis conducted for Alternative 2 regarding ARFF relocation (see **Section 4.5.3**), this site does not perform well under several evaluation metrics. The most significant concern is the potential for the facility to obstruct the ATCT's line of sight to nearby airfield pavement, creating a nonstandard and unsafe condition for taxiing aircraft. To accommodate large aircraft like the ERJ-175, which is anticipated to operate at SUX in the near future, the proposed MRO facility would need to be at least 10 feet taller than the aircraft's tail height of 32 feet. This height would create a considerable obstacle to the ATCT's line-of-sight, obstructing views of parts of Taxiway A and the runway holding position marking on Taxiway B. Additionally, the site is contiguous to the IANG base, meaning future growth of the MRO facility would be limited by adjacent IANG development needs.

4.5.6.1 Aircraft Maintenance Facility Alternatives Evaluation

Table 4-7 presents the overall evaluation of the four aircraft maintenance facility alternatives. Based on the analysis, Alternatives 2 and 4 are not recommended for further consideration due to constraints on future growth potential. Additionally, Alternative 4 introduces a new airfield safety issue.

Alternative 3 remains a feasible option, provided that existing infrastructure issues—such as the alert hangar and deteriorating apron pavement—are addressed before development to

accommodate the scale of the proposed facility. In contrast, Alternative 1 scored favorably across nearly all evaluation criteria and is deemed the most ready for development, the safest in terms of operational functionality, and capable of future expansion. Consequently, Alternative 1 will be advanced as the preferred site for the aircraft maintenance facility.

Table 4-7 Aircraft Maintenance Facility Alternatives Evaluation

Evaluation Criteria	Alternative 1 (Al Haynes Drive)	Alternative 2 (Joliet Avenue)	Alternative 3 (Former Alert Hangar)	Alternative 4 (South of Terminal)
Operational/Public Safety	Good	Good	Good	Poor
Operational Efficiency	Fair	Fair	Fair	Good
Meets FAA Design Standards	Good	Good	Good	Good
Effectively Serves Target User	Good	Good	Good	Good
Resolves Current Issues	Good	Good	Good	Good
Meets Long-Term Facility Needs	Good	Fair	Good	Fair
Appropriate Level of Service	Good	Good	Good	Good
Ease of Implementation	Good	Poor	Fair	Good
Cost to Implement	Good	Poor	Fair	Fair
Flexible/Future Expansion	Good	Poor	Good	Poor
Environmental Impacts	Good	Good	Good	Good
Supports Sustainability Principles	Good	Fair	Good	Good

Performance Legend:

Good

Fair

Poor

Source: RS&H Analysis, 2024

4.5.7 Iowa Air National Guard Support Facilities

The IANG's missions result in unique airfield and facility needs that differ from those of other operators at the airport. Although the FAA does not provide funding for these additional requirements, they do influence operations, other airport facilities, and airfield geometry, necessitating coordination with the airport. The Siouxland Nexus program prioritizes the expansion of Runway 13-31 (as discussed in **Section 4.5.7.2**), along with ramp rehabilitation and other airfield enhancements.

4.5.7.1 Land Use

The IANG's operations are primarily situated on their base, located south of the terminal area and east of Runway 13-31. This base is largely landlocked by other airport facilities, with the entrance road and terminal area to the north, Interstate 29 to the east, and Runway 13-31 to the west and south. According to the Guard's IDP, planned improvements include an expansion of the base that will require the transfer of land previously reserved for aeronautical development to the IANG for repurposing. The specifics of the scoped development for each expansion area are not publicly disclosed; therefore, this master plan focuses on analyzing the impacts of future development solely through land use expansion (see **Figure 4-3** for the FutureLand Use plan referenced below).

The first planned IANG expansion is set to occur on the site of a former 20-unit T-hangar structure south of the terminal area. This area, contiguous to the IANG base, will be repurposed for IANG use and extends up to the primary access route for Gate #1, which serves as the main emergency access gate for the airport. This expansion will only affect one potential airport development initiative: an alternative site for an aircraft maintenance hangar, which is currently planned to operate outside the proposed IANG expansion zone.

The second IANG expansion initiative involves relocating the IANG's entry control point, as detailed in **Section 4.5.7.3, Entry Control Point Relocation**. The project is still in the preliminary layout stage, so to accommodate any scope changes, land use protection for all parcels within the project footprint will be included in this analysis.

Across from Runway 13-31, near the IANG's aircraft apron, there are additional IANG facilities, including aircraft paint facilities accessible via Taxiway M. The previous ALP accounted for future expansion in this area, either for IANG use or the development of cargo facilities. Analysis of the IDP indicates that protecting land for IANG expansion remains necessary, as base facilities on the other side of Runway 13-31 are largely landlocked by other airport developments. The land situated between the intersecting airfield surfaces of the two runways is not essential for other airport development and is therefore recommended for protection for IANG expansion.

Additionally, the Army National Guard maintains facilities on the same side of the airfield as the IANG base, across Harbor Drive. Plans for expanding these facilities are also underway, targeting further development to the south, adjacent to the RPZ of Runway 13-31.

4.5.7.2 Siouxland Nexus

At the time of this writing, the airport, in collaboration with both the IANG and the United States DoD, is in the engineering design phase of a significant airfield expansion and facilities development plan collectively referred to as the Siouxland NEXUS program. This program encompasses four improvement projects aimed at ensuring the IANG's aeronautical facilities and primary Runway 13-31 are fully mission-capable for current KC-135R operations and future KC-46 air refueler operations. The four components of the NEXUS program are outlined in detail below.

- **Runway 13-31 Reconstruction**

  The current pavement of Runway 13-31 is undergoing accelerated deterioration due to heavy military aircraft activity. As part of the first phase of the Nexus expansion program, the existing runway pavement will be reconstructed to support the operational requirements of the current KC-135R aircraft and the anticipated KC-46 air refueler operations at SUX.

- **Runway 13-31 and Taxiway A Extension**

  As discussed in **Section 4.3.1.1, Runway 13-31 Extension Alternatives**, the IANG's mission is currently constrained by the 9,002 feet available on Runway 13-31, which necessitates a minimum of 10,000 feet to avoid aircraft load restrictions. Following an alternatives analysis, the project team has identified the preferred development plan as adding 1,000-foot extensions to each runway end designated for military use, along with 1,000-foot blast pads. Consequently, Taxiway A will also require similar 1,000-foot extensions on each end to address several nonstandard taxiway conditions detailed in **Section 4.3.2.2, Taxiway Alternatives**. The program for runway extensions will also encompass the relocation and enhancement of various NAVAIDs.

- **IANG Aircraft Apron Reconstruction**

  To support the current and future missions of the IANG, which involve changing aircraft, the reconfiguration and expansion of the aircraft apron is essential. This expansion will ensure the appropriate safety areas for both the KC-135R and KC-46 aircraft, enhance pavement strength, and improve overall airfield safety through a new pavement marking plan.

- **Warm-Up/Holding Pad Construction**
  The addition of a warm-up/holding pad at the north end of Taxiway A will enable aircraft to conduct run-up checks away from other airport facilities and areas susceptible to FOD generation. This proposed holding pad will be accessible for both civil and military operations.

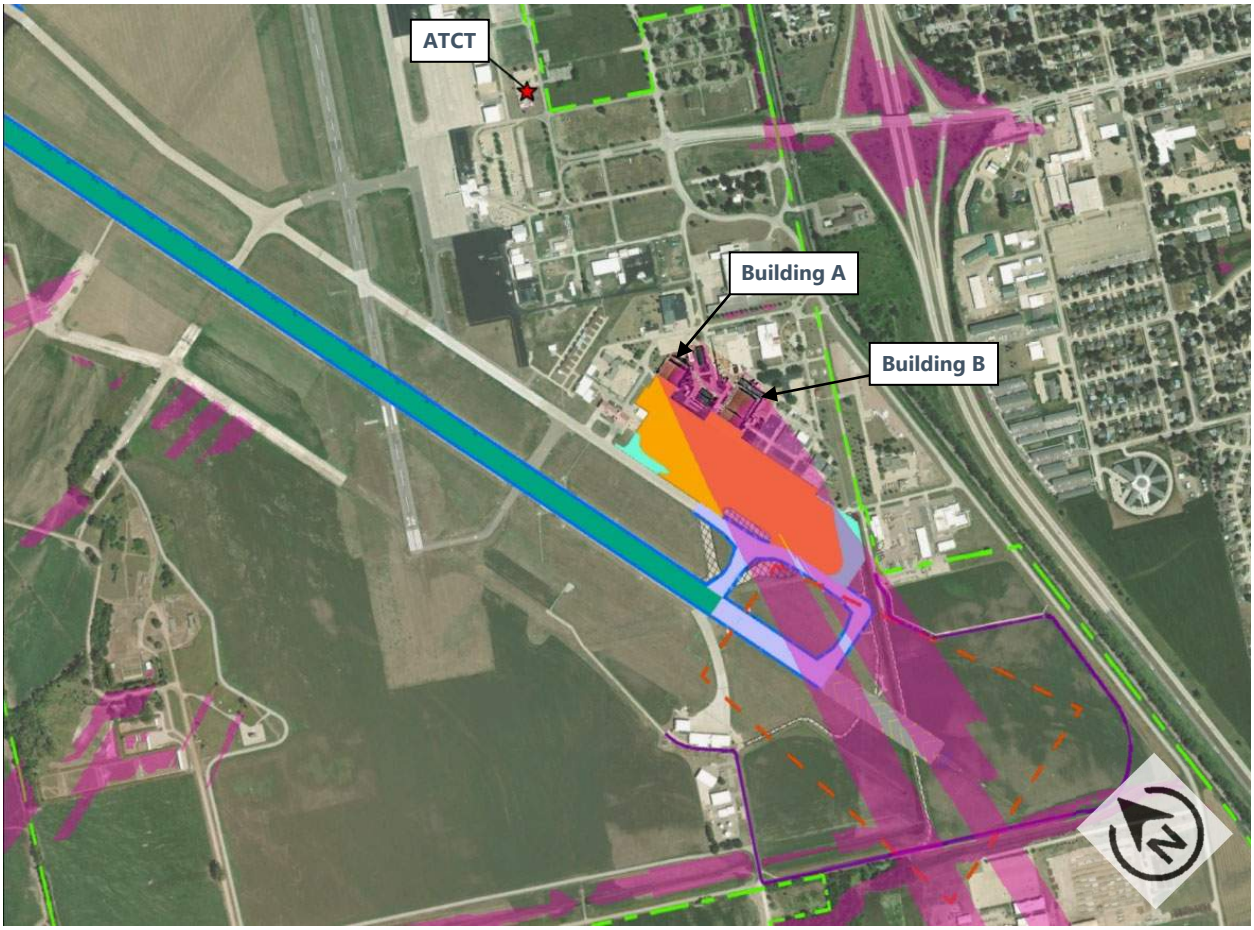
4.5.7.3 Entry Control Point Relocation

As outlined in **Chapter 3, Facility Requirements**, the IANG intends to relocate its primary Entry Control Point (ECP) from its current location within the IANG boundary, as it fails to meet current guard queuing and setback requirements. The proposed new ECP will be situated between Aviation Boulevard and Ogden Avenue, with a roadway that curves to the south, circumventing the existing airport maintenance building, and leading into the IANG base at Halsey Street. This relocation project will affect several landside access roads and the future expansion of the airport maintenance building, as well as the primary airfield and emergency access route through Gate #1. To address airfield access issues, an alternative route for Gate #1 is proposed, and future expansion of the airport maintenance building will be planned around this anticipated development.

4.5.7.4 IANG Hangar Relocation

As detailed in **Section 4.3.2.1**, **Hot Spot Mitigation Alternatives**, one of the IANG's hangars currently causes a line-of-sight issue between the control tower and Taxiway G, which is officially recognized as Hot Spot 2 (HS 2). Furthermore, an analysis of the proposed Siouxland Nexus airfield improvements (specifically the extensions of Runway 13-31 and Taxiway A, as well as the reconfiguration of Taxiways A and G) indicates the potential for additional line-of-sight issues arising from the new airfield surfaces. The preliminary analysis of the Nexus improvements, illustrated in **Figure 4-27**, highlights potential visibility challenges on the extended segments of Taxiway A and also affects the future threshold of Runway 31.

Figure 4-27 Nexus Improvements LoS Analysis



Source: RS&H ArcGIS Analysis, 2024

The IANG facilities contributing to the current line-of-sight issues include the fuel cell hangar (identified as Building "A" in **Figure 4-27**) and the existing aircraft maintenance hangar (Building "B"). Both hangars have surpassed their useful life and are scheduled for replacement or relocation within the base. Building "A" encompasses approximately 25,000 square feet of storage space along with 6,500 square feet allocated for administrative purposes, and it is planned to be relocated to another site on the base in a facility of similar size. Meanwhile, Building "B" currently offers about 42,000 square feet of hangar space and 26,000 square feet of administrative space but is set to be replaced by a new facility measuring 62,000 square feet, designed to better accommodate the IANG's operational needs at SUX.

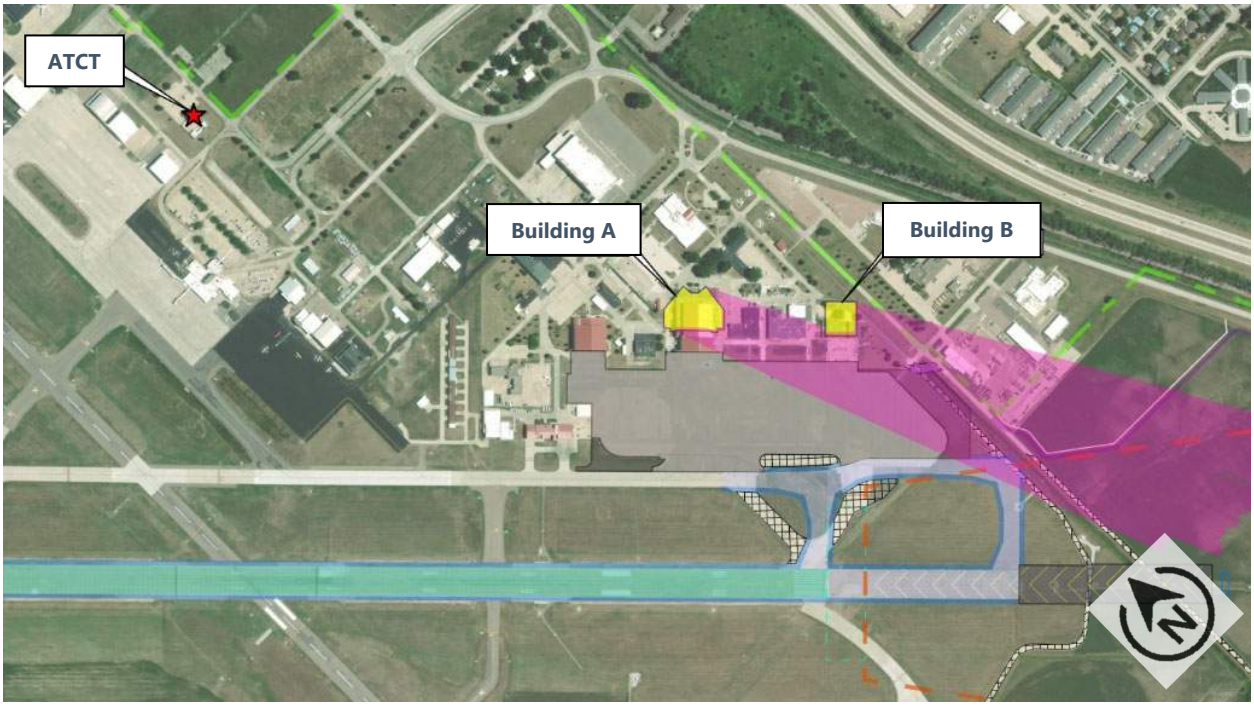
Since both buildings are owned by the IANG, the airport does not have authority over their relocation timetable or funding. Nevertheless, due to the planned relocations of each facility, an analysis was conducted to identify preliminary recommendations for new sites that would address existing line-of-sight issues associated with Hot Spot 2 (HS 2) while also ensuring

compatibility with the proposed Nexus airfield improvements. The key recommendations are summarized below:

- **Building A:** The relocation of the current building and associated facilities towards Harbor Drive necessitates demolition of the existing structures. Additionally, realignment of landside roadways will be required. The new location is expected to avoid any line-of-sight issues with both airfield movement and non-movement areas.
- **Building B:** The relocation of Building "B" involves demolishing the existing structure and constructing a new facility set further back from the apron's edge. This setback is necessary to prevent shadowing of the proposed Taxiway A pavement from the ATCT. The required distance for Building B's setback will depend on the height of the new building, which has been analyzed at 60 feet tall (as shown in **Figure 4-28**). This design aims to ensure that no new line-of-sight issues arise with the proposed 1,000-foot extensions to Taxiway A and Runway 31.

Figure 4-28 illustrates the two recommended new locations for Buildings "A" and "B", along with a shadow analysis that evaluates the preliminary impacts on line-of-sight concerning the proposed Nexus development.

Figure 4-28 IANG Hangar Relocation Analysis



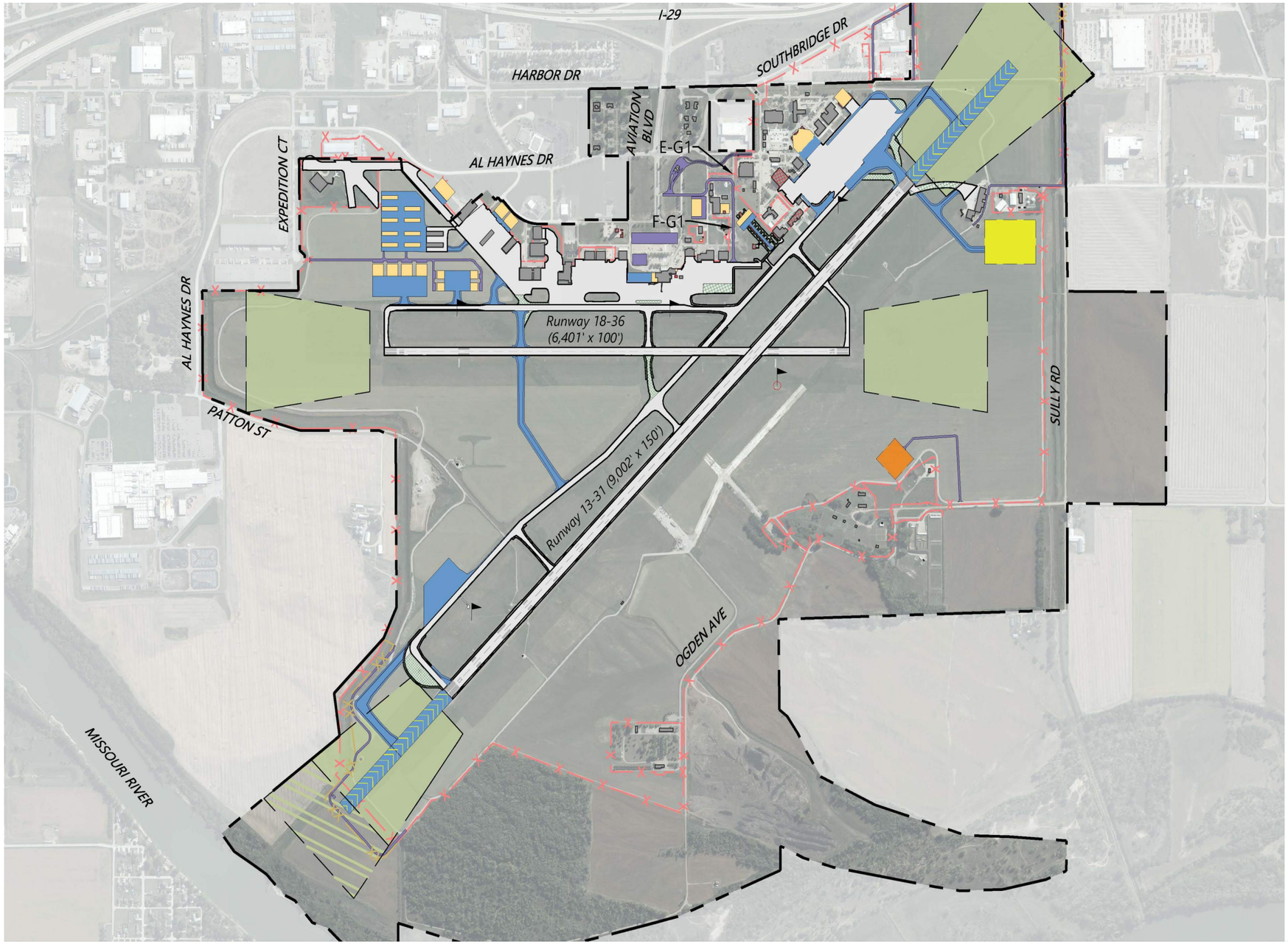
Source: RS&H Analysis, 2024

Without input on the timetable for relocating these two IANG facilities, airport staff should proceed with efforts to mitigate the existing hot spot issues by relocating other airfield facilities. Additionally, the airport should continue collaborating with the IANG to ensure that future development plans eliminate safety concerns and remain compatible with ongoing expansion initiatives.

4.6 Preferred Airport Development Plan

The preferred airport development plan, shown in **Figure 4-29**, integrates the favored alternatives and solutions for each facility detailed in this chapter. This plan was developed through collaborative workshops with airport leadership, supplemented by public involvement efforts. The leading and trailing elements of the development plan function independently, ensuring that the airport's future facility requirements are effectively met. This plan visually demonstrates how each facility interrelates within the overall system, setting the stage for the implementation and capital programming of the respective development initiatives.

Figure 4-29 Preferred Airport Development Plan



Existing Airport Property Line
Existing Airfield Pavement
Existing Building
Existing Perimeter Fence
Existing Wind Cone
Existing RPZ
Future Airfield Pavement
Future Pavement Demolition
Future Building Demolition
Future Building
Future Segmented Circle
Future Roadway / Auto Parking
Future Perimeter Fence
Future ATCT Site*
Future Development Area
Future RPZ

Note
"*": Further study required to identify precise location that meets the siting criteria outlined in FAA Order 6480.4A, *Airport Traffic Control Tower Siting Process*.

Abbreviations
E-G1: Existing Gate '1' Site
F-G1: Future Gate '1' Site
ATCT: Airport Traffic Control Tower
RPZ: Runway Protection Zone

0' 750' 1,500'

Source: RS&H Analysis, 2024