Chapter Six

Airport Alternatives

6.1 Introduction

This chapter presents the Non-Terminal Alternatives Development and Evaluation section of this Master Plan Update (MPU) that identifies and evaluates scenarios and alternatives needed to accommodate the facility requirements presented in Chapter Four. As an essential component in the planning process, this chapter will review alternatives that Springfield-Branson National Airport (SGF or Airport) could develop to meet the needs of airport users, satisfy future demand, and conform to Federal Aviation Administration (FAA) design standards.

The guidelines prescribed in FAA Advisory Circular (AC) 150/5070-6B, Change 2, *Airport Master Plans,* were utilized to ensure the elements and processes outlined by FAA were followed. Additionally, standards set forth in FAA AC 150/5300-13B, *Airport Design* (AC 13B), were applied to airfield design alternatives to identify compliance.

There are endless possibilities of scenarios and concepts that can be developed during the Alternatives Development and Evaluation phase. Therefore, professional judgment and experience have been applied to identify alternatives with the greatest potential for implementation. As such, the alternatives scenarios presented in this section are organized by facility type:

1. Airfield and Airspace
2. General Aviation (GA)/Corporate
3. Cargo/Maintenance, Repair, and Overhaul (MRO)
4. Support Facilities
5. Ground Access, Circulation, and Parking Requirements

An evaluation process analyzed alternatives, ultimately identifying a Preferred Development concept. The Preferred Development concept will be used in the development of the Airport Layout Plan (ALP).

6.2 Airfield and Airspace

The Facility Requirements chapter found that much of the SGF airfield complies with FAA design standards. Areas of opportunity to further enhance safety are as follows:

- 25' runway shoulders along both runways
- 200' x 200' blast pads on RWY 2 & 32
- Adjust the hold bars to 263' from the centerline
- Bring ROFA & RSA incompatibilities into compliance
- Address RPZ incompatibilities
- High-energy intersection mitigation
- Direct access from apron to runway mitigation
- Taxiway shoulders

6.2.1 Runway Design Standards

AC 13B sets forth design standards for runways and elements associated with runways, such as shoulders, blast pads, high-energy intersections, runway safety areas (RSAs), obstacle-free zones (OFZs), object-free areas (OFAs), clearways, and stop bars.

SHOULDERS AND BLAST PADS

Table 6.2-1 presents the runway design standards that are not consistent with AC 13B criteria based on the Runway Design Code (RDC) of Runways 14-32 and 02-20 and subsequently identifies the level of deficiency. In summary, Runways 14-32 and 02-20 do not comply with the runway shoulders and blast pads dimension requirements based on the critical aircraft and RDC of D-IV, as previously identified in this Master Plan Update.

Table 6.2-1: Runway Geometry Standards Evaluation

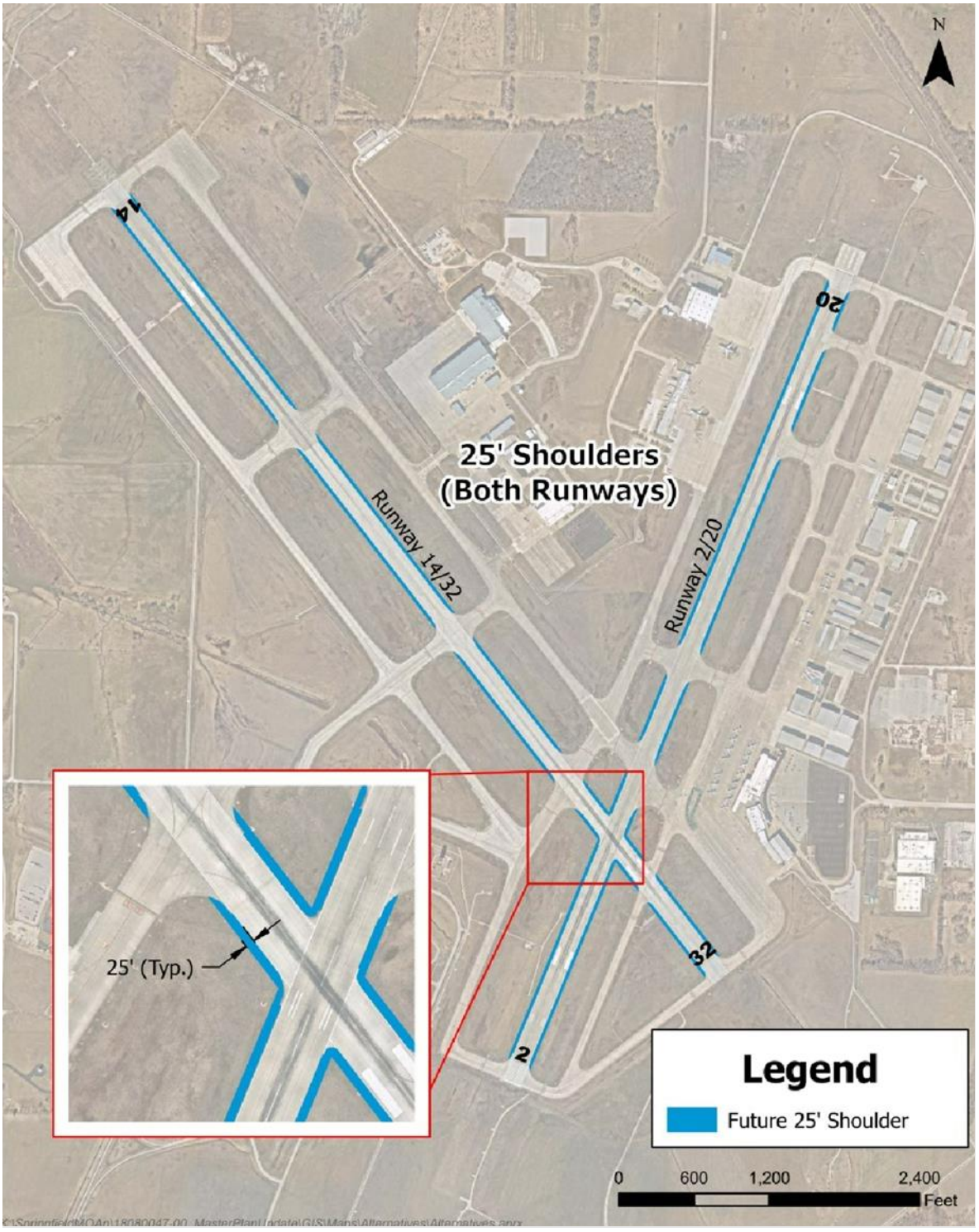
DESIGN ELEMENT	RUNWAY 14-32				RUNWAY 02-20			
	EXISTING		FUTURE		EXISTING		FUTURE	
	14	32	14	32	2	20	2	20
Runway Design Code	D-IV		D-IV		D-IV		D-IV	
Runway Width (ft.)	150		150		150		150	
Shoulder Width (ft.)	0		25		0		25	
Blast Pad Width (ft.)	200	0	200		0	200	200	
Blast Pad Length (ft.)	200	0	200		0	200	200	

Source: CMT, FAA AC 150/5300-13B

As detailed in Chapter 4 – *Airport Facility Requirements*, AC 13B indicates paved shoulders are required for runways accommodating Airplane Design Group (ADG) IV and higher and are recommended for runways accommodating ADG III aircraft. It is recommended that these blast pads and shoulders be

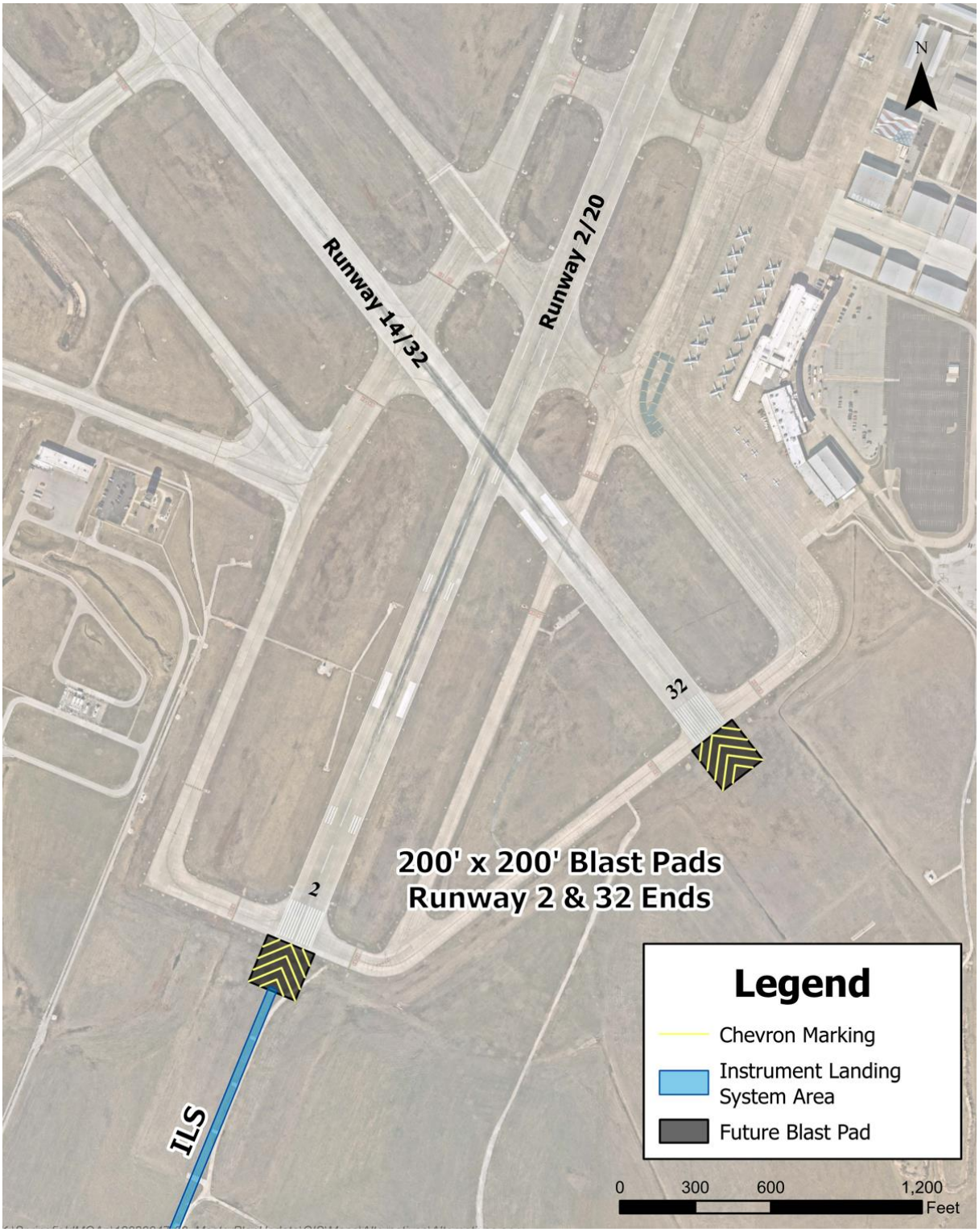
installed if resources are available during the next runway rehabilitation project. Exhibits 6.2-1 and 6.2-2 depict the recommended addition of shoulders and blast pads.

Exhibit 6.2-1: Addition of Runway Shoulders at SGF



Source: CMT (2022)

Exhibit 6.2-2: Addition of Blast Pads to Runways 02 and 32

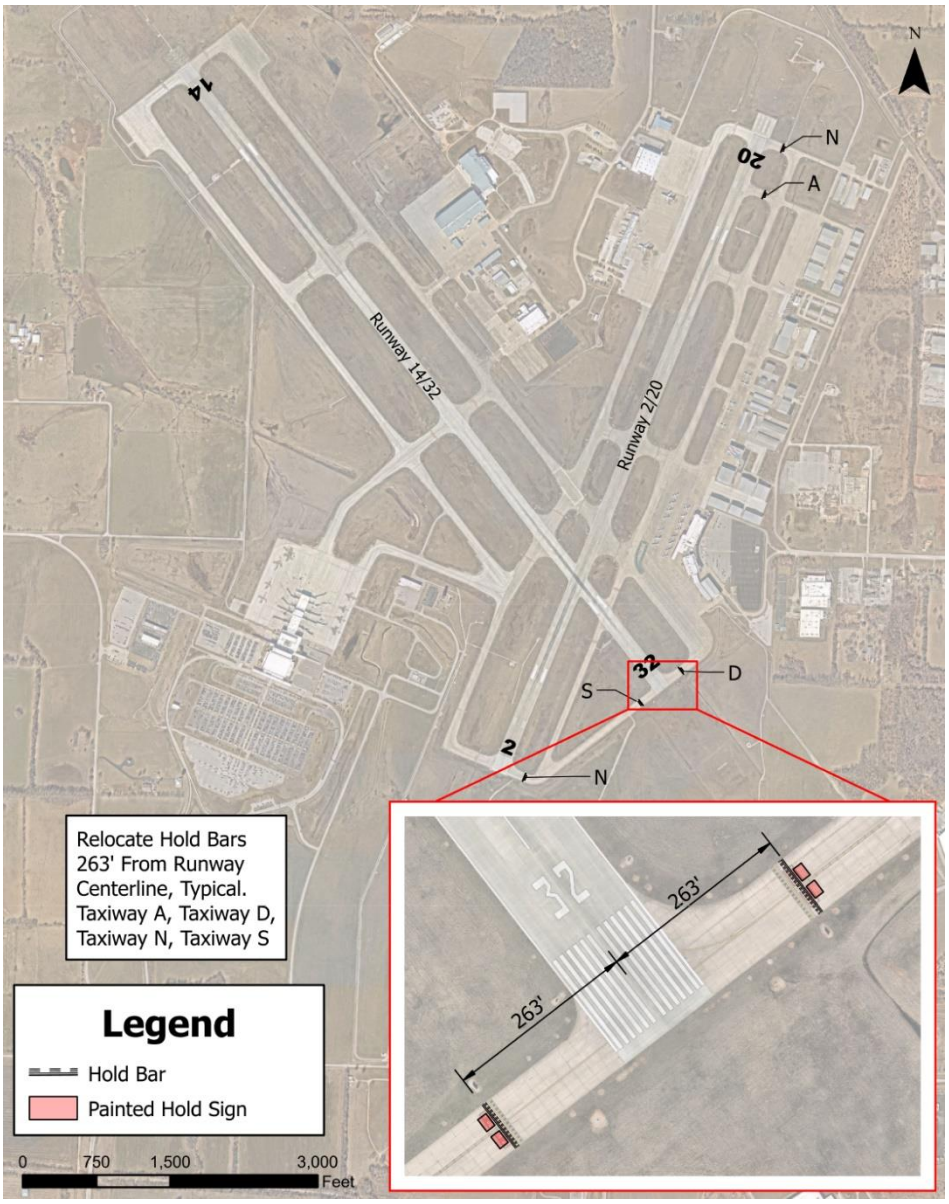


Source: CMT (2023)

HOLDING POSITION MARKINGS

Holding position markings generally identify the beginning of a Runway Safety Area (RSA) and require clearance before crossing. The holding position markings are to increase one (1) foot for every 100 feet above sea level from a base separation of 250 feet from the runway centerline. This means that the holding position markings at SGF need to be a minimum of 263 feet from the runway centerline. There are five instances of deficient markings, in which the separation is less than 263 feet, at approximately 240 feet. **Exhibit 6.2-3** flags the location of each deficiency.

Exhibit 6.2-3: SGF Holding Position Marking Deficiencies



Source: CMT (2022)

Bringing all stop bars to the compliant distance of 263' from the runway centerline is recommended.

6.2.2 Runway Protection Zones (RPZ)

RUNWAY 14 RPZ

Chapter 4 – *Airport Facility Requirements* identified an incompatibility within the Runway 14 RPZ, which is a portion of W Farm Rd 104 (see Exhibit 4.2-7). No action is recommended until such time that either the Airport or a surrounding municipality proposes to expand or relocate this roadway. However, the Airport should plan to acquire sufficient control over the portion of non-owned land in the future Runway 14 RPZ.

RUNWAY 32 RPZ

There are no incompatibilities identified for the existing or future Runway 32 RPZ.-

RUNWAY 2 RPZ

There are no incompatibilities identified for the existing Runway 02 RPZ.

RUNWAY 20 RPZ

Chapter 4 – *Facility Requirements* identified an incompatibility within the Runway 20 RPZ, which is a portion of W Willard Road (see Exhibit 4.2-10). No action is recommended until such time that either the Airport or a surrounding municipality proposes to expand or relocate this roadway.

RPZ INCOMPATIBILITIES

Given that the identified RPZ incompatibilities at SGF are public roads, mitigation or relocation can represent a challenge due to the extensive planning and resources required to relocate a portion of a busy road. Where practical, Airport owners should own sufficient property interests under the runway approach and departure areas to at least the limits of the RPZ. It is desirable to clear the entire RPZ of all above-ground objects. Where this is impractical, airport owners, as a minimum, should maintain the RPZ clear of all facilities supporting incompatible activities. It is recommended that the Airport monitor activities within each RPZ and continuously work with its neighbors to prevent any incompatible activities and future developments.

If either the Airport or a surrounding municipality considers alternatives to relocate any roads that impact an RPZ, a separate RPZ study will be required.

6.2.3 Runway Safety Areas and Runway Object Free Areas (RSA & ROFA)

As determined in Chapter 4 – *Facility Requirements*, there are several incompatible objects within the ROFA that are not considered "fixed-by-function", such as wind cones, distance-measuring equipment (DME), localizer, and terrain.

SUPPLEMENTAL WIND CONES

Supplemental wind cones are allowed within the ROFA provided they are currently frangible mounted. SGF's supplemental wind cones are frangible mounted. At such times when the wind cones need to be replaced, the FAA recommends that they be relocated outside of the ROFA, if physically possible within the supplemental wind cone siting criteria and if allowed by airfield geometry and topography.

DISTANCE-MEASURING EQUIPMENT (DME)

The DME antennas are located within the localizer equipment shelters within the ROFA. The shelters are recommended to be located 1,000 feet beyond the end of the runway and outside the ROFA.

LOCALIZER

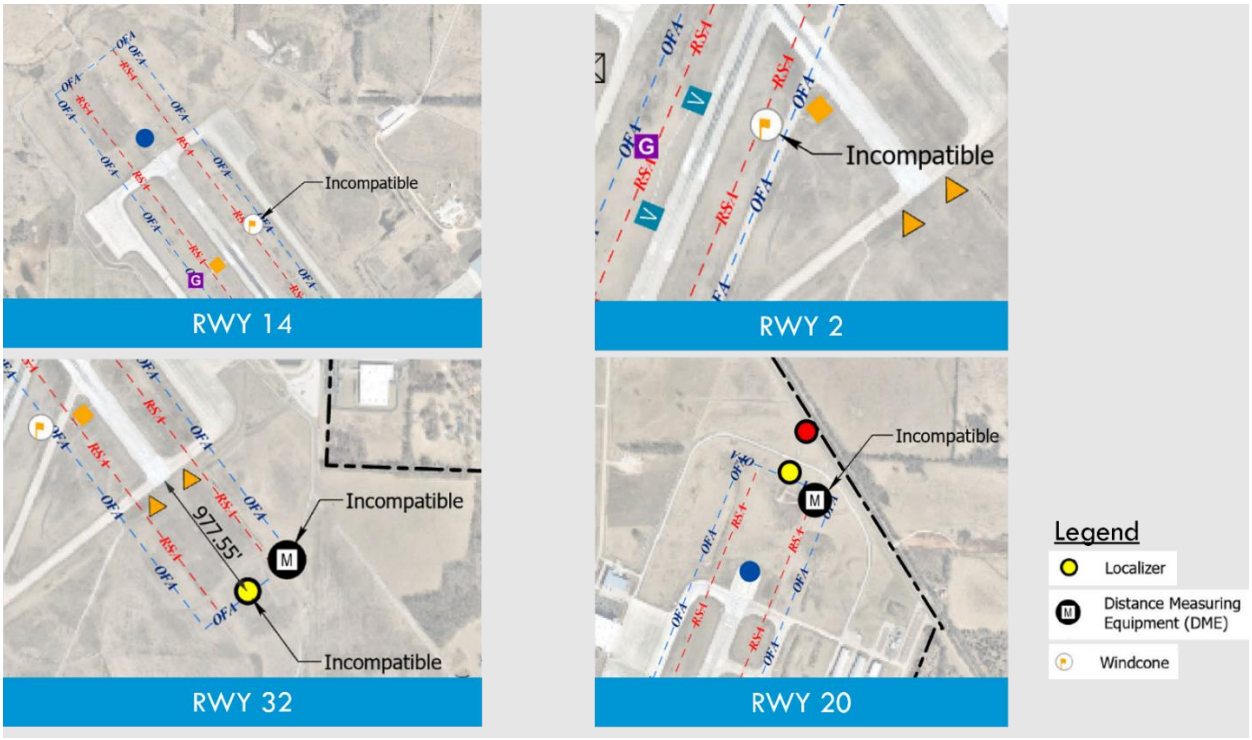
The Runway 14 localizer antenna, located off the end of Runway 32 within the RSA, is measured 977.55' beyond the Runway 32 threshold. Just as with the DME equipment, it is recommended that the equipment is located 1,000' beyond the end of the runway, outside of the RSA. The FAA (ATO and Airports) has formally documented the localizer antenna to initiate the budgeting process for FAA (ATO) to request funds and implement the relocation of the localizer antenna out of the RSA at a future date. The RSA Executive Project Summary is included as Appendix 13.

Exhibit 6.2-4 below shows the location of each RSA and ROFA incompatibility.

TERRAIN

Terrain off the end of Runway 32 within the ROFA penetrates the FAA's 20:1 visual approach surface. One result of this penetration is the less-than-optimal one-mile visibility minimums for the Runway 32 instrument approach procedure. The high area of terrain is likely associated with an embankment above an FAA Technical Operations service line in the vicinity. Lowering the service line and grading the area is necessary to mitigate the visual approach surface penetration and request lower (3/4 mile) instrument approach visibility minimums. Further details about the feasibility of reducing the visibility minimums described above are provided in Appendix 8.

Exhibit 6.2-4: RSA & ROFA Incompatibilities at SGF



Source: CMT

To reasonably mitigate these incompatibilities in a way that is economically conscious, relocation of this equipment should be done when it has met its expected lifetime or needs repair.

6.2.4 Taxiway Design Standards & Geometry

Taxiway design standards are set by the FAA and are a function of the size of aircraft that are intended to use the taxiway. Chapter 4 – *Airport Facility Requirements* identified four taxiway design standards that need to be addressed:

- High-energy intersections
- Direct access from apron to runway
- Taxiway width
- Taxiway shoulders

HIGH-ENERGY INTERSECTIONS AND DIRECT ACCESS FROM APRON TO RUNWAY

There are three high-energy intersections, intersections within the middle third of a runway, at SGF. Two of which are located on Runway 02-20 and one on Runway14-32. These intersections could pose a problem as this section of the runway is where aircraft are typically traveling the fastest, and collisions are more likely to occur. Exhibit 6.2-5 below shows the locations of those high-energy intersections.

Exhibit 6.2-5: High-Energy Intersections and Direct Apron to Runway Access at SGF

Source: CMT (2023)

The intersection on Runway 14-32 is located at Taxiway F. The southern crossing on 02-20 is at Taxiway D, and the northern crossing is at Taxiway C. Taxiway D is a full-length parallel taxiway to Runway 14-32, where the intersection with Runway 02-20 on the east side is currently marked on the airport diagram as a cautionary hot spot.

Further studies should be conducted to evaluate preferred alternatives to mitigate each high-energy crossing, ensuring the safe and efficient use of the airfield.

As shown in Exhibit 6.2-5, there are two instances where taxiways provide direct access from an apron to a runway. The first is Taxiway F that leads directly from the terminal apron to Runway 14-32. The second is the segment of Taxiway C on the east side of Runway 2-20 that leads from the General Aviation apron to the runway.

For Taxiway F, mitigation alternatives include removing the connector section between Runway 14-32 and Taxiway W or realigning the section of Taxiway F between the terminal apron and Taxiway W so that it no longer provides direct access to Runway 14-32. After coordination with the Airport, the realignment option was chosen so that the connector portion of Taxiway F could continue to serve as a runway exit.

For Taxiway C, the most feasible concept is to remove the section of pavement east of Taxiway N so that aircraft from the apron will need to make a turn onto Taxiway N before accessing the runway.

The recommended taxiway reconfigurations are shown on the Airport Layout Plan.

TAXIWAY WIDTH

All parallel taxiways at SGF are 75' wide and are designed for ADG-IV/TDG-5 aircraft, or aircraft with up to 171-foot wingspans, except the portion of Taxiway N south of Runway 14-32, which is 60' wide. This portion of Taxiway N can accommodate most ADG-IV aircraft, except those in which the cockpit to main gear (CMG) dimension and width of the main gear (MGW) exceed the values prescribed in AC 150/5300-13B, such as the B767-300F. Consideration should be given to widening this section of Taxiway N to comply with TDG 5 criteria.

More detailed aircraft operational and fleet mix data will need to be collected and assessed to justify pavement widths in the General Aviation areas when reconstruction is warranted.

TAXIWAY SHOULDERS

Existing taxiway shoulders at SGF consist of stabilized turf, whereas current FAA guidance calls for paved shoulders on taxiways accommodating ADG-IV and larger aircraft. In the past, FAA only recommended paved shoulders for ADG-IV taxiways. The Airport has requested and received FAA approval to omit paved shoulders on recent taxiway reconstruction projects where the result would be a non-continuous shoulder. Installation of paved shoulders should be considered during future taxiway projects.

6.2.5 Runway Extensions

RUNWAY 02 EXTENSION

Runway 02-20 is currently 7,003' with a planned 1,000-foot extension on the Runway 02 end reflected on the previous Airport Layout Plan (ALP) and is factored into the established airport overlay (AO) districts.

This extension would contribute to airfield resiliency, helping to mitigate the operational and safety impacts should Runway 14-32 be closed or unfavorable due to weather conditions.

In addition to relocating the MALSR approach lighting system, approximately 4.4 acres of RPZ property would need to be acquired to facilitate this extension. This is illustrated in **Exhibit 6.2-6.**

Appendix 10 provides an assessment of runway length needs at SGF.

RUNWAY 14 EXTENSION

As described in **Appendix 6**, *Parallel Runway Assessment*, the potential need exists for a primary runway length of up to 9,000' in the future beyond the planning period. Should this demand transpire sooner than anticipated, an alternative to constructing a new parallel runway is to extend existing Runway 14-32 from its current 8,000' to 9,000'.

This extension would provide the ability to access a wider range of destinations while avoiding the large costs associated with constructing a new runway and taxiway system.

An extension to the Runway 14 end would require significantly less earthwork than constructing a new runway. However, other factors, such as relocating the MALSR, must be considered. Additionally, the established airport overlay (AO) districts were not created to account for an extension of Runway 14. As such, further evaluation would be required to analyze potential impacts to the communities northwest of SGF.

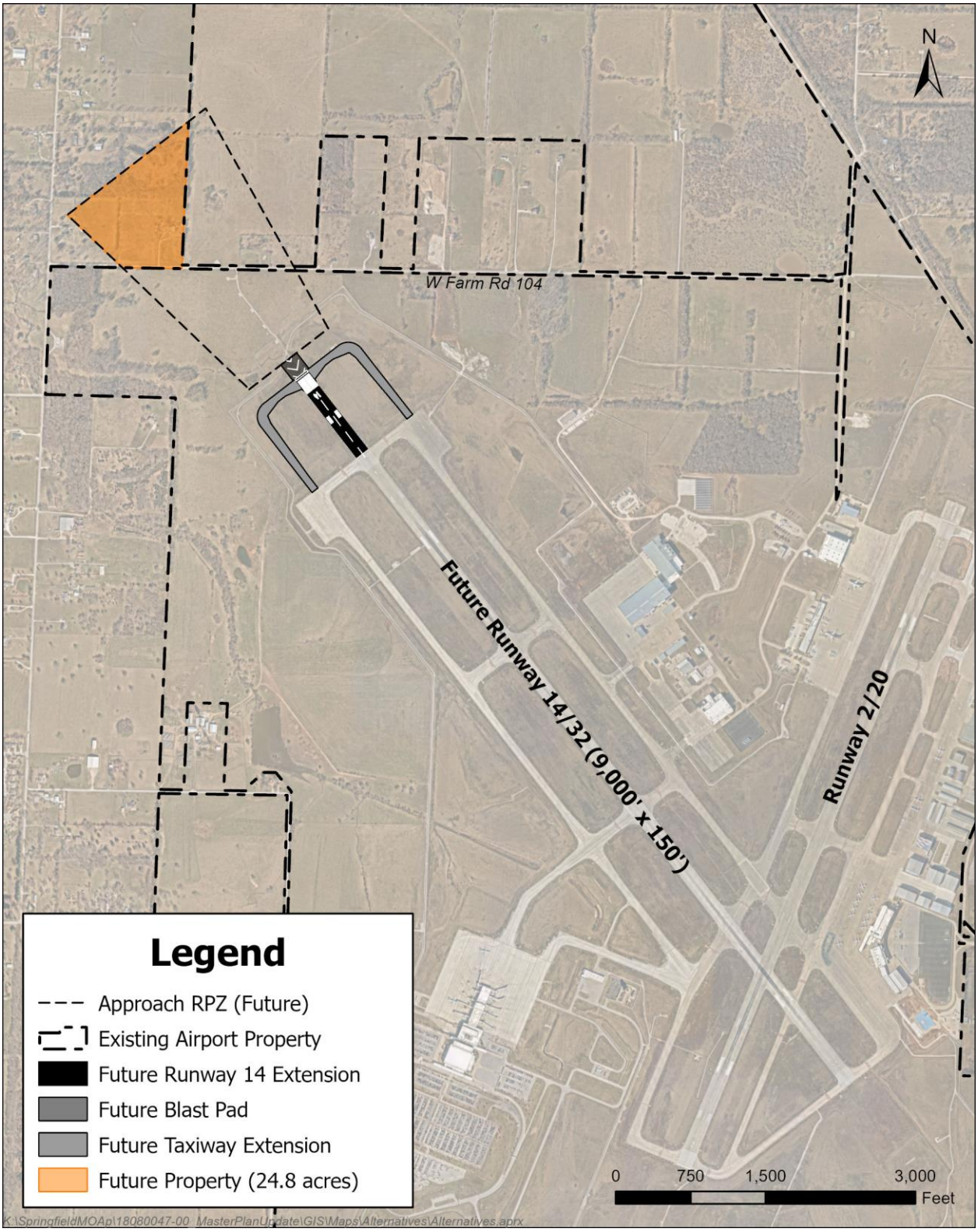
Approximately 2.6 acres would need to be acquired to facilitate this extension, as illustrated in **Exhibit 6.2-7.**

The Runway 14-end extension is not being carried forward as a recommended action in this Master Plan Update. However, it is recommended to reduce the Runway 14 visibility minimums from ¾ statute-mile to ½ statute-mile, resulting in a larger RPZ. Further details about the feasibility of reducing the visibility minimums described above are provided in **Appendix 8.**

Exhibit 6.2-6: Runway 2 Extension RPZ Land Acquisition

Source: CMT (2023)

Exhibit 6.2-7: Runway 14 Extension RPZ Land Acquisition



Source: CMT (2023)

6.3 General Aviation (GA)/Corporate

SGF currently has a wait list of potential users, operators, and developers who are vying to get hangar space. Hangar wait lists are not always indicative of the actual demand for space at an airport. Chapter 4 – *Airport Facility Requirements* considered the wait list, approved demand projections, and other variables to isolate several capacity needs regarding GA/corporate hangar capacity, as summarized in Table 6.3-1.

Table 6.3-1: GA Capacity Needs

RESULT	EXISTING		PAL 1	PAL 2	PAL 3	PAL 4
GA Hangars Total Area (ft^2)	T-Hangar	90,945	96,925 (+1 10-unit Hangar)	103,902 (+1 10-unit Hangar)	109,882	117,855 (+1 10-unit Hangar)
	Box Hangar	340,815	355,067 (+ 1 140'x140' Hangar)	362,193	369,320 (+ 1 140'x140' Hangar)	376,446
GA Apron Total Area (yd^2)	106,372		-	-	-	+ 8,640

Source: CMT

The capacity needs determined by the Facility Requirements were paired with feedback collected throughout a series of stakeholder engagement meetings to create and evaluate GA/corporate development alternatives. This feedback included fleet modernization, fleet mix, and associated hangar sizing. It also reinforced the need to accommodate the thriving corporate community surrounding SGF through the expansion of corporate and charter services. The following sections and evaluation are focused solely on GA/corporate capacity alternatives.

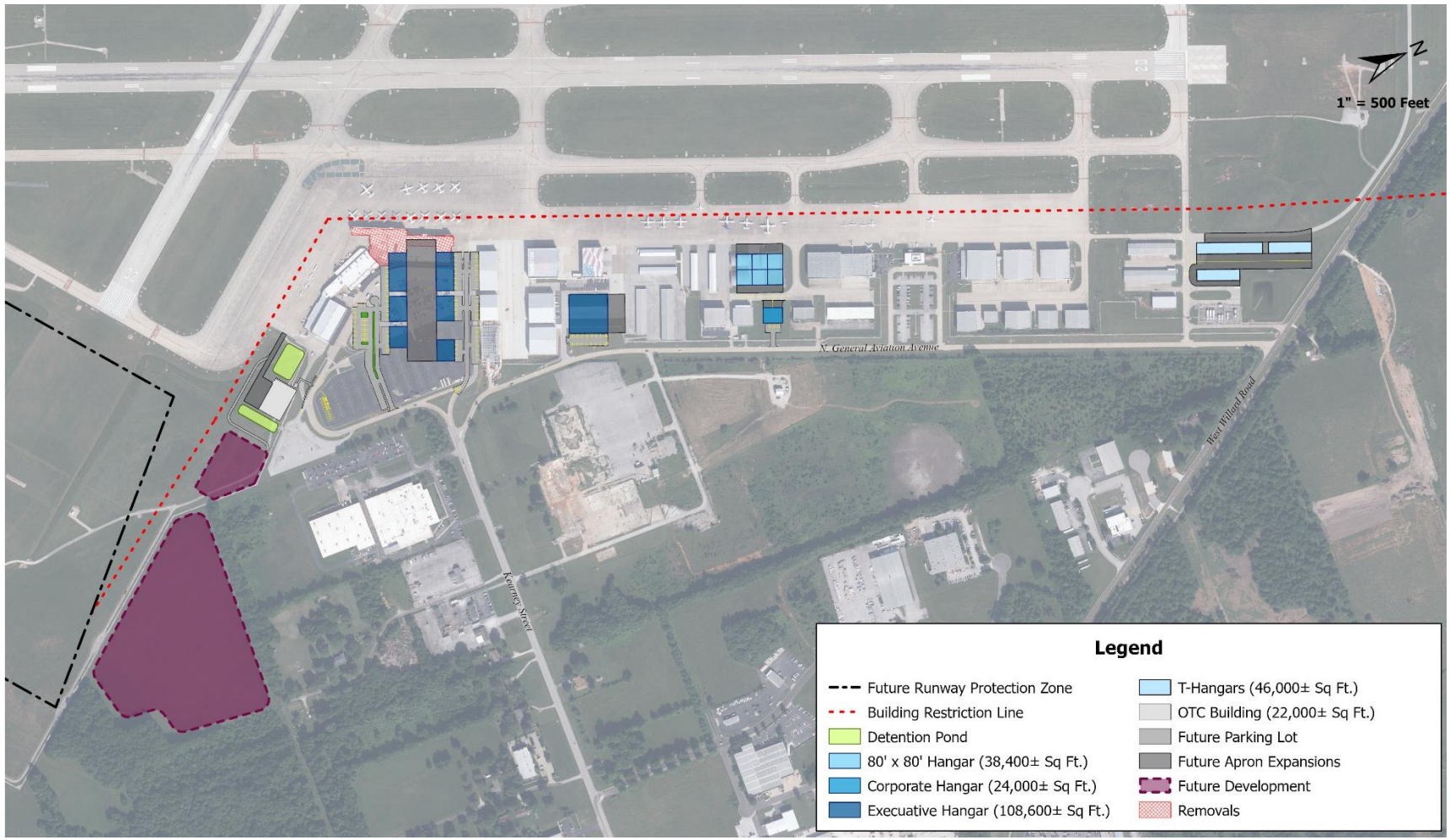
6.3.1 Alternative 1 - Infill

Alternative 1 infills the existing GA/corporate footprint and is characterized by:

- Infill existing areas with 100' x 100' and 80' x 80' hangars,
- Addition of a 200' x 200' hangar
- Development of three (3) t-hangars to the north, adding 36 units,
- Demolition of West Kearney Terminal (after lease expiration in 2036) and construction of 6-unit executive hangar complex
- Demolition of existing barrel hangars and adjacent hangar for a 6-plex of 80' x 80' hangar units
- Preservation of land for future OTC expansion

This alternative infills available land to the maximum extent possible, satisfying and exceeding all capacity deficiencies. This alternative does not expand the overall GA footprint, possibly constraining private development interests in the future. Consideration needs to be given to existing pavement strengths and FAA design standards. The West Kearney Terminal Redevelopment is planned around utility infrastructure (i.e. a sanitary sewer line), limiting full development of that area. Alternative 1 is shown in Exhibit 6.3-1.

Exhibit 6.3-1: Alternative 1 – GA/Corporate



Source: CMT (2023)

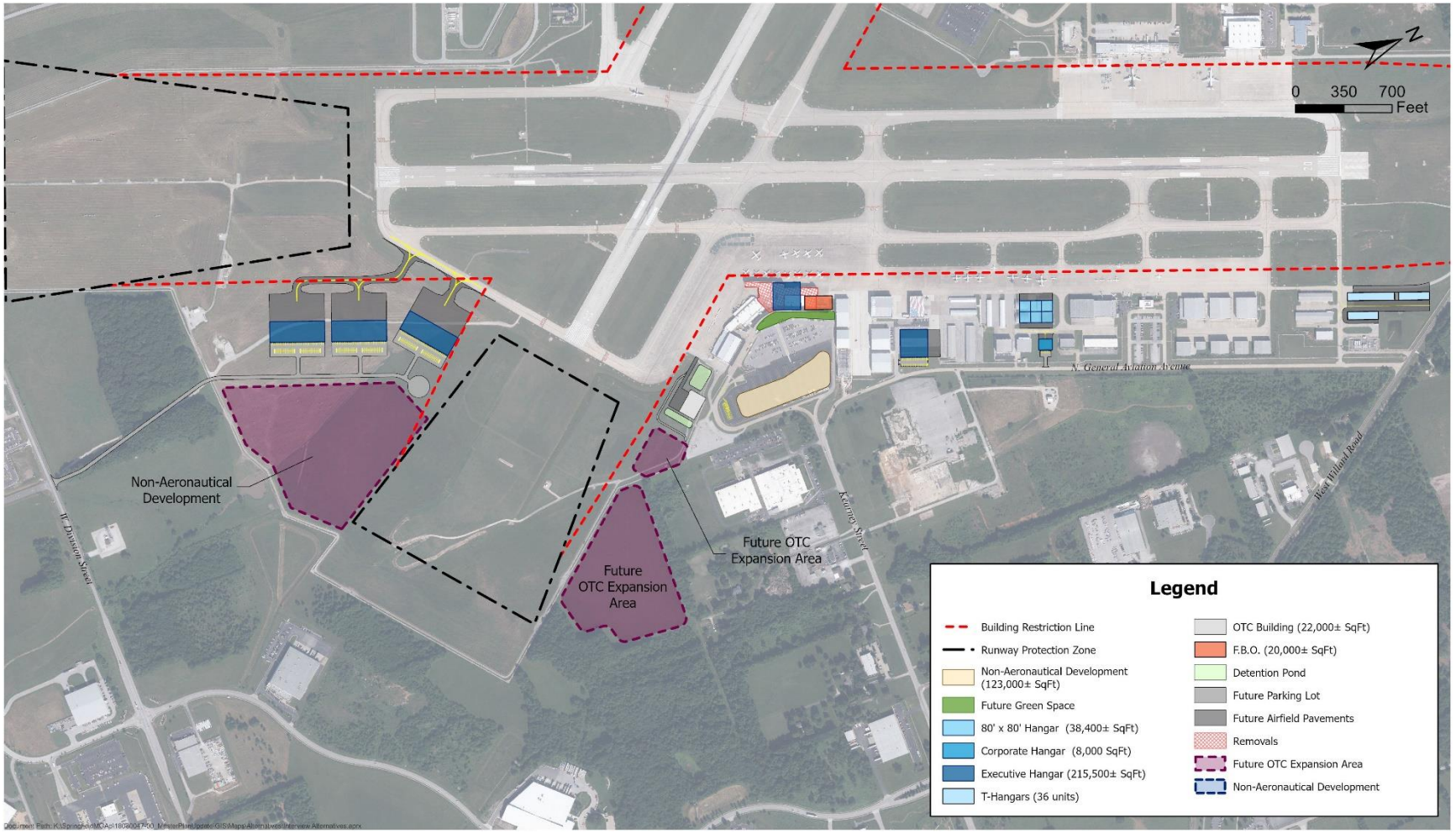
6.3.2 Alternative 2 – Corporate Hangar Campus

Alternative 2 is the same as Alternative 1, except the following:

- Demolition of West Kearney Terminal (after lease expiration in 2036) and construction of Fixed Base Operator (FBO) and associated 200' x 200' community hangar,
- Development of executive hangars along Taxiway S,
- Vehicle access off W Division Street and airport perimeter road

As with Alternative 1, this alternative satisfies capacity deficiencies throughout the planning period and introduces a large corporate aircraft campus on the southeast portion of the airfield. Airport officials and stakeholders indicated the West Kearney Terminal redevelopment strategy in Alternative 1 provided more hangar capacity, thus was more efficient. Alternative 2 is shown in Exhibit 6.3-2.

Exhibit 6.3-2: Alternative 2 – GA/Corporate



Source: CMT (2023)

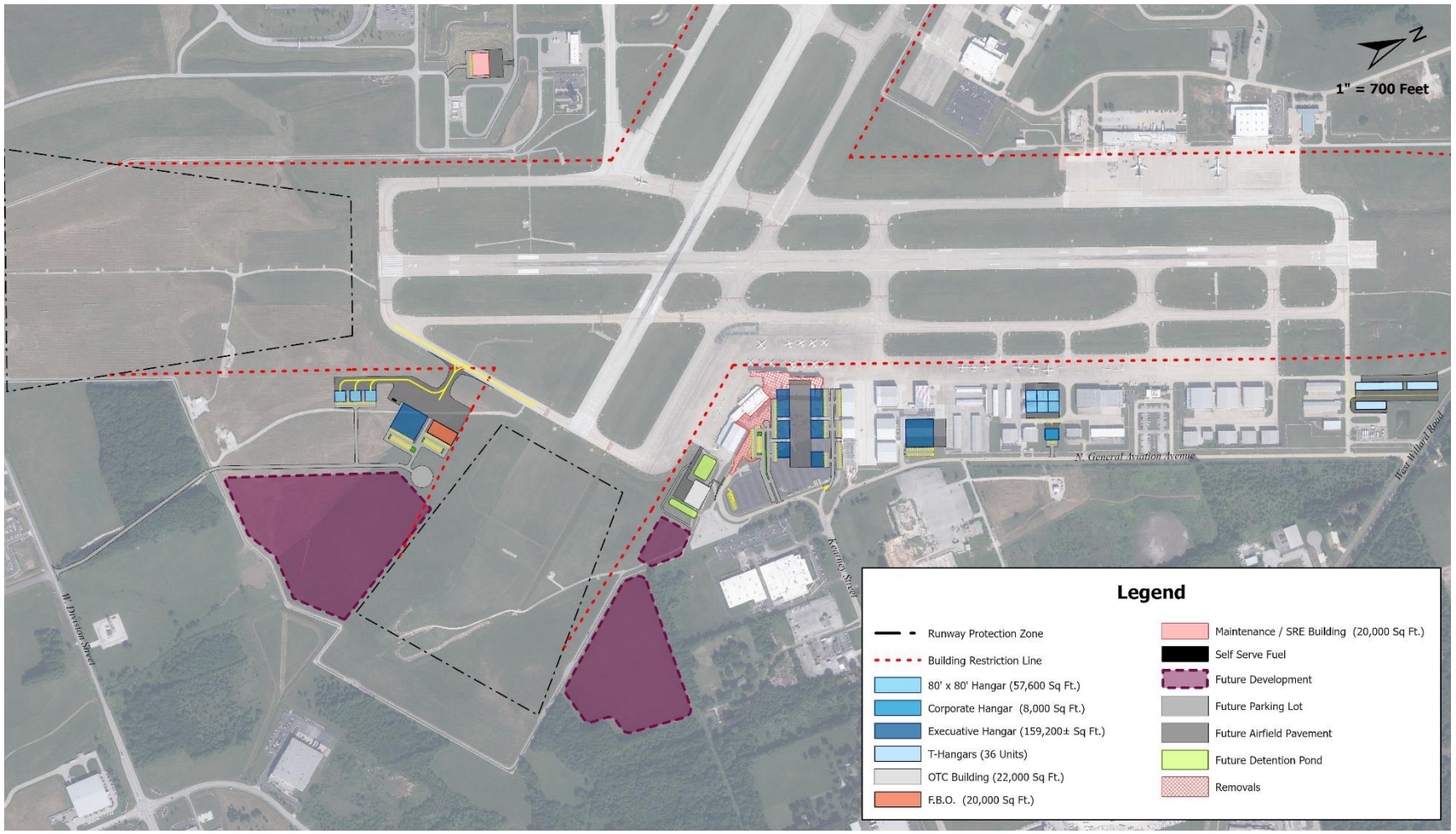
6.3.3 Alternative 3 – Satellite FBO

Alternative 3 is the same as Alternative 1, except the following:

- Develop FBO along Taxiway S with:
    - Community hangar
    - Tie-town space
    - Self-service fuel station
    - 80' x 80' box hangar complex
- Vehicle access off W Division Street and airport perimeter road
- Relocation of SRE west of midfield fuel farm

This alternative provides the same GA configuration on the northern half of the airfield as in Alternative 1. In contrast to the large corporate campus to the south, as shown in Alternative 2, this alternative introduces a satellite FBO and associated GA hangars. Alternative 3 is shown in **Exhibit 6.3-3.**

Exhibit 6.3-3: Alternative 3 – GA/Corporate



Source: CMT (2023)

6.3.4 GA/Corporate Alternatives Evaluation Summary

Table 6.3-2 shows the evaluation of each GA/corporate alternative.

Table 6.3-2: GA/Corporate Alternatives Summary

CRITERIA	ALT 1 SCORE	ALT 2 SCORE	ALT 3 SCORE
Earthwork required	🟢	🔴	🔴
Additional road infrastructure	🟢	🔴	🔴
Non-aeronautical streams of revenue	🔴	🟡	🔴
Fulfills hangar capacity requirements	🟢	🟢	🟢
Provides flexibility for private development	🔴	🟢	🟢
Land acquisition	🟢	🟢	🟢

Source: CMT (2023)

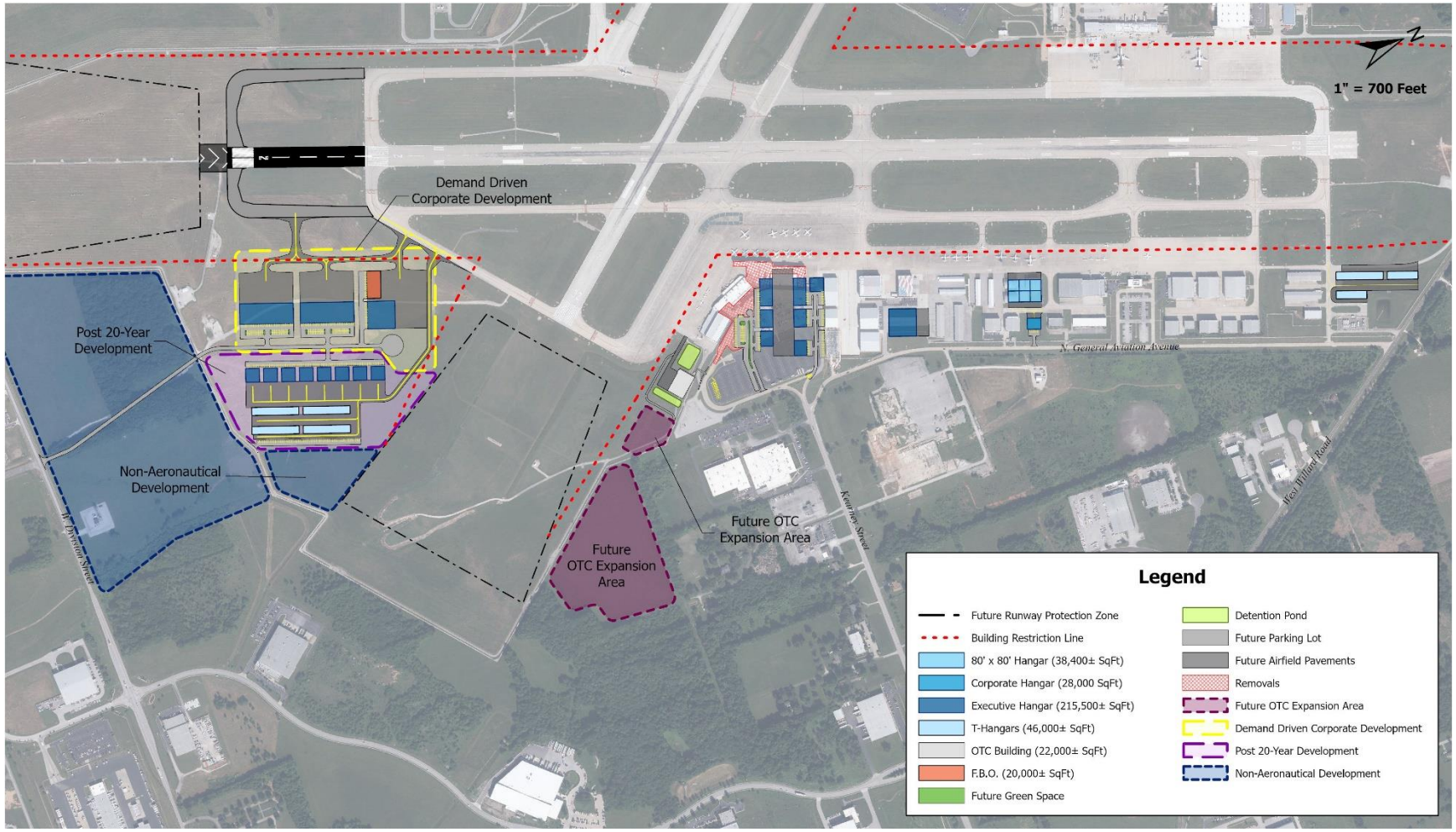
6.3.5 GA/Corporate Preferred Alternative

After presenting all three alternatives to airport officials and stakeholders, feedback was taken to create the preferred alternative, which is characterized by the following:

- Infill of existing areas with 100' x 100' and 80' x 80' hangars,
- Vehicle parking demands met via each hangar development,
- Addition of a 200' x 200' hangar on the north end of the airfield,
- Development of three (3) t-hangars to the north, adding 36 units,
- Demolition of West Kearney Terminal (after lease expiration in 2036) and construction of 7-unit executive hangar complex,
- Demolition of existing barrel hangars and adjacent hangar for a 6-plex of 80' x 80' hangar units,
- Preservation of land for future OTC expansion,
- Phased GA/Corporate development plan along Taxiway S, as shown in **Exhibit 6.3-5**, tying into Runway 2 extension. Phases can happen concurrently or sequentially, depending on demand and availability of funding:
    - Phase A: Demand-Driven Corporate Development
        - Corporate hangars
        - FBO
        - Community hangar
    - Phase B: Post 20-Year Development
        - T-hangars
        - 100' x 100' hangar complex
    - Phase C: Non-Aeronautical Development
- South GA/Corporate development vehicle access off W Division Street and airport perimeter road,
- Site security could be achieved either with a centralized security gate on the main access road or at the entrances to the individual parking lots as hangars are constructed.

The preferred GA/corporate development alternative is shown in **Exhibit 6.3-4**.

Exhibit 6.3-4: Preferred Alternative – GA/Corporate



Source: CMT (2023)

Exhibit 6.3-5: Rendering of Future GA/Corporate Development Concept Along Taxiway S

Source: CMT (2023)

6.4 Cargo/Maintenance, Repair, and Overhaul (MRO)

The preferred forecast presented in Chapter Three – *Forecast of Aviation Demand,* indicated that cargo operations have been on a growth trend and accounts for the addition of a third cargo operator at SGF within the planning period. As a compatible use with cargo operations, there has been a growing desire to consolidate and collocate MRO operations in the cargo corridor. This corridor is adjacent to the Aviation Classification Repair Activity Depot (AVCRAD). In discussions with military personnel and airport officials it was desirable to eliminate the southern entrance into the AVCRAD during this planning process.

Three alternatives were developed and evaluated for this corridor based on the following:

- Building and apron capacity to accommodate third cargo operator,
- Sufficient space for relocation and addition of MRO facilities,
- Infill of existing footprint,
- Southern AVCRAD entrance elimination,
- Earth work required,
- SRE facility alternatives (see Section 6.5.2).

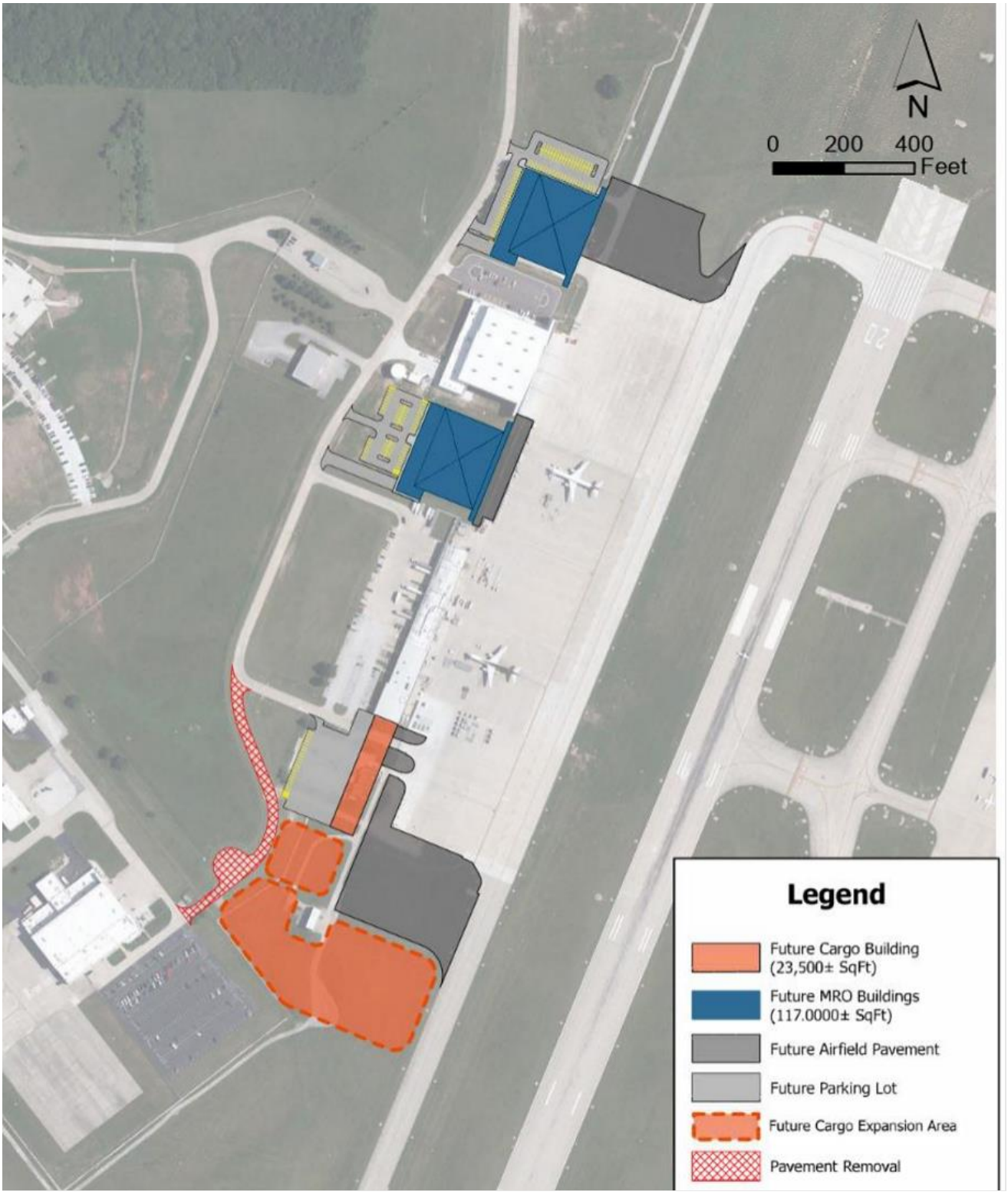
6.4.1 Alternative 1

Alternative 1 infills the existing cargo/MRO footprint and is characterized by the following:

- Cargo building and apron expansion to south of existing for third operator,
- Future cargo expansion area south of electrical vault,
- Relocation of Snow Removal Equipment (SRE) facility,
- Addition of two (2) MRO facilities,
- Removal of south entrance to Aviation Classification Repair Activity Depot (AVCRAD).

This alternative involves minimal expansion to the north. However, by planning for an MRO just north of the existing cargo facilities, additional cargo apron space is needed on the south, pushing the future cargo expansion area south of the electrical vault. In discussions with airport officials, it was indicated that it would be most desirable to keep all developments north of the electrical vault, as a southern development or relocation of the vault may be cost prohibitive. In addition to incompatibilities with the electrical vault, this alternative may introduce conflicts with the runway visibility zone (RVZ) and tower line-of-sight. Alternative 1 is shown in **Exhibit 6.4-1.**

Exhibit 6.4-1: Alternative 1 – Cargo/MRO



Source: CMT (2023)

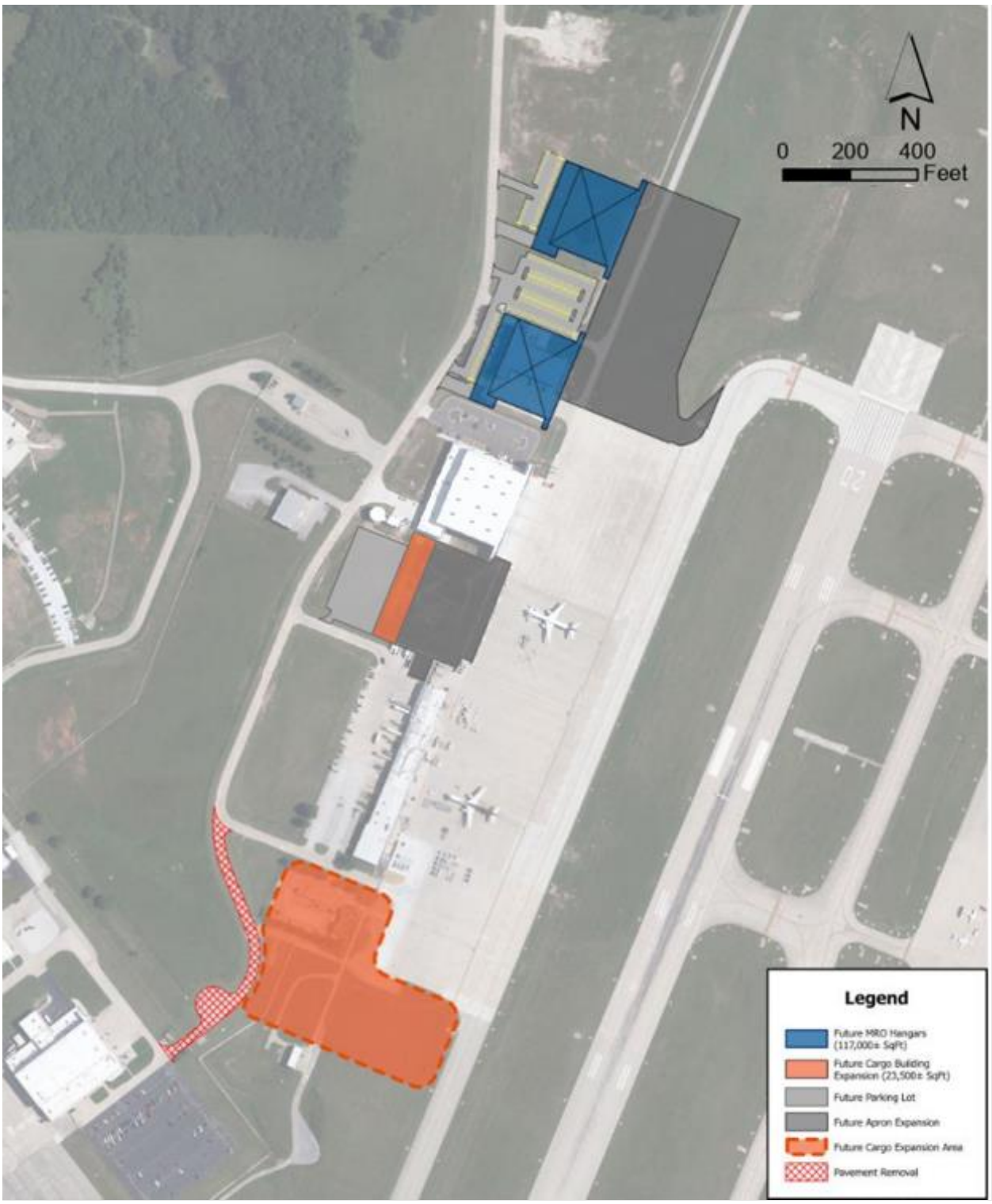
6.4.2 Alternative 2

Alternative 2 also proposes relocation of the SRE facility but shifts MRO development to the north. This alternative is characterized by the following:

- Cargo expansion northwest of existing cargo building to create more cargo apron depth
- Relocation of SRE facility
- Addition of two (2) MROs to the north of existing MRO
- Future cargo expansion area between electrical vault and existing cargo building
- Removal of south entrance to AVCRAD.

This alternative avoids potentially costly development surrounding the electrical vault, while still increasing capacity to serve a third cargo operator and two additional MROs, as shown in **Exhibit 6.4-2**.

Exhibit 6.4-2: Alternative 2 – Cargo/MRO



Source: CMT (2023)

6.4.3 Alternative 3

Alternative 3 proposes expansion of the existing SRE, pushing future development further north. This alternative is characterized by the following:

- Addition of two (2) MROs north of existing SRE facility,
- Expand SRE facility to 20,000 ft^2,
- Cargo expansion directly north of existing cargo building
- Future cargo expansion area between electrical vault and existing cargo building,
- Removal of south entrance to AVCRAD.

In discussions with airport officials and stakeholders this alternative is the least desirable as the SRE is occupying prime real estate that could be planned/developed for MRO or cargo use. Additionally, this alternative pushes development further north, resulting in more earth work and additional environmental considerations. Alternative 3 is shown in **Exhibit 6.4-3**.

Exhibit 6.4-3: Alternative 3 – Cargo/MRO

Source: CMT (2023)

6.4.4 Cargo/MRO Alternatives Analysis

The three alternatives were evaluated based on satisfying capacity requirements, SRE facility alternatives, and earth work required. All three alternatives utilize land already owned by the sponsor. The biggest differentiators between the alternatives were the capacity/earth work implications of developments expanding too far to the north and south, and the location/relocation of the SRE facility.

Per the scoring criteria and discussions with airport officials, Alternative 2 is the preferred cargo/MRO alternative, as shown in **Exhibits 6.4-2 and 6.4-4**.

Table 6.4-1 provides a summary of the alternatives scoring.

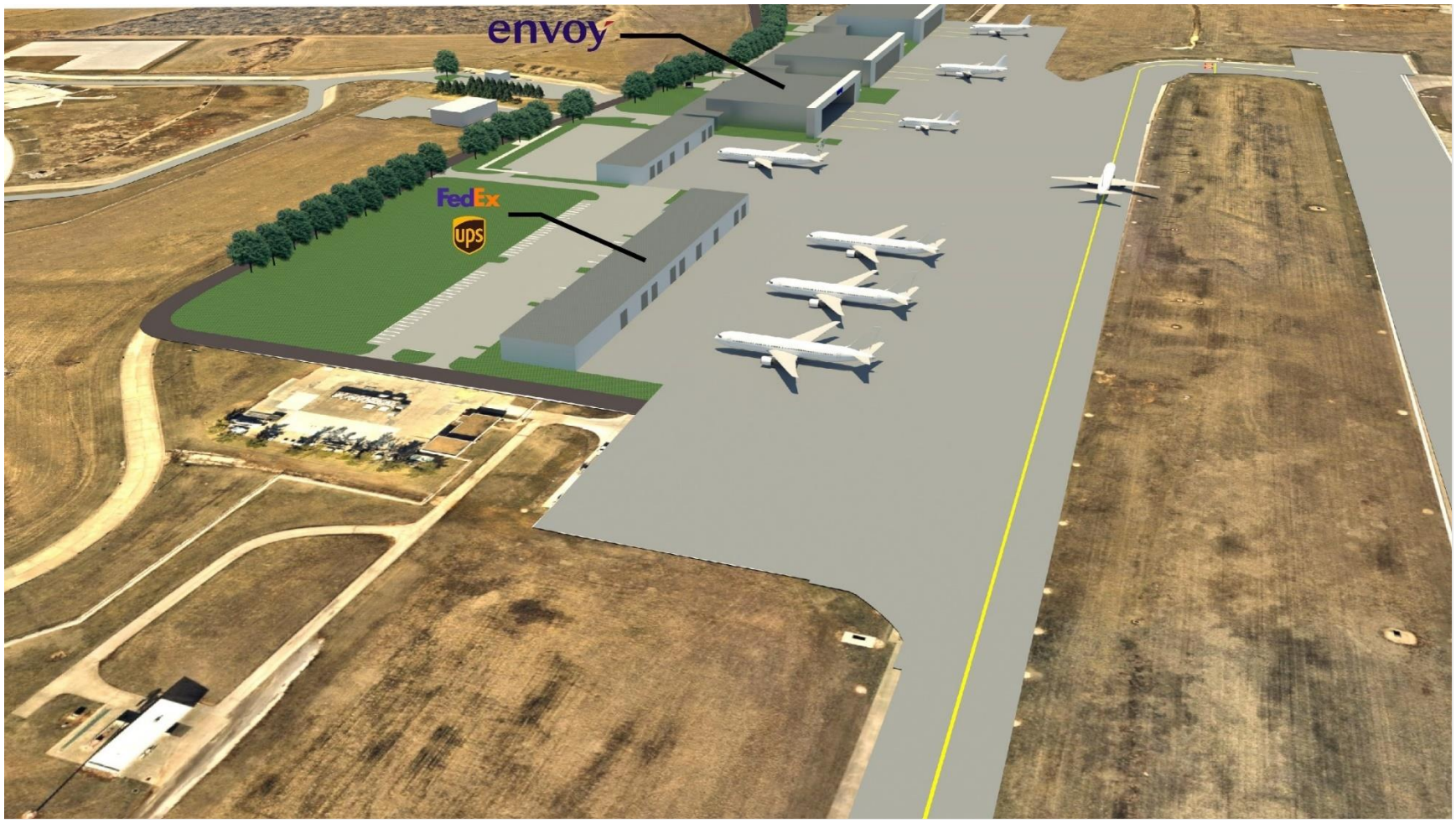
Table 6.4-1: Cargo/MRO Alternatives Summary

CRITERIA	ALT 1	ALT 2	ALT 3
	SCORE	SCORE	SCORE
Building and apron capacity to accommodate third cargo operator	🔴	🟢	🟢
SRE no longer impedes development	🟢	🟢	🔴
Impact to electrical vault	🔴	🟢	🟢
Possible Runway Visibility Zone incompatibilities	🟡	🟢	🟢
Sufficient space for relocation/addition of MRO facilities	🟢	🟢	🟢
Infill of undeveloped land within cargo corridor	🟢	🟢	🔴
Earth work required	🟡	🟡	🔴
Land Acquisition	🟢	🟢	🟢

Source: CMT (2023)

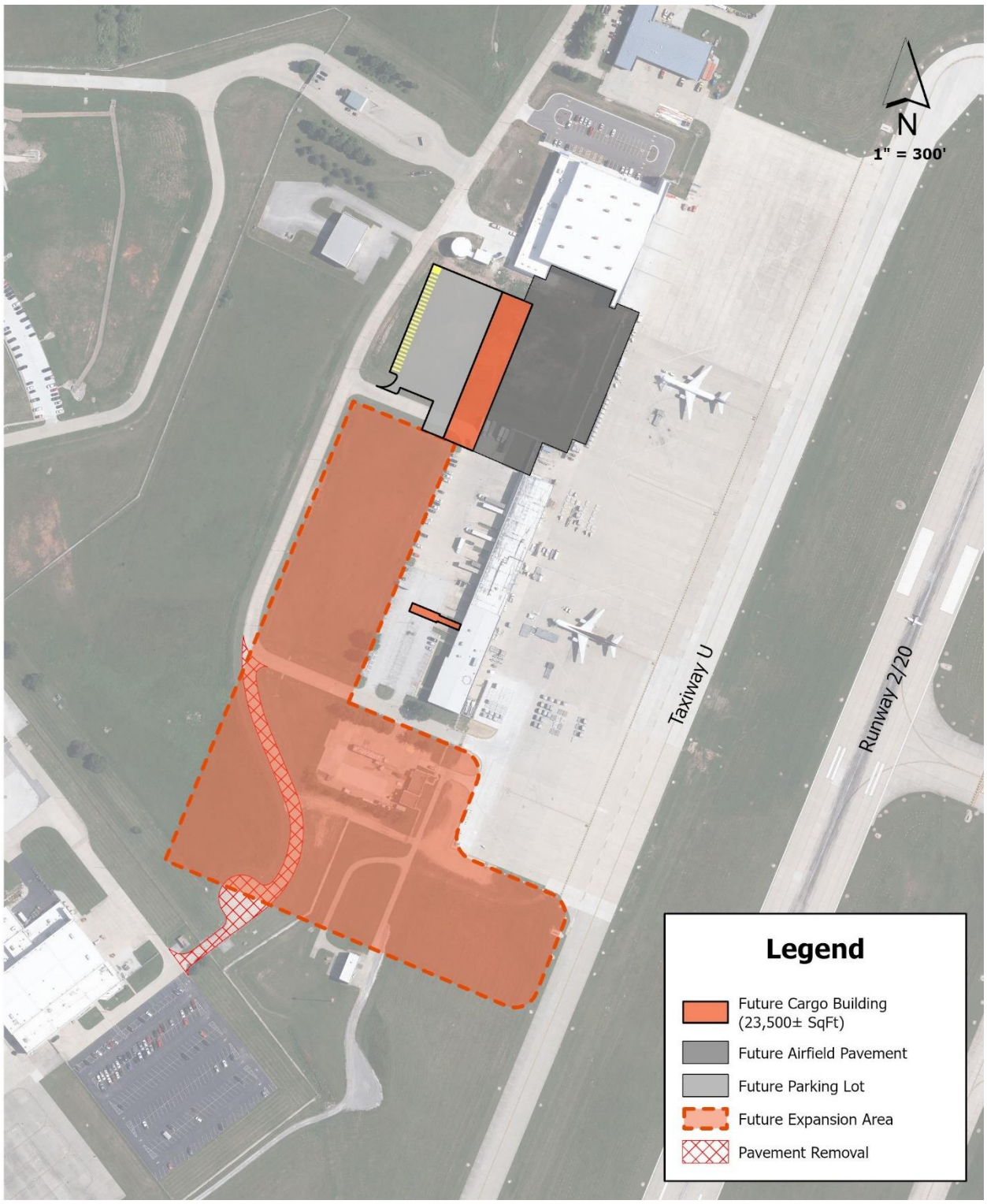
Further refinements to the Alternative 2 concept have been made to ensure that tails of aircraft parked on the future MRO facility aprons will not penetrate protected airspace surfaces. The adjusted layout is shown on the Airport Layout Plan and **Exhibit 6.4-5**.

Exhibit 6.4-4: Rendering of Preferred Cargo/MRO Alternative: Alternative 2



Source: CMT (2023)

Exhibit 6.4-5: Preferred Cargo/MRO Alternative



Source: CMT (2023)

6.5 Support Facilities

Table 6.5-1 summarizes the facility requirements isolated from the Airport Facility Requirements chapter. The following sections present alternatives generated for categories with capacity deficiencies. In addition to the sections isolated in Facility Requirements, this section also provides discussion on the impact these and other facilities may have on the existing Airport Traffic Control Tower (ATCT).

Table 6.5-1: Support Facilities Facility Requirements

CATEGORY	EXISTING	PAL 1	PAL 2	PAL 3	PAL 4
Fuel Storage: Jet A (gallons)	180,000	(+1) 30,000-gal tank	(+1) 30,000-gal tank	(+1) 30,000-gal tank	(+1) 30,000-gal tank
Fuel Storage: Avgas (gallons)	30,000	-	-	-	-
Aircraft Rescue and Firefighting (ARFF)	14,300 ft^2 of building space	-	-	-	-
Airport Maintenance / Snow Removal Equipment (SRE) Storage (ft^2)	17,500	Construct 21,000 ft^2 facility			

Source: CMT (2023)

6.5.1 Airport Traffic Control Tower (ATCT)

Per AC 13B, new airport development has the potential to affect the operations of an existing ATCT and must consider the following when planning and designing future airport development projects:

- Maintain an unobstructed LOS from the ATCT cab to all points on movement area pavement.
- Maintain the minimum angle of incidence from the ATCT cab to all points on the movement area at 0.80 degrees.
- Ensure new light sources (e.g., area lighting) do not obscure the controller's view of the movement area.
- Consider potential effects of threshold parallax as viewed from the ATCT when designing a new parallel runway.

Having been commissioned in 1978, the ATCT at SGF will be nearing 70 years old by the end of the planning period. As such, SGF must not only be aware of how planned development may impact its existing ATCT, but also plan for how it may impact a future ATCT.

To determine these impacts, it is prudent for the Airport to plan for a future ATCT location and the future land use of the existing ATCT. A Preliminary ATCT Siting Study is recommended to identify potential sites

on the airfield that should be preserved for relocation of the ATCT. FAA Oder 6480.4B, *Airport Traffic Control Tower Siting Process,* defines the methods used to complete the ATCT siting process to foster a safe, secure, and efficient aviation system.

For site preservation purposes, two locations have been depicted on the Airport Layout Plan as potential candidates for ATCT relocation.

- Site 1 is in the vicinity of the existing ATCT as a relocation site if the future parallel runway is not constructed.
- Site 2 is to the west of the passenger terminal building as a relocation site if the future parallel runway is constructed.

6.5.2 Fuel Facilities

SGF has two primary fuel farms, with a third that services ground vehicles, such as rental cars. Jet A and avgas fuel demands are projected to meet the 3-day supply standard with the existing fuel tanks. The avgas tanks will meet the demands well past the planning period, but additional Jet A fuel tanks will be needed on a 5-day supply. This data shows that there is little room for any supply chain inconsistencies or abnormalities. No additional fuel capacity for ground vehicles is anticipated throughout the planning period. Exhibit 6.5-1 shows the Midfield and GA Fuel Farm locations.

Exhibit 6.5-1: Fuel Farm Locations

Source: CMT (2023)

JET A

To provide SGF with a reliable amount of fuel (5-day supply) on hand, it is recommended that one (1) 30,000-gallon Jet A fuel tank is added during each PAL. In their current configurations, the GA Fuel Farm and Midfield Fuel Farm have combined capacity to accommodate three additional 30,000-gallon fuel tanks; two at the GA Fuel Farm and one at the Midfield Fuel Farm.

Infill of the current open fuel tank positions, starting with the open position at the Midfield Fuel Farm during PAL 1, is how this capacity should be fulfilled.

The location and use of the fourth Jet A tank, to be added in PAL 4, will be demand-driven may result in the following:

- Expansion of either the Midfield or GA Fuel Farms;
- Creation of a new fuel farm co-located with expanded GA facilities on the southeast side of the airfield;

- Introduction of sustainable aviation fuel (SAF) at SGF, as either an SAF-specific tank, or a Jet A/SAF blended tank; tank location dependent upon target market of fuel.

AVGAS

No additional fuel capacity is required for avgas through the end of the planning period. Avgas remains the only transportation fuel in the United States to contain lead, prompting development of alternative unleaded fuels. In alignment with FAA's Eliminate Aviation Gasoline Lead Emissions (EAGLE) initiative, should SGF transition to 94UL Unleaded Avgas, or other alternative unleaded aviation fuels, an additional tank may need to be installed. The GA Fuel Farm currently has capacity for up to two more avgas tanks to accommodate this transition.

6.5.3 Snow Removal Equipment (SRE) Storage & Ground Service Equipment Maintenance & Storage

To consolidate all SRE and airfield maintenance into one facility, a minimum of 21,000 ft^2 is required, which is 3,500 ft^2 larger than the existing facility. Three alternatives were presented to stakeholders to address this capacity deficiency with the following objectives:

- Provide 21,000 ft^2 facility,
- Minimize impact to future aeronautical development areas, and
- Have a centralized location.

In addition to the three primary alternatives, a fourth alternative was introduced and evaluated. This alternative is contingent upon relocation of the ATCT. **Exhibit 6.5-2** illustrates the location of each proposed alternative.

Exhibit 6.5-2: SRE Facility Alternative Locations

Source: CMT (2023)

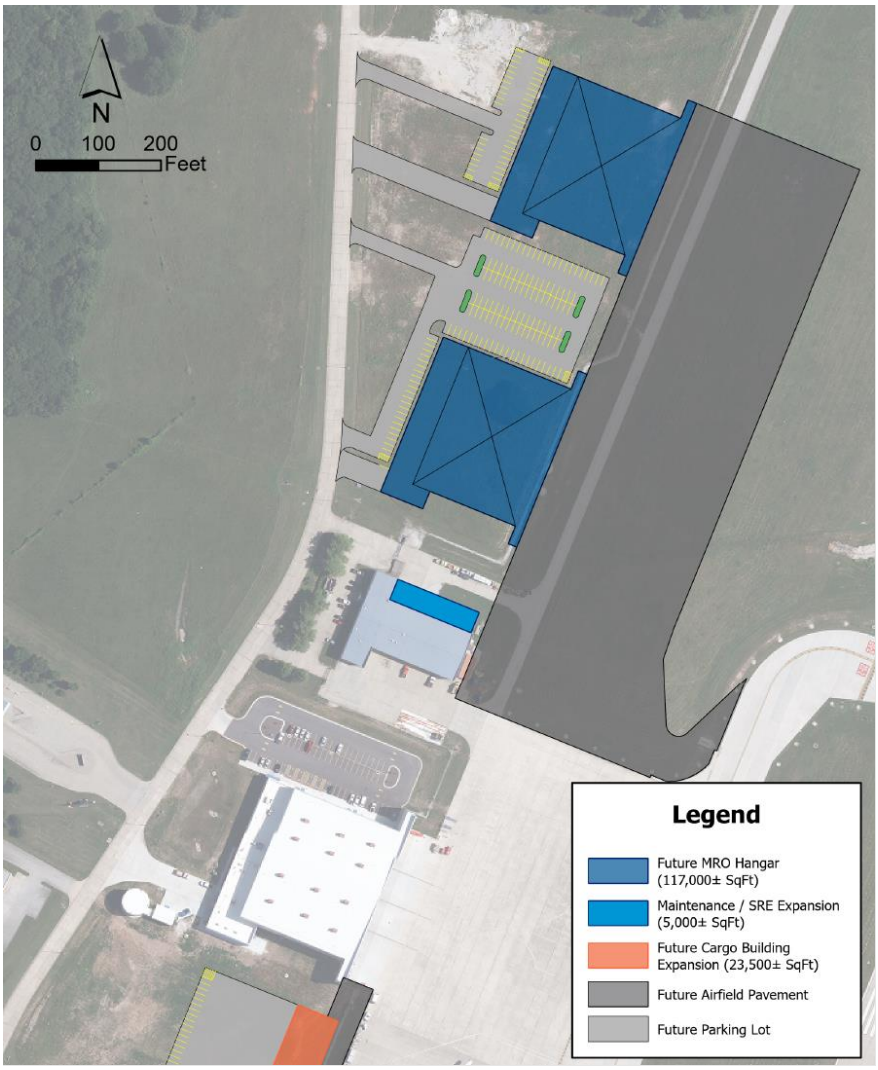
ALTERNATIVE 1 – EXPANSION OF EXISTING

Alternative 1 is the least intrusive and is characterized by the following:

- Expansion of existing facility to 21,000 ft^2,
- Utilizes existing SRE facility footprint,
- Located in cargo/maintenance, repair, and overhaul (MRO) corridor,
- Fronts on prime aeronautical real estate.

In discussions with airport officials and stakeholders, this alternative was the least desirable due to its location on prime aeronautical property.

Exhibit 6.5-3: Alternative 1 – SRE Facility



Source: CMT (2023)

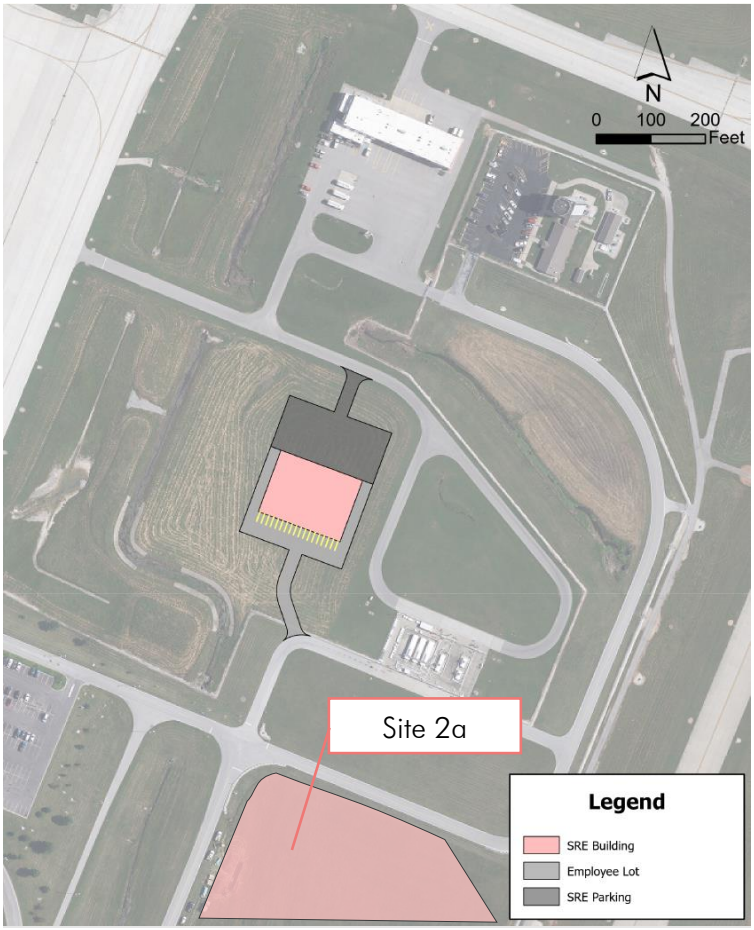
ALTERNATIVE 2 – RELOCATION TO MIDFIELD

Alternative 2 proposes relocation of the SRE facility to the midfield area, in the vicinity of the aircraft rescue and firefighting (ARFF) facility and the airport traffic control tower (ATCT). This alternative is characterized by the following:

- Construction of 21,000 ft^2 facility,
- Leverages existing roadways,
- Central location,
- Location not ideal for aeronautical development,

In discussions with airport officials and stakeholders the location proposed is prone to flooding, making it less desirable. Site 2a was proposed approximately 350 feet south of Alternative 2, and has the same characteristics as listed above, but does not have the same flood concerns. However, Site 2a is slightly less ideal due to its distance from the terminal.

Exhibit 6.5-4: Alternative 2 – SRE Facility



Source: CMT (2023)

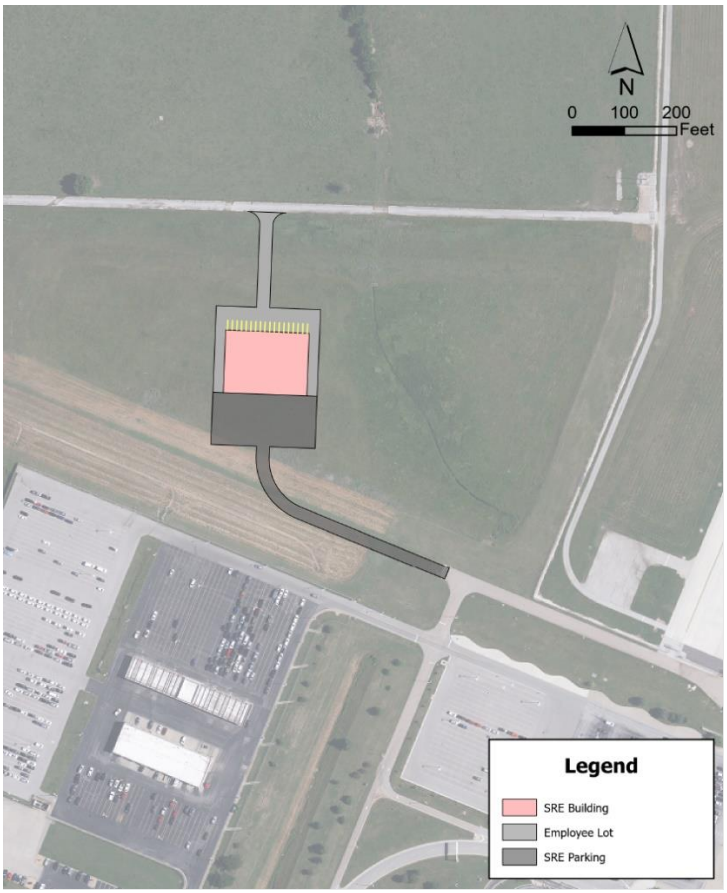
ALTERNATIVE 3 – RELOCATION TO TERMINAL

Alternative 3 proposes relocation of the SRE facility to west of the terminal apron. This alternative is characterized by the following:

- Construction of 21,000 ft^2 facility,
- Leverages existing roadways,
- Central location,
- Location not ideal for aeronautical development,
- Allows for future terminal apron expansion, if needed

In discussions with airport officials and stakeholders this location is preferred due to its proximity and access to the terminal, possibly alleviating current delivery and storage issues. Additionally, some maintenance operations could be consolidated into this facility, given its location. Consideration would need to be given to the roadway network to ensure proper circulation with passenger vehicles.

Exhibit 6.5-5: Alternative 3 – SRE Facility



Source: CMT (2023)

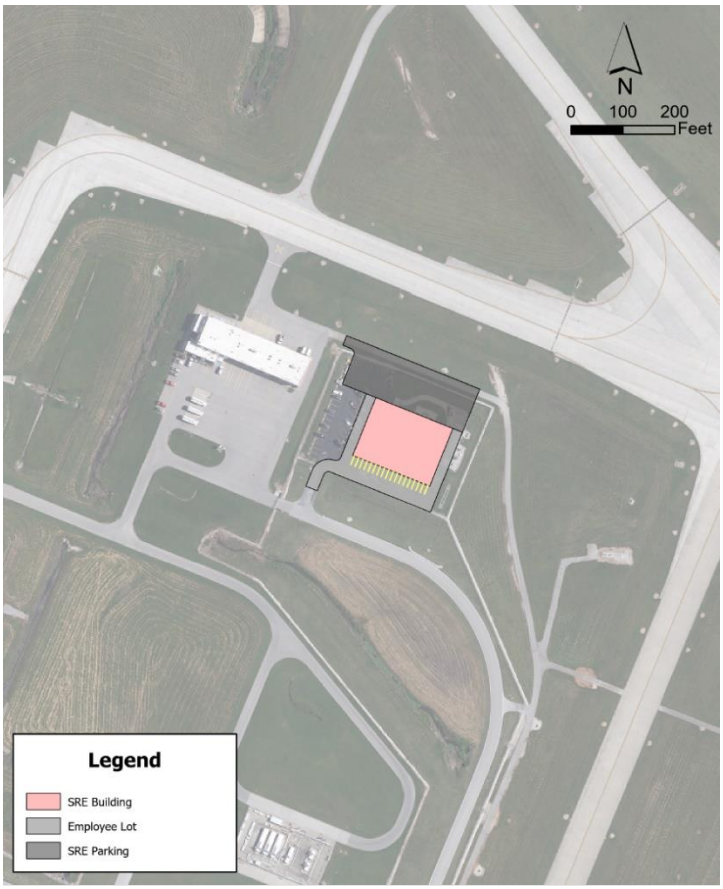
ALTERNATIVE 4 – RELOCATION OF ATCT

Alternative 4 proposes planning for the future land use of the existing ATCT, should ATCT relocation take place, by constructing an SRE facility at the current ATCT site. This alternative is characterized by the following:

- Construction of 21,000 ft^2 facility,
- Leverages existing roadways,
- Central location,
- Location not ideal for aeronautical development,
- Proximity to other ground operations (i.e., ARFF Facility)

This alternative is contingent in nature, thus would not satisfy immediate SRE capacity needs. However, this is a prime central location. Proximity to the ARFF facility helps consolidate large machinery to one area of the airfield.

Exhibit 6.5-6: Alternative 4 – SRE Facility



Source: CMT (2023)

SRE FACILITY ALTERNATIVES ANALYSIS

The three alternatives were evaluated based on satisfying capacity requirements, location, and environmental/land considerations. All three alternatives utilize land already owned by the sponsor. The biggest differentiators between the alternatives were the impact to aeronautical development and environmental considerations. Table 6.5-2 provides a summary of the alternatives scoring.

Table 6.5-2: SRE Facility Alternatives Summary

CRITERIA	ALT 1 EXPANSION SCORE	ALT 2 MIDFIELD SCORE	ALT 3 TERMINAL SCORE	ALT 4 ATCT SCORE
Satisfies Capacity Requirements: 21,000 ft²	🟢	🟢	🟢	🟢
Satisfies Capacity Requirements: Construction possible within planning period	🟢	🟢	🟢	🔴
Centralized Location	🔴	🟢	🟢	🟢
Minimal impact to future aeronautical development areas	🔴	🟢	🟢	🟢
Environmental considerations	🟢	🟡	🟡	🟢
Land Acquisition	🟢	🟢	🟢	🟢

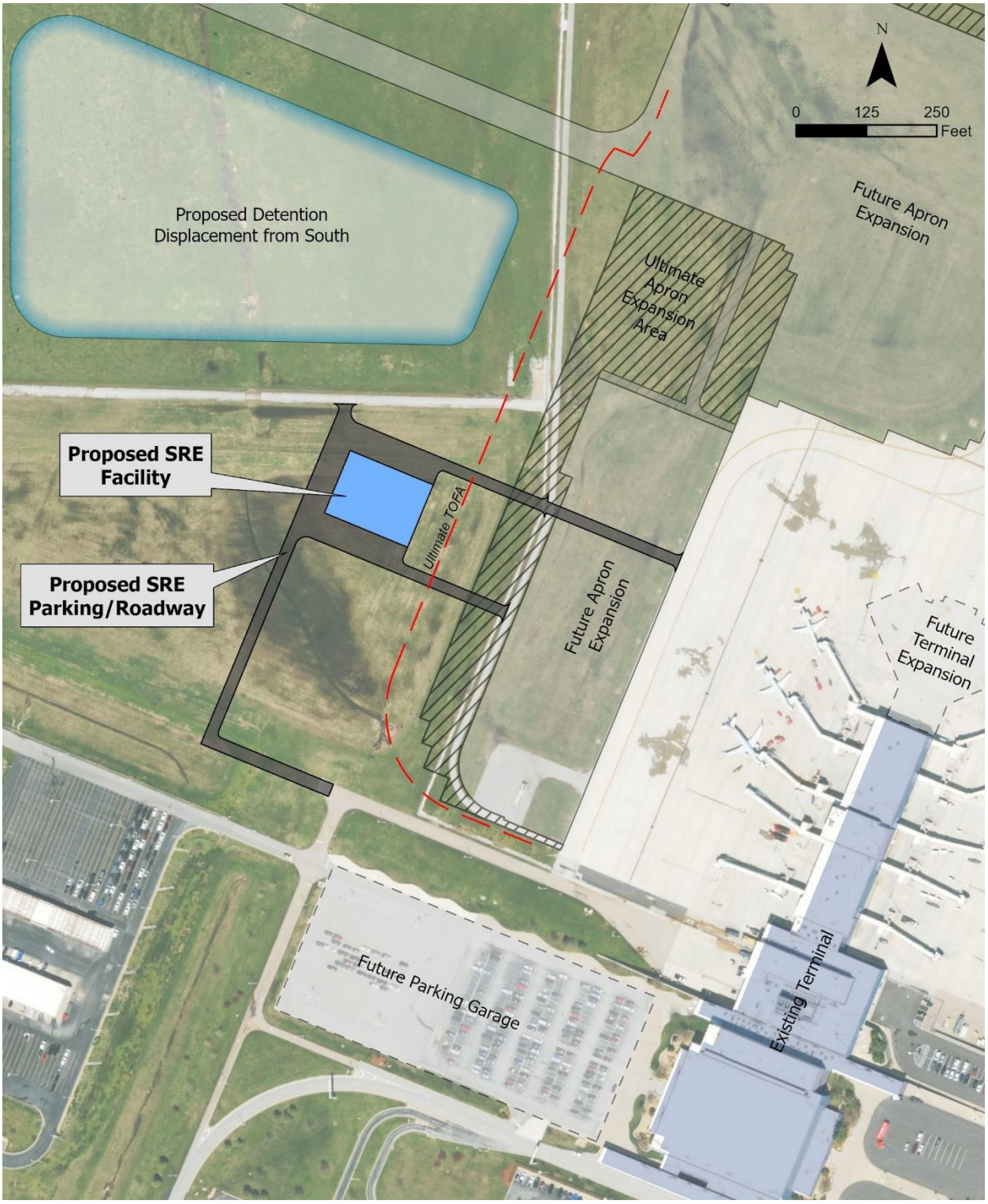
Source: CMT (2023)

Per the scoring criteria, Alternatives 2 and 3 have merit to serve as the preferred SRE facility alternative. After presenting all alternatives to airport officials and stakeholders, feedback was taken to create the preferred alternative, which yielded the following recommendations:

- Shift and reorient the Alternative 3 location (Alternative 3a) to improve airside/airfield access, minimize detention pond encroachment, and ensure the location does not impede future terminal apron expansion, as shown in Exhibit 6.5-7.

Required road improvements, environmental considerations, and final building configuration/vehicle circulation will be addressed during the project design phase.

Exhibit 6.5-7: Alternative 3a – SRE Facility



Source: CMT (2023)

6.6 Ground Access, Circulation, and Parking

Chapter 4 – *Airport Facility Requirements* isolated several capacity needs regarding vehicle parking, as summarized in Table 6.6-1. Parking improvements for GA and Cargo users are directly related to their respective facility alternatives and thus are not evaluated independently. The following section and evaluation are focused solely on commercial terminal parking alternatives.

Table 6.6-1: Vehicle Parking Capacity Needs

RESULT	EXISTING	PAL 1	PAL 2	PAL 3	PAL 4
Vehicle Parking: GA Users (Spaces)	110	Locate New Parking Spaces Based on New Hangar Locations			
Vehicle Parking: Cargo Users (Spaces)	70	+25 Based on New Facility			
Vehicle Parking: Commercial (Spaces)	2,630	+807	+1,362	+1,625	+1,725

Source: CMT

In addition to commercial terminal parking alternatives, this section addresses relocation of transportation network companies (TNC), such as Uber and Lyft.

6.6.1 Commercial Terminal Parking

As discussed in Chapter 4 – *Airport Facility Requirements,* the number of parking spaces at the midfield terminal for airline travelers needs to increase by over 65 percent by the end of the planning period, with airport officials currently reporting that the short-term parking lot is regularly at capacity.

Three alternatives were proposed to airport stakeholders to address these capacity concerns, while factoring in level of service (LOS) expectations outlined in FAA AC 150/5360-13A, Airport *Terminal Planning*. As illustrated in Exhibit 6.6-1, available land within the recommended 600-foot and 800-foot walking distances for optimal LOS has already been utilized for parking. SGF also currently has parking spaces beyond those distances; the first two alternatives address the capacity concerns through increased accessibility of those spaces to help increase utilization and LOS. The third alternative addresses capacity concerns through added infrastructure while increasing LOS and providing an additional stream of revenue.

Exhibit 6.6-1: Parking LOS at SGF

Source: CMT (2022)

ALTERNATIVE 1 – SHUTTLE SERVICES

One solution to access additional parking located further from the terminal and increase the LOS is to provide a shuttle service. This alternative can be phased in, starting with a manned shuttle vehicle and transitioning to an unmanned autonomous vehicle, as shown in **Exhibit 6.6-2.**

Exhibit 6.6-2: Autonomous Shuttle

Source: CMT (2023)

With SGF's level of passenger traffic, one or two shuttles to transport passengers between the terminal and nearby parking lots or other transportation hubs may be necessary. Further assessment would be required to determine the number of shuttles needed.

A typical autonomous shuttle vehicle used for public transportation could cost anywhere from $200,000 to over $1 million. This range considers various factors such as the size and capacity of the shuttle, the level of autonomy, and the type of power source (electric, hybrid, or gasoline).

This concept would utilize current parking positions at SGF with strategically placed pickup/drop-off stations. Shuttles would be called from designated staging/charging areas to retrieve passengers and take them to their destination. Ideally, shuttles will be most utilized by passengers parking 800' or more from the entrance of the terminal entrance, so the staging area should be placed to service those users quickly. The rear corners of the long-term parking lot are ideal locations for shuttle staging/charging stations as they would not occupy valuable parking spaces within the walkable LOS. These corners are

often underutilized by passenger vehicles and can easily be converted to house two shuttles while also being quickly accessible. Small pads just outside of the existing parking footprint could also be placed to house the shuttles as an alternative location to not infringe upon existing parking patterns and capacity.

Exhibit 6.6-3 below outlines the areas where the shuttle charging stations could be placed.

Exhibit 6.6-3: Possible Shuttle/TNC Staging Areas

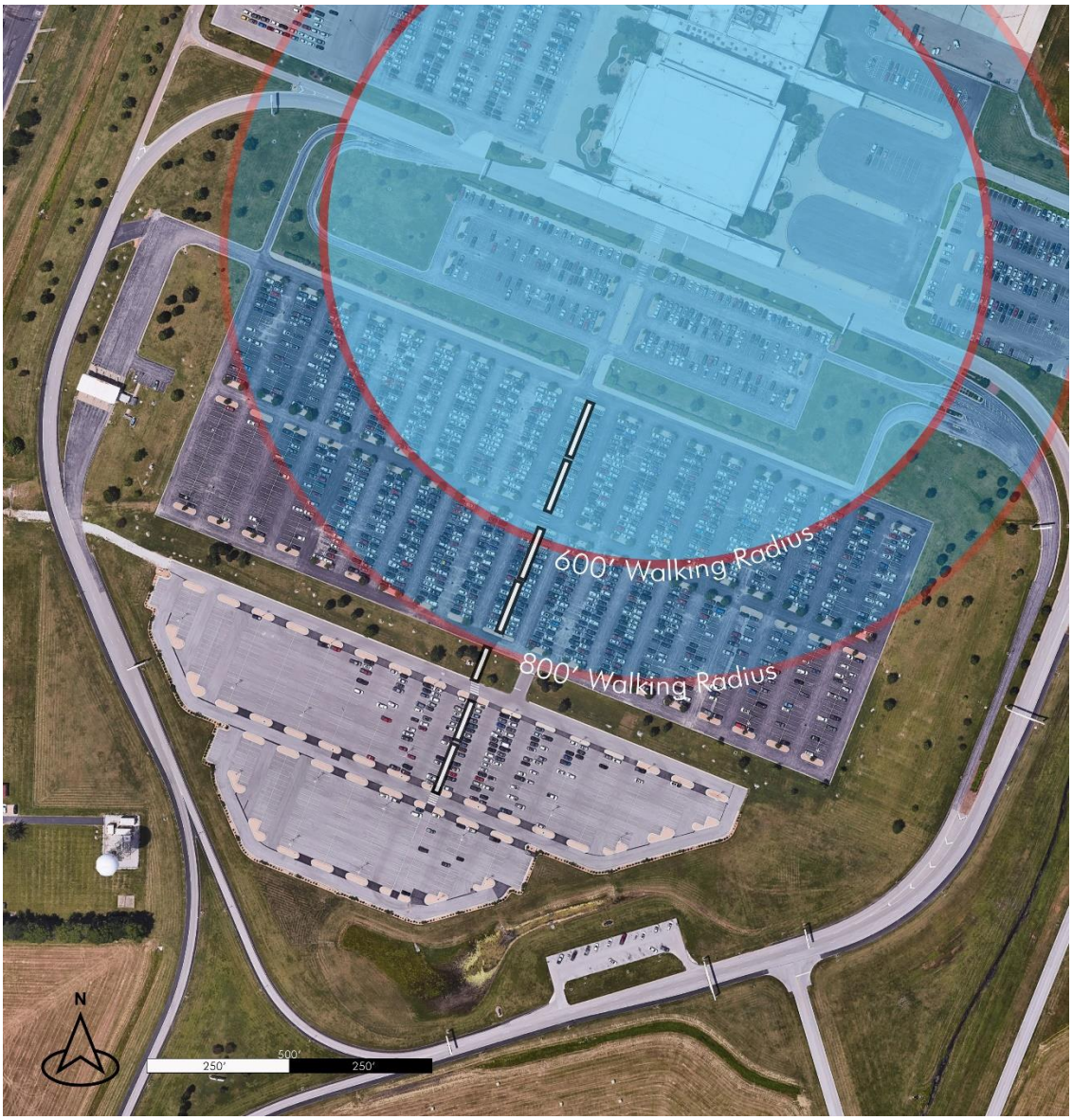
Source: CMT (2023)

It is worth noting that the cost of autonomous shuttle vehicles is expected to decrease as the technology becomes more widespread and production volumes increase. Additionally, operating costs for autonomous shuttles are typically lower than those for traditional vehicles due to lower fuel and maintenance costs, as well as reduced labor costs from not requiring a human driver.

ALTERNATIVE 2 – MOVING WALKWAY

The Moving Walkway concept is a series of covered conveyor belts to give people a higher LOS outside of the expected 600' to 800' walking radius, as illustrated in **Exhibit 6.6-4**. Assisting the walking times and ultimate LOS could bring a new value to further away parking.

Exhibit 6.6-4: Moving Walkway with Walking LOS Limits



Source: CMT (2023)

A recent study from Norfolk International Airport priced out four indoor 150' walkways at $5 million for procurement. Applying that same estimate, this alternative could be assumed to be a well over $10 million investment prior to ongoing maintenance and utility costs.

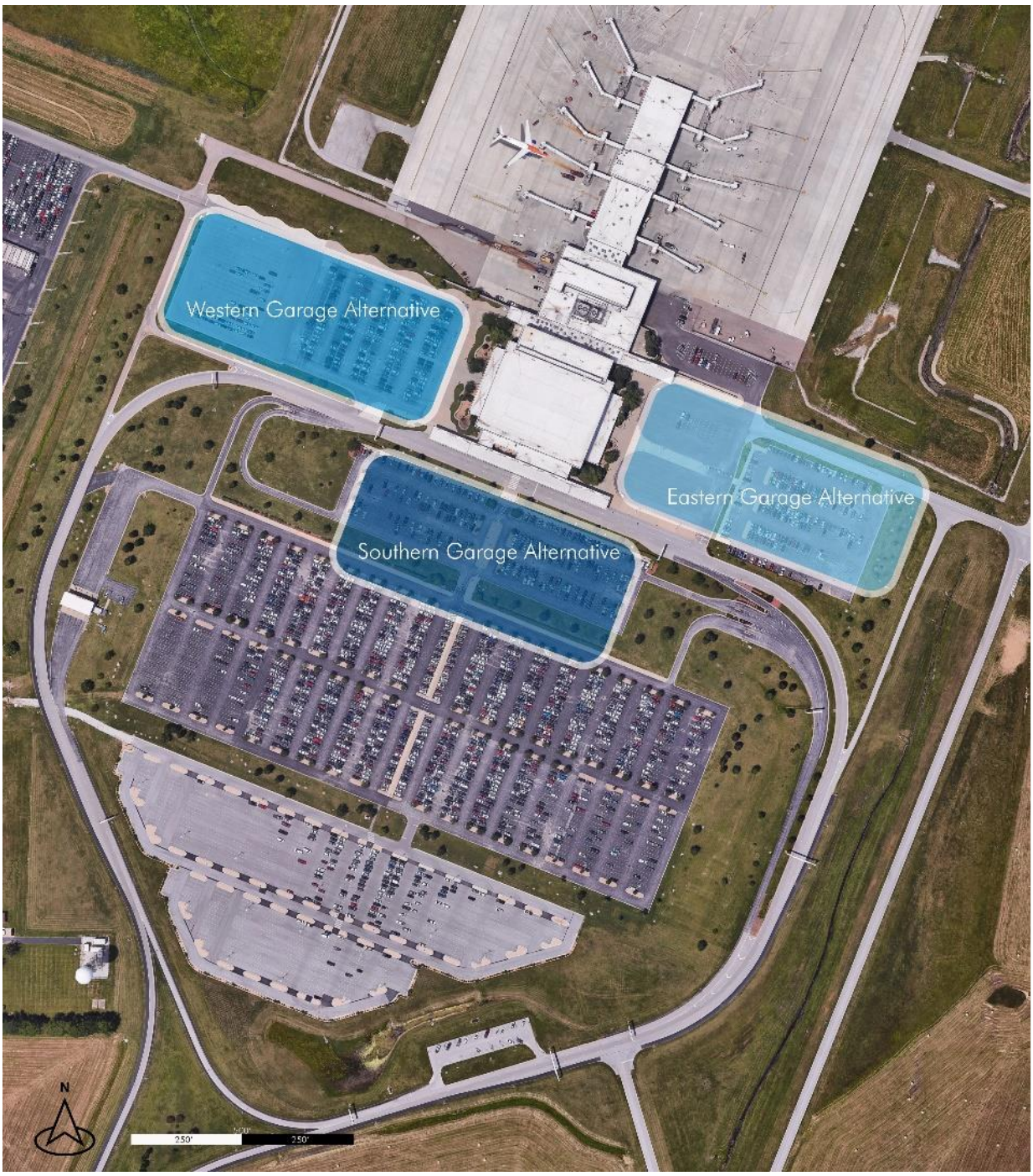
ALTERNATIVE 3 – PARKING GARAGE

A parking garage can provide additional parking spaces while increasing the LOS and providing an additional revenue stream. The cost and configuration of a parking garage with a total square footage to accommodate approximately 1,800 spaces (as dictated by forecasted demand), average-sized driving lanes, ramps, and pedestrian walkways would depend on the specific design, layout, and use. As a rule of thumb, parking garages typically require 325 to 400 square feet of space per stall to account for circulation, access, and safety features.

Applying these metrics to the desired number of spaces, it can be estimated that a parking structure at SGF would need to be between 585,000 and 720,000 square feet to fulfill the capacity demands by the end of the planning period. To provide the most efficient and versatile configuration, it is recommended to divide this square footage between levels and create a multi-story parking garage.

Three possible locations were proposed to airport stakeholders: on top of the existing short-term parking lot (south of terminal), rental car parking lot (west of terminal), and bus/taxi and employee parking lots (east of terminal), as shown in Exhibit 6.6-5.

Exhibit 6.6-5: Potential Parking Garage Locations



Source: CMT (2023)

The western garage location was preferred from a circulation, accessibility, and aesthetic standpoint. This leaves the other two locations open to still accommodate short-term, employee, bus, and taxi parking, with the potential to accommodate TNC and shuttle parking. Since the western location sits

atop existing rental car parking, it is reasonable to expect they will be relocated within the parking structure.

As a rough estimate, the construction cost of a parking garage can range from $20,000 to $50,000 per parking space, depending on the complexity of the design and the level of finishes. Using the estimate of $30,000 per parking space (based on the parking construction expert), the construction cost of a 1,800-space parking garage would be approximately $54 million. This estimate only covers the construction cost and does not include design and engineering fees, financing costs, or other related expenses. These additional costs can add significantly to the overall cost of the project.

A parking garage also provides the opportunity to install a rooftop solar panel development, helping to achieve possible cost-savings and to pursue new sustainability objectives. Any solar panel development at the airport would need to mitigate any ocular glint/glare to ATCT operations.

Alternately, the top of a parking garage may be able to accommodate a vertiport, following FAA Engineering Brief No. 105 design standards, to support advanced air mobility (AAM) aircraft. Thorough planning studies would be needed to determine feasibility of AAM at SGF and at the proposed location.

COMMERCIAL TERMINAL PARKING ALTERNATIVES ANALYSIS

The three alternatives were evaluated based on LOS provided, earth work and environmental considerations, level of protection provided to vehicles from the elements, and potential income. All three alternatives utilize land already owned by the sponsor. The biggest differentiators between the alternatives were the earthwork and environmental considerations, ability to satisfy future capacity requirements, potential income, and protection of vehicles from the elements.

Although it will require new infrastructure and a thorough environmental process, construction of a parking garage on the west side of the Midfield Terminal is the preferred parking alternative for SGF. A rendering of the preferred parking structure location is illustrated in **Exhibit 6.6-6**. In recent conversations with airport officials and understanding of available parking spaces per day, a parking feasibility study is recommended prior to proceeding with the preferred alternative. **Table 6.6-2** provides a summary of the alternatives scoring.

Table 6.6-2: Commercial Terminal Alternatives Summary

CRITERIA	ALT 1 SHUTTLE SCORE	ALT 2 MOVING WALKWAY SCORE	ALT 3 GARAGE SCORE
Increased LOS	🟢	🟡	🟢
Satisfies Capacity Requirements	🔴	🔴	🟢
Earth Work	🟢	🟡	🔴
Protection from the Elements	🔴	🔴	🟢
Land Acquisition	🟢	🟢	🟢
Potential Income	🔴	🟡	🟢
Requirement of Environmental Assessment/NEPA	🟢	🟡	🔴

Source: CMT (2023)

Exhibit 6.6-6: Parking Garage Rendering

Source: Walker Consultants (2023)

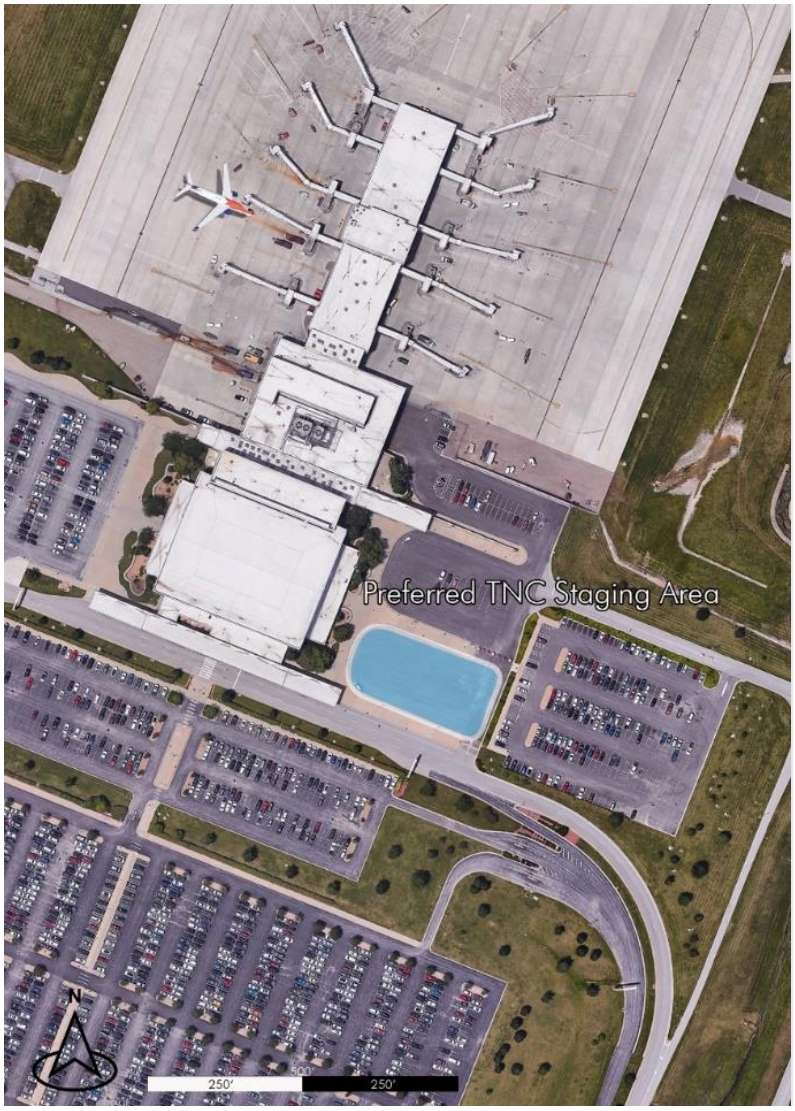
6.6.2 Transportation Network Companies (TNCs)

Transportation Network Companies (TNC), such as Uber or Lyft, and taxis have a steady demand at SGF and are increasingly becoming a more popular mode of transportation for travelers. Having adequate facilities to accommodate TNCs and those who utilize them is important.

To date, TNC staging has been directed to the West Kearney Terminal parking lot and often causes congestion, inefficiencies, and a lower LOS. Utilizing the existing taxi staging area directly east of the Midfield Terminal to include other TNCs would maximize the use of the currently underutilized pavements and increase the LOS for those utilizing the services.

The preferred TNC staging area is directly east of the terminal as illustrated in **Exhibit 6.6-7**.

Exhibit 6.6-7: Possible Shuttle/TNC Staging Areas



Source: CMT (2023)