Chapter 4
Alternatives

In the previous chapter, the aviation facilities required to satisfy airside and landside demand through the long-term planning period of the master plan were identified. In addition, several Federal Aviation Administration (FAA) standards were discussed that apply to airfield design. The next step in the planning process is to evaluate reasonable ways these facilities can be provided while meeting design standards. The purpose of this chapter is to formulate and examine rational development alternatives that address the short-, intermediate-, and long-term planning horizon levels. Because there are multiple possibilities and combinations, it is necessary to focus on the opportunities that have the greatest potential for success. Each alternative provides a different approach to meeting existing and future facility needs; these layouts are presented for evaluation and discussion.

Some airports become constrained due to limited availability of space, while others may be constrained due to adjacent land use development or geographical features. Careful consideration should be given to the layout of future facilities and impacts on potential airfield improvements at Kerrville-Kerr County Airport (ERV). Proper planning at this time can ensure the long-term viability of the airport for aviation and economic growth.

The primary goal of this planning process is to develop a feasible plan for meeting the needs that result from the projected market demand over the next 20 years. The plan of action should be developed in a manner that is consistent with the future goals and objectives of the City of Kerrville/Kerr County and airport stakeholders, including users of the airport and the local community and region, all of which have a vested interest in the development and operation of ERV.

The goal is to develop an underlying rationale that supports the final recommended concept. Through this process, an evaluation of the highest and best uses of airport property will be made while also weighing local development goals, efficiency, physical and environmental factors, capacity, and appropriate safety design standards.

The alternatives presented in this chapter have been formulated as potential means to meet the overall program objectives for the airport in a balanced manner. Through coordination with the City of Kerrville/Kerr County, ERV management, the planning advisory committee (PAC), and the public, an alternative (or combination of alternatives) will be refined and modified, as necessary, into a recommended development concept (Chapter 5); therefore, the planning considerations and alternatives presented in this chapter can be considered a beginning point in the evolution of a recommended concept for the future of ERV.

NO-ACTION/NON-DEVELOPMENT ALTERNATIVES

Prior to the presentation of development alternatives for ERV, several non-development options should be taken into consideration. Non-development alternatives include a "no-build" or "do-nothing" alternative, development of a replacement airport at a new location, or closure of the existing airport and the transfer of services to another existing airport. This section presents a discussion of the primary non-development alternatives.

NO-BUILD/DO-NOTHING ALTERNATIVE

The City of Kerrville/Kerr County is charged with managing the airport for the economic improvement of the community and region. In some cases, alternatives may include a no-action option; for ERV, this would effectively reduce the quality of services being provided to the public, affect the aviation facility's ability to meet FAA design standards, and affect the region's ability to support aviation needs. The ramifications of a no-action alternative expand into impacts on the economic well-being of the region. **An analysis of the economic benefit of the airport was completed in 2018 and found that ERV had a total annual economic impact of $38.3 million and supported more than 680 jobs.** If facilities are not maintained and improved so the airport can support general aviation operations; delays become unacceptable; or aircraft storage is not available, aviation activities and business may shift elsewhere. The no-action alternative is also inconsistent with the long-term goal of the FAA and Texas Department of Transportation (TxDOT) Aviation Division to enhance local and interstate commerce.

Furthermore, ERV has received nearly $14.9 million in state and federal grants since 2000. These grants represent a direct economic stimulus that has lasting positive economic impacts. The City of Kerrville/ Kerr County has a vested interest in maintaining and improving airport facilities for business and general aviation users. Without a commitment to ongoing improvement of the airport, users of the airport will be constrained from taking full advantage of the airport's air transportation capabilities; therefore, a no-action alternative is not considered further in this master plan.

TRANSFER OF SERVICE/RELOCATE AIRPORT

This study will not consider the relocation of services to another airport or the development of a new airport site. The development of a new facility is a complex and expensive option. A new site would require greater land area, duplication of investment in facilities, installation of supporting infrastructure that is already available at the existing site, and greater potential for negative impacts to natural, biological, and cultural resources.

As previously mentioned, the City of Kerrville/Kerr County has accepted nearly $14.9 million in federal and state development grant funding. Through grant assurances, the acceptance of these grants obligates the airport sponsor to maintain the airport as an airport. Closing the existing airport and transferring services to another existing airport would be considered a violation of the grant assurances and would require repayment of grants that are not yet fully depreciated. The investments made and the economic benefits received from the airport (both public and private) could not readily be shifted or regenerated to another airport without significant costs/losses. As such, this alternative is not considered practical, reasonable, or financially feasible.

NON-DEVELOPMENT ALTERNATIVES SUMMARY

The purpose of this master plan is to examine aviation needs at ERV over the course of the next 20 years; therefore, this master plan will examine the needs of the existing airport and present a program of needed capital improvement projects to cover the scope of the plan. The airport is a lucrative business, transportation utility, and economic asset for the region. It can accommodate existing and future demand and should be developed accordingly to support the interests of residents and businesses that rely upon it. Ultimately, the final decision regarding development rests with the City of Kerrville/Kerr County, TxDOT, and the FAA on an individual project basis. ERV is a vibrant facility with abundant remaining growth potential; as such, the non-development alternatives will not be considered further in this planning process. The following analysis covers airside and landside development alternatives that consider an array of facility demands, including safety, capacity, access, and efficiency.

PLANNING OBJECTIVES

A set of basic planning objectives has been established to guide the alternatives development process. It is the goal of this master planning effort to produce a development plan for the airport that addresses forecasted aviation demand and meets FAA design standards to the greatest degree possible. As the owner and operator of the airport, the City of Kerrville/Kerr County provides the overall guidance for its operation and development. It is of primary concern that ERV is marketed, developed, and operated for the betterment of the community and users of the airport. The following basic planning principles and objectives are utilized as general guidelines during this planning effort:

- Develop a safe, attractive, and efficient aviation facility in accordance with applicable federal, state, and local regulations.
- Preserve and protect public and private investments in existing airport facilities.
- Provide a means for the airport to grow as dictated by demand.
- Establish a plan to ensure the long-term viability of the airport and promote compatible land uses surrounding the airport.
- Develop a facility that is readily responsive to the changing needs of all aviation users.

- Reflect and support the long-term planning efforts that currently apply to the region.
- Develop a facility with a focus on self-sufficiency in operational and developmental cost recovery.
- Ensure future development is environmentally compatible.

REVIEW OF PREVIOUS AIRPORT PLANS

The previous master plan for ERV was completed in 2013. Recommendations from the previous master plan include the following:

- Maintain Runway 12-30 to C/D-II design standards.
- Maintain Runway 3-21 to A-I design standards.
- Retain existing runway lengths for both runways.
- Maintain instrument approach capabilities with visibility minimums down to one mile.
- Construct a partial-parallel taxiway on the west side of Runway 3-21 to support landside development in that area.
- Hangar development within the existing airport property boundary on the east and west landside areas.

The analysis presented in this chapter revisits the recommendations presented in the previous master plan. Since the completion of the last plan, the FAA has made significant modifications to design standards, as outlined in Chapter Three. As such, some elements of the previous plan may be carried over to this master plan, while others may be changed or removed from further consideration.

AIRSIDE ALTERNATIVES

Development alternatives are categorized into two functional areas: airside and landside. Airside considerations relate to elements such as runways, taxiways, navigational aids, lighting, and marking aids and require the greatest commitment of land area to meet the physical layout of the airport, as well as the required airfield safety standards. The design of the airfield also defines minimum setback distances from the runway and object clearance standards. These criteria are defined first to ensure the fundamental needs of the airport are met. Landside considerations include hangars, aircraft parking aprons, and terminal services, as well as utilization of remaining property to provide revenue support for the airport and benefit the economic development and well-being of the regional area.

The remainder of this chapter describes various development alternatives for airside and landside facilities. Although each area is treated separately, ultimate planning will integrate the individual requirements so they can complement one another.

AIRSIDE CONSIDERATIONS

Table 4A presents the airside considerations that are specifically addressed in this analysis. Landside planning considerations are outlined later in this chapter. These issues are the result of the findings of the aviation demand forecasts and facility requirements evaluations, as well as input from the PAC, airport management, the City of Kerrville/Kerr County, and the public. In addition to these considerations, both runways should continue to meet applicable runway design code (RDC) standards.[1] Runway 12-30 is planned to meet RDC C-II-5000 standards and Runway 3-21 is planned to meet RDC A/B-I-5000 design standards.

TABLE 4A | Airside Planning Considerations

#	Non-Standard/Deficient Condition	Applicable Design Standard	Proposed Action(s) to be Evaluated
1	The designation for Runway 12-30 should be changed to Runway 13-31 based on the current magnetic declination of the runway.	FAA AC 150/5340-1L, *Standards for Airport Markings*, §2.3.e(3)	Change the runway designation to Runway 13-31.
2	At 6,004 feet long, Runway 12-30 is limited in its ability to serve the critical aircraft (Falcon 900) during all takeoff and landing situations and during the hottest weather conditions.	FAA AC 150/5325-4B, *Runway Length Requirements for Airfield Design,* Paragraph 306	Consider extension options for Runway 12-30.
3	Portions of the Runway 12 and 30 RPZs are unprotected and/or contain incompatible (residential) land uses.	FAA AC 150/5190-4B, *Airport Land Use Compatibility Planning*, §2.2.5	Acquire new avigation easements over uncontrolled properties within the RPZ and work to clear incompatible land uses.
4	The ROFA on Runway 12-30 partially extends off airport property over Texas Highway 27.	FAA AC 150/5300-13B, *Airport Design*, Paragraph 3.12	Due to the high cost of relocating either the runway or the road, the FAA and TxDOT have previously accepted the deficiency as a minor modification to standard. The condition is planned to remain.
5	Runway 3-21 should be equipped with REILS to improve pilot situational awareness.	FAA AC 150/5300-13B, *Airport Design,* Appendix K.1.1.4.	Add REILs to both ends of Runway 3-21.
6	The AWOS is located in an area planned for future landside development.	FAA Order JO 6560.20C, *Siting Criteria for Automated Weather Observing Systems (AWOS),* Chapter 3	Consider relocation sites for the AWOS per the FAA's preferred siting criteria.[1]
7	The segmented circle and lighted wind cone are located in an area planned for future landside development.	FAA AC 150/5340-5D, *Segmented Circle Airport Marker System*; FAA AC 150/5340-30J, *Design and Installation Details for Airport Visual Aids*	Consider relocation sites for the segmented circle and lighted wind cone.

[1]FAA Order JO 6560.20C stipulates the preferred AWOS siting should be between 1,000 and 3,000 feet from the primary runway threshold and between 500 and 1,000 feet from the runway centerline. These criteria may be waived on a case-by-case basis.
AWOS = automated weather observation system
REIL = runway end identifier lights
ROFA = runway object free area
RPZ = runway protection zone

Source: Coffman Associates analysis

[1] Applicable RDC standards are detailed in Chapter 3.

AIRSIDE ALTERNATIVES

Three alternatives have been prepared to address the items outlined in **Table 4A**. The details of each alternative, including associated advantages and disadvantages, are described as follows. Airside Planning Considerations 1 and 5 do not offer multiple alternative options; therefore, the proposed actions for both considerations are assumed to be incorporated into each airside alternative.

Prior to the development of this master plan, the airport has worked with TxDOT on the acquisition of approximately 53.9 acres of property to the southwest of the runway. The acquisition has been planned to accommodate a runway extension/shift to correct safety area issues, which have been temporarily mitigated by modifying the runway's published declared distances. The proposed fee simple acquisition of this property is reflected in each of the following airside alternatives.

Runway 12-30 Alternative 1

Runway 12-30 Alternative 1 is depicted on **Exhibit 4A** and considers the following:

- Elimination of the 687-foot Runway 12 displaced threshold and extension of the runway 987 feet to the southeast results in a full runway length of 6,304 feet, which is the minimum length recommended to accommodate 100 percent of the business jet fleet operating at 60 percent useful loads. At this length, the runway's utility is increased over the existing condition; however, it would still be incapable of accommodating the critical aircraft (Falcon 900) taking off at 90 and 100 percent useful loads during the hottest days of the year.

- No displaced runway thresholds are planned. The published declared distances would equal the full length of the runway (6,304 feet), which is preferred to avoid pilot confusion when portions of a runway are declared unusable in certain takeoff and landing situations. This alternative also results in the co-location of the approach and departure runway protection zones (RPZs) off the Runway 12 threshold. The RPZ is shifted off residential properties but would still require the acquisition of approximately 1.26 acres of avigation easement to protect the uncontrolled properties. The portion of Texas Highway 27 (Memorial Boulevard) that extends through the RPZ is not shown as an ultimate easement because TxDOT (the controlling agency over the highway) typically does not grant easements over highway right-of-way.

- Fee simple acquisition of approximately 53.9 acres of property to the southwest accommodates the runway extension and rerouting of the Airport Loop access road. The ultimate safety areas, including the RPZ, are each contained within the acquired property.

- Taxiway A is extended southwest to the ultimate Runway 30 end. The taxiway extension is planned to meet taxiway design group (TDG) 2A standards and includes the construction of a holding bay, which allows pilots to perform preflight checks without blocking the taxiway. Another holding bay is added near the intersection of Taxiways A and F to provide the same capabilities near the Runway 12 end.

- An exit taxiway is added approximately 1,000 feet from the Runway 12 displaced threshold to allow aircraft landing on Runway 30 to exit the runway earlier, reducing runway occupancy times.

Runway 12-30 Runway Design Code: C-II-5000
Runway 3-21 Runway Design Code: B-I-5000

Declared Distances (measurements in feet)	Runway			
	12	30	3	21
Takeoff Run Available (TORA)	6,304	6,304	3,597	3,597
Takeoff Distance Available (TODA)	6,304	6,304	3,597	3,597
Accelerate Stop Distance Available (ASDA)	6,304	6,304	3,597	3,597
Landing Distance Available (LDA)	6,304	6,304	3,597	3,597

LEGEND

- Airport Property Line
- Ultimate Property Line
- Existing Easements
- A — Taxiway Designation
- Runway Safety Area (RSA)
- Runway Object Free Area (ROFA)
- Runway Obstacle Free Zone (ROFZ)
- Runway Protection Zone (RPZ)
- AWOS Critical Area
- Ultimate Avigation Easement
- Localizer Critical Area
- Pavement Removal
- Ultimate Airfield Pavement
- Ultimate Roads

Peterson Farm Rd
Al Mooney Rd
Airport Loop
Memorial Blvd
Colvin Ranch Rd
Holding Bay
Relocated Segmented Circle and Lighted Wind Cone
987′ Runway Extension
Holding Bay
Blast Pad 120′ x 150′
Proposed Property Acquisition - 53.9 Acres
1.26 Acres
Ultimate Runway 12-30 (6,304′ x 100′)
ROFA to Remain Per Modification to Standard
Blast Pad 120′ x 150′
6.7 Acres
Relocated AWOS
ROFA to Remain Per Modification to Standard
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SCALE IN FEET
Photo Source: Google Earth 08/2024

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- Blast pads are added at both ends of Runway 12-30 to mitigate any potential for soil erosion caused by jet wash.

- The AWOS equipment is relocated to a site on the west side of the runway, along Memorial Boulevard. This site is outside the runway object free area (ROFA) and meets the FAA's preferred siting criteria. This site requires the acquisition of an avigation easement for approximately 6.7 acres of property on the west side of Memorial Boulevard to protect the area from new buildings/structures that could potentially impact the AWOS sensors. Existing structures in the area may need to be mitigated by raising the elevation of the AWOS sensors.

- The segmented circle and lighted wind cone are relocated to a site east of the runway, between Taxiways A and E.

Runway 12-30 Alternative 2

Runway 12-30 Alternative 2 is depicted on **Exhibit 4B** and considers the following:

- The existing runway, including the Runway 12 displaced threshold, is maintained and extended 2,000 feet southeast for a full length of 8,004 feet; however, declared distances must still be applied to prevent the localizer, perimeter fencing, and Al Mooney Road from obstructing the runway safety area (RSA)/ROFA off the northwest end of the runway. As shown on the exhibit, the declared distances result in a landing distance available (LDA) of at least 7,300 feet in both directions, which accommodates the critical aircraft (Falcon 900) in all takeoff configurations at all weights, as well as landing during Part 135 charter operations.

- The takeoff run available (TORA) distance for Runway 30 is reduced to 7,654 feet to shift the departure RPZ off residential properties west of Memorial Boulevard.

- Avigation easements (1.76 total acres) are acquired to protect portions of the Runway 12 and 30 RPZs.

- Fee simple acquisition of approximately 53.9 acres of property to the southwest accommodates the runway extension and rerouting of the Airport Loop access road. A portion of the Airport Loop reroute extends through the Runway 30 RPZ; however, the impact is to a small portion in the far corner of the RPZ and is minimal.

- Taxiway A is extended southwest to the ultimate Runway 30 end. The taxiway extension is planned to meet TDG 2A standards and includes the construction of a holding bay, which allows pilots to perform preflight checks without blocking the taxiway. Another holding bay is added near the Runway 12 end, adjacent to the Mooney hangar complex.

- An exit taxiway is added approximately 1,400 feet from the Runway 12 threshold to allow aircraft landing on Runway 30 to exit the runway earlier, reducing runway occupancy times.

- Blast pads are added at both ends of Runway 12-30 to mitigate any potential for soil erosion caused by jet wash.

- The AWOS equipment is relocated to a site on the east side of the runway, along Airport Loop. This site is more centrally located on the airport and meets the FAA's preferred siting criteria but would require clearing trees/vegetation to avoid obstructing AWOS sensors. The AWOS critical area would be located entirely on airport property.

- The segmented circle and lighted wind cone are relocated to a site west of the runway, near Memorial Boulevard.

Runway 12-30 Alternative 3

Runway 12-30 Alternative 3 is depicted on **Exhibit 4C** and considers the following:

- The 687-foot Runway 12 displaced threshold is eliminated and the runway is extended 1,750 feet to the southeast. This is the maximum extension allowable while keeping the Runway 30 RPZ off the Airport Loop reroute and within the boundary of the proposed property acquisition parcel. The runway extension results in a full length of 7,067 feet, which provides increased utility for the critical aircraft (Falcon 900) taking off at over 90 percent useful loads and landing under most conditions.

- No displaced runway thresholds are planned. The published declared distances equal the full length of the runway (7,067 feet), which is preferred to avoid pilot confusion when portions of a runway are declared unusable in certain takeoff and landing situations. This alternative also results in the co-location of the approach and departure RPZs off the Runway 12 threshold. The RPZ is shifted off residential properties but would still require the acquisition of approximately 1.29 acres of avigation easement to protect the uncontrolled properties.

- Fee simple acquisition of approximately 53.9 acres of property to the southwest accommodates the runway extension and rerouting of the Airport Loop access road. The ultimate safety areas, including the RPZ, are each contained within the acquired property.

- Taxiway A is extended southwest to the ultimate Runway 30 end. The taxiway extension is planned to meet TDG 2A standards and includes the construction of a holding apron. A bypass taxiway is shown near the Runway 12 end, which improves circulation, similar to a holding bay; this option is considered if landside development of the midfield area east of Taxiway A does not allow for a holding bay.

- An exit taxiway is added approximately 1,000 feet from the Runway 12 threshold to allow aircraft landing on Runway 30 to exit the runway earlier, reducing runway occupancy times.

- Blast pads are added at both ends of Runway 12-30 to mitigate any potential for soil erosion caused by jet wash.

- The AWOS equipment is relocated to a site southeast of the terminal apron. This site is less preferrable because it is slightly outside the FAA's siting criteria and the location could be impacted by existing buildings and limit development potential of other landside facilities. This site requires the acquisition of an avigation easement for approximately 0.22 acres of neighboring property to protect the area from new buildings/structures that could potentially impact the AWOS sensors.

Runway 12-30 Runway Design Code: C-II-5000
Runway 3-21 Runway Design Code: B-I-5000

Declared Distances (measurements in feet)	Runway			
	12	30	3	21
Takeoff Run Available (TORA)	8,004	7,654	3,597	3,597
Takeoff Distance Available (TODA)	8,004	8,004	3,597	3,597
Accelerate Stop Distance Available (ASDA)	8,004	7,300	3,597	3,597
Landing Distance Available (LDA)	7,317	7,300	3,597	3,597

LEGEND

- Airport Property Line
- Ultimate Property Line
- Existing Easements
- A — Taxiway Designation
- Runway Safety Area (RSA)
- Runway Object Free Area (ROFA)
- Runway Obstacle Free Zone (ROFZ)
- Runway Protection Zone (RPZ)
- AWOS Critical Area
- Ultimate Avigation Easement
- Localizer Critical Area
- Pavement Removal
- Ultimate Airfield Pavement
- Ultimate Roads

Peterson Farm Rd
Al Mooney Rd
Airport Loop
Memorial Blvd
Colvin Ranch Rd

Approach RPZ
Departure RPZ
1.63 Acres
Holding Bay
Relocated AWOS
2,000' Runway Extension
Holding Bay
Blast Pad 120' x 150'
Proposed Property Acquisition - 53.9 Acres
0.13 Acres
Ultimate Runway 12-30 (8,004' x 100')
ROFA to Remain Per Modification to Standard
Blast Pad 120' x 150'
Relocated Segmented Circle and Lighted Wind Cone
ROFA to Remain Per Modification to Standard

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0 900
SCALE IN FEET

Photo Source: Google Earth 08/2024

Runway 12-30 Runway Design Code: C-II-5000
Runway 3-21 Runway Design Code: B-I-5000

Declared Distances (measurements in feet)	Runway			
	12	30	3	21
Takeoff Run Available (TORA)	7,067	7,067	3,597	3,597
Takeoff Distance Available (TODA)	7,067	7,067	3,597	3,597
Accelerate Stop Distance Available (ASDA)	7,067	7,067	3,597	3,597
Landing Distance Available (LDA)	7,067	7,067	3,597	3,597

LEGEND

- Airport Property Line
- Ultimate Property Line
- Existing Easements
- A — Taxiway Designation
- Runway Safety Area (RSA)
- Runway Object Free Area (ROFA)
- Runway Obstacle Free Zone (ROFZ)
- Runway Protection Zone (RPZ)
- AWOS Critical Area
- Ultimate Avigation Easement
- Localizer Critical Area
- Pavement Removal
- Ultimate Airfield Pavement
- Ultimate Roads

Peterson Farm Rd
Relocated AWOS
Relocated Segmented Circle and Lighted Wind Cone
Al Mooney Rd
Bypass Taxiway
0.22 Acres
1,750' Runway Extension
Holding Bay
Blast Pad 120' x 150'
Proposed Property Acquisition - 53.9 Acres
Airport Loop
1.29 Acres
Ultimate Runway 12-30 (7,067' x 100')
Memorial Blvd
Colvin Ranch Rd
ROFA to Remain Per Modification to Standard
Blast Pad 120' x 150'
ROFA to Remain Per Modification to Standard
N
0
900
SCALE IN FEET
Photo Source: Google Earth 08/2024

- The segmented circle and lighted wind cone are relocated to a site adjacent to the terminal apron and Taxiway E.

LANDSIDE ALTERNATIVES

Generally, landside issues are related to the facilities necessary or designed for the safe and efficient parking and storage of aircraft, movement of pilots and passengers to and from aircraft, airport support facilities, and overall revenue support functions. To maximize airport efficiency, it is important to locate facilities together that are intended to serve similar functions. The best approach to landside facility planning is to consider the development like that of a community for which land use planning is the guide. For airports, land use in the terminal area should generally be dictated by aviation activity levels.

LANDSIDE CONSIDERATIONS

Landside facility development at ERV is primarily focused on the east side, including the terminal and its associated apron, as well as most of the occupied hangar capacity. The north side of the airport consists of the Mooney manufacturing hangar complex.

Development of landside facilities is challenging at ERV because the rising terrain makes site preparation to meet FAA grading standards costly. Longitudinal grades for taxiways and taxilanes are limited to a maximum of 1.5 percent; however, the longitudinal grade can be increased to 2.0 percent for taxiways/taxilanes that exclusively serve small aircraft that weigh 30,000 pounds or less. Development of land east of the terminal apron, where terrain rises greater than 3.0 percent in some areas, will be particularly challenging.

Landside planning considerations are summarized in **Table 4B**. Generally, the considerations reflect the needs of a growing general aviation airport that has an existing hangar waiting list and growing itinerant traffic that demands greater apron capacity. The airport's terminal building is centrally located and its capacity is adequate for current activity levels, but it may need to be expanded at some point in the future. Jet A fuel storage capacity may also need to be expanded in the future and an additional unleaded aviation fuel (100UL) tank may be needed once 100UL fuel is more widely available and demanded by users. Consideration is also given to reserving space for advanced air mobility (AAM), a new entrant to the aviation industry. AAM is described in more detail in the following sections.

TABLE 4B | Landside Planning Considerations

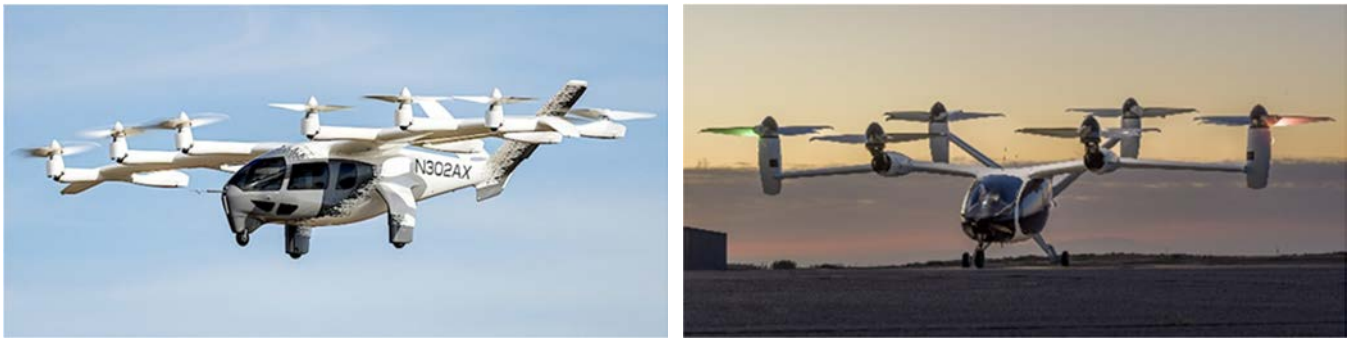
#	Landside Component	Existing Capacity	Consideration
1	Aircraft Storage Hangars	435,170 sf of existing capacity	Increase total capacity by 127,730 sf.
2	Aircraft Parking Apron	32,200 sy of apron/parking	Increase total capacity by 40,600 sy.
3	General Aviation Terminal Services	5,000 sf terminal building	Increase total capacity by 625 sf.
4	Fuel Storage Capacity	24,000 gallons (Jet A); 15,000 gallons (100LL)	Increase Jet A storage by 10,273 gallons. Add a dedicated unleaded aviation fuel (100UL) tank.
5	Advanced Air Mobility (AAM)	None	Reserve space for future vertiport and support facility development.

sf = square feet
sy = square yards

Source: Coffman Associates analysis

Advanced Air Mobility (AAM)

Since the turn of the decade, private companies have been developing and testing AAM technologies. AAM, which may also be called urban air mobility (UAM), is an emerging concept of air transportation using electric vertical takeoff and landing (eVTOL) aircraft to move people and cargo between places that are not easily or currently served by surface or air modes. A common example is the air taxi, in which a person or small group of people could travel within or between metropolitan areas, including airports, using small eVTOL aircraft. Development of infrastructure in support of AAM is currently underway in test cities across the county and AAM is projected to become a key component of the nation's air transportation network. The following images show several different AAM/eVTOL aircraft currently in development that would use a vertiport like the one proposed in some alternatives.



eVTOL Aircraft in Development (Courtesy of Archer and Joby)

Design Standards for Vertiports

Design dimensions for a vertiport are established by a reference aircraft. A vertiport may consist of several facilities, including aircraft charging and storage, a passenger terminal, and takeoff and landing areas. The landside facilities of a vertiport will be specific to and determined by the unique AAM company that chooses to establish a presence in the study area. The airside facilities are the focus of FAA Draft Engineering Brief (EB) 105A, *Vertiport Design*, which was published in September 2024. The takeoff and landing area design and geometry contained in *Vertiport Design* include the TLOF, the FATO, and the safety area, which are defined in detail as follows.

- *Final Approach and Takeoff Area (FATO)* | The FATO is a defined load-bearing area over which an aircraft completes the final phase of its approach to a hover or landing, and from which the aircraft initiates takeoff. The FATO is similar to the total surface of a helipad.

- *Touchdown and Liftoff Area (TLOF)* | The TLOF is a load-bearing, generally paved area centered in a FATO on which the aircraft performs a touchdown or liftoff. The TLOF is analogous to the center "H" of a helipad.

- *Safety Area* | The safety area is a defined area surrounding the FATO that is intended to reduce the risk of damage to aircraft accidentally diverging from the FATO. The vertiport safety area is identical in purpose to a runway or taxiway safety area.

The calculations for these areas are presented in **Table 4C** and are based on the controlling dimension (designated "D") or propulsion dimension (designated "D-p") of the design eVTOL aircraft, as defined for the vertiport facility (see **Figure 4A**). D is the diameter of the smallest circle enclosing the aircraft on a horizontal plane while the aircraft is in the takeoff or landing configuration with rotors/propellers turning (if applicable). D-p is the smallest circle enclosing all the propulsion units (including propellers, rotors, fans, etc.) on a horizontal plane while the aircraft is in the vertical takeoff or landing configuration with rotors turning (if applicable).

TABLE 4C | Takeoff and Landing Area Minimum Dimensions

	DIMENSION (length and width or diameter)	
Element	**Non-Powered Lift**	**Powered Lift**
TLOF	1.88 D-p	1 D-p
FATO	1.88 D-p	2 D-p
Safety Area	2.5 D	2.5 D
FATO = final approach and takeoff area TLOF = touchdown and liftoff area		

Source: FAA, Draft EB 105A, Vertiport Design, Table 2-1

Each element is centered within the subsequent element: the TLOF is located in the center of the FATO, which is centered within the safety area, as shown in **Figure 4B**. The "broken wheel" symbol should be used and located in the center of the TLOF to identify the site as a vertiport, as opposed to a heliport. Both the TLOF and FATO are expected to be located on level terrain or a structure, be clear of penetrations and obstructions, and support the weight of the design eVTOL aircraft. The TLOF may be circular, square, or rectangular in shape.

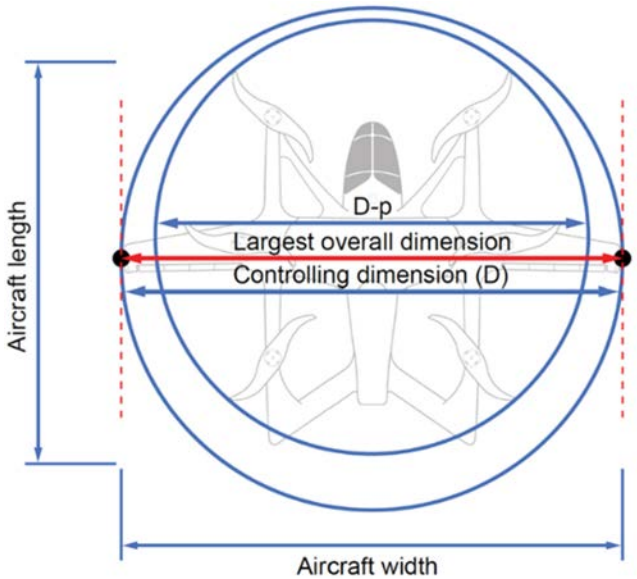


Figure 4A – eVTOL Controlling Dimensions

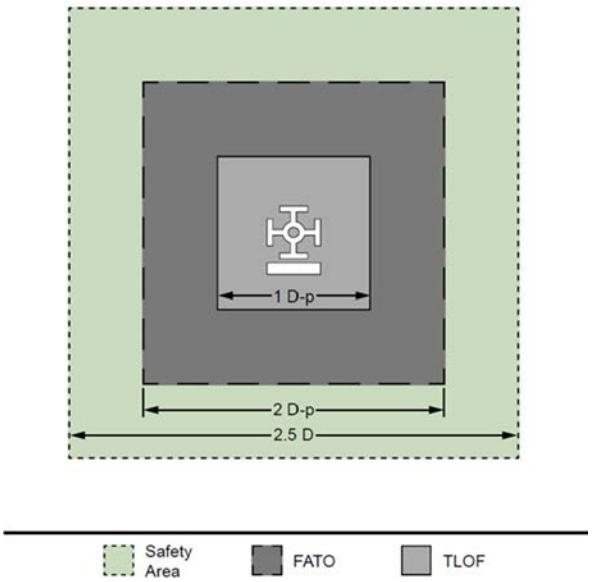


Figure 4B – Relationship and Dimensions of TLOF, FATO, and Safety Area

Approach Profiles – Imaginary Surfaces

The imaginary surfaces defined for heliports in Title 14 Code of Federal Regulations (CFR) Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace*, are applicable to vertiports and include the primary surface, approach, and transitional surfaces. Section 77.23 defines these surfaces for heliports and they have been adopted for use and presented in *Vertiport Design*.

- *Primary Surface* | The primary surface is the same size and shape as the FATO. This surface is a horizontal plane at the established vertiport elevation.

- *Approach Surface* | This surface begins at each end of the vertiport's primary surface, has the same width as the primary surface, and extends outward and upward for a horizontal distance of 4,000 feet, at which point its width is 500 feet. The slope of this surface is 8:1 and it doubles as the departure surface.

- *Transitional Surface* | The transitional surface extends outward and upward from the lateral boundaries of the primary and approach surfaces at a slope of 2:1 for 250 feet horizontally from the centerline of the primary and approach surfaces.

The primary, approach, and transitional surfaces should remain clear of penetrations whenever possible, unless an FAA analysis determines the penetrations to any Part 77 surface not to be hazardous. **Figure 4C** is a visual representation of the imaginary surfaces as they apply to vertiports.

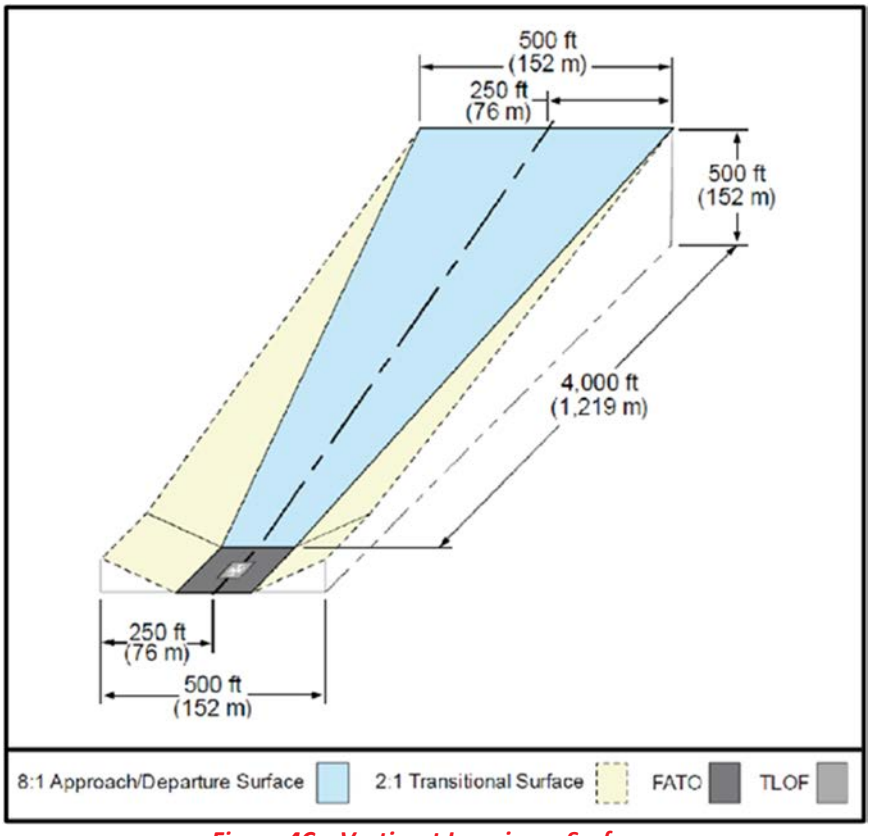


Figure 4C – Vertiport Imaginary Surfaces

Vertiport Summary

eVTOLs and AAM/UAM represent an emerging (yet unproven) aviation market. Testing and initial adoption are likely to occur in large metropolitan areas and then expand to mid-sized and smaller markets. Full integration of eVTOL into the national airspace system may not occur for many years; however, it is prudent for this planning study to consider the potential for such activity at ERV. For this reason, the alternatives analysis includes options for a potential future vertiport on airport property. The vertiport dimensions depicted are conceptual and are not based on a specific reference aircraft.

As most eVTOL vehicles under development are powered by electricity, electrical infrastructure will be the most significant need to support vertiport development. For recharging capabilities, initial power supply estimates from manufacturers range between 500 kilowatts (kW) to 1.0-megawatts (MW) per charger with a goal to provide an 80 percent charge in 15 to 25 minutes.

LANDSIDE ALTERNATIVES

The following section describes a series of landside alternatives as they relate to the identified considerations. Variations of future hangar and apron developments are presented to help visualize what future facility developments could look like.

Six alternatives have been prepared: two for the midfield area, which focus on the main terminal apron and undeveloped property where the AWOS and segmented circle are currently located; two for the east landside area beyond the existing terminal facilities, which are largely undeveloped; and two for the north landside area, which examine undeveloped property near the Mooney manufacturing complex. The alternatives provide potential development plans aimed at meeting the needs of general aviation through the long-term planning period and beyond.

The alternatives presented are not the only reasonable options for development. In some cases, a portion of one alternative could be intermixed with another, and some development concepts could be replaced with others. The overall intent of this exercise is to outline basic development concepts to spur collaboration for a final recommended plan. The final recommended plan only serves as a guide for the airport to aid the City of Kerrville/Kerr County in the strategic planning of airport property. Airport operators often change their plans to meet the needs of specific users. **The goal in analyzing landside development alternatives is to focus future development so airport property can be maximized and aviation activity can be protected.**

Midfield Landside Alternatives

The midfield area of the airport, which includes the existing terminal and main aircraft parking apron, features existing utility infrastructure, accessibility to the airfield, and level ground to build new facilities. The AWOS, segmented circle, and lighted wind cone are in this area and will need to be relocated, as was discussed in the airfield alternatives. Among all the undeveloped areas of the airport, the midfield area will be the most readily available for major new developments once the AWOS and segmented circle are relocated.

Midfield Landside Alternative 1

Midfield Landside Alternative 1 is depicted on **Exhibit 4D** and considers the following:

- The main terminal apron is expanded by extending the apron out to Taxiway E and an additional 160 feet west of Taxiway E, adding 32,100 square yards (sy) of new apron. An additional 11,000 sy of new apron is added west of two rows of new hangars for a total addition of 43,100 sy of new apron.

- Development of 12 new 10,000-square-foot (sf) hangars between the new aprons and one 22,500-sf hangar at the east side of the existing apron creates 142,500 total sf of new hangar capacity.

- An access road is extended to the midfield area by extending around the east side of the terminal apron, which requires cutting off existing taxiways/taxilanes to the apron and the Guadalupe Aviation facilities. Access to the terminal apron is reduced to a single access point on the west side and the Guadalupe Aviation taxilane is rerouted to intersect with Taxiway A.

- Relocation of the self-service fuel facilities to the west end of the expanded terminal apron includes a loop road for refueling trucks. A temporary self-service fuel facility is included on the taxilane leading to the Guadalupe Aviation facilities, where they will be staged until the terminal apron can be expanded.

Midfield Landside Alternative 2

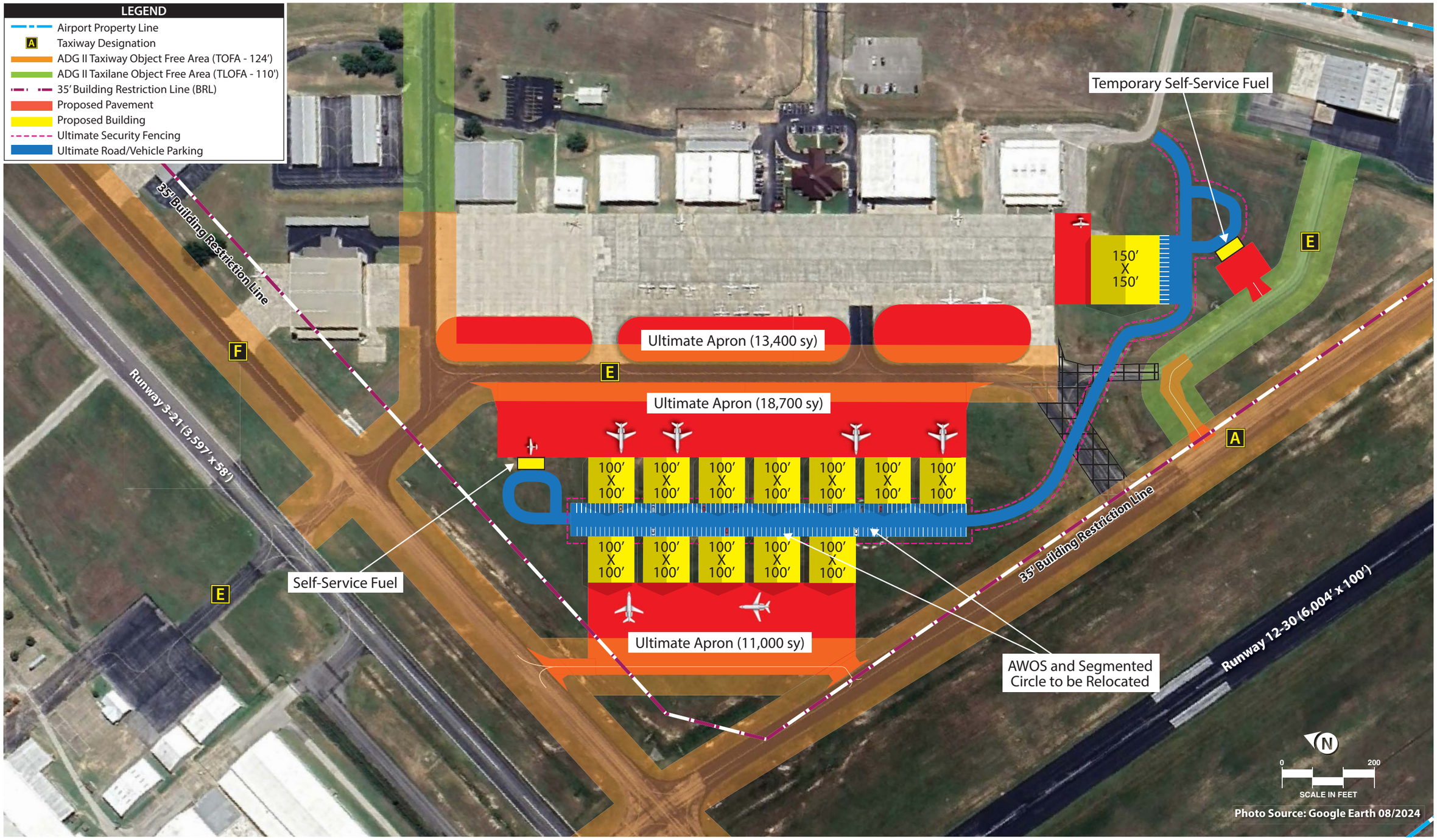
Midfield Landside Alternative 2 is depicted on **Exhibit 4E** and considers the following:

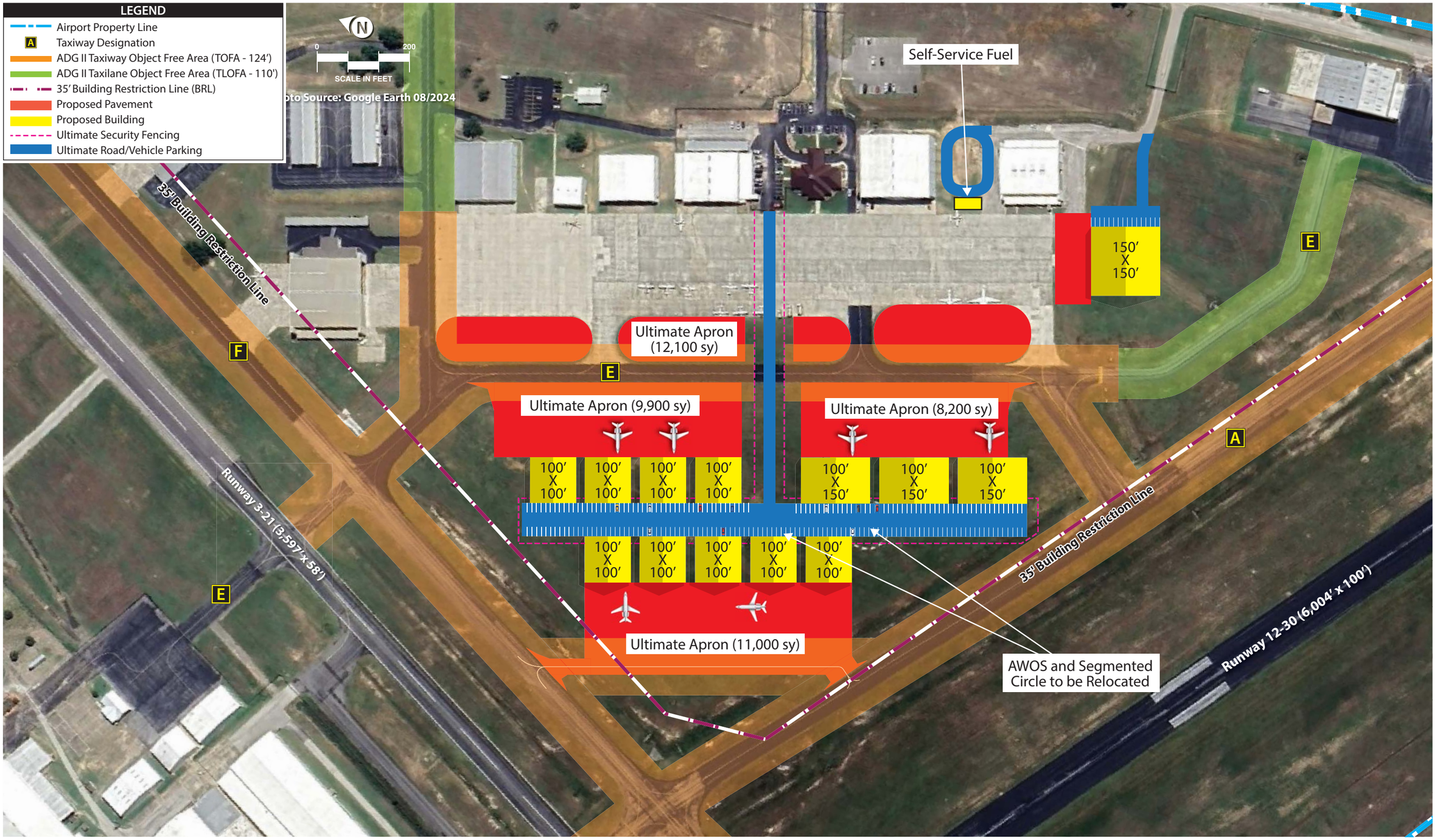
- The main terminal apron is expanded by extending the apron out to Taxiway E and an additional 160 feet west of Taxiway E, adding 30,200 sy of new apron. An additional 11,000 sy of new apron is added west of two rows of new hangars for a total addition of 41,200 sy of new apron.

- Development of nine 10,000-sf hangars and three 15,000-sf hangars between the new aprons and one 22,500-sf hangar at the east side of the existing apron creates 157,500 total sf of new hangar capacity.

- The major difference between this alternative and the previous alternative is the vehicle access point to the new midfield hangars. This alternative extends a road from the terminal building through the middle of the terminal apron, which avoids closure of existing taxiway/taxilane access to the apron and the Guadalupe Aviation facilities but splits the terminal apron in half.

- The self-service fuel facilities are relocated between two Kerrville Aviation conventional hangars on the existing apron. A new loop road is extended from an existing access road to this site for refueling truck access.


LEGEND
Airport Property Line
A Taxiway Designation
ADG II Taxiway Object Free Area (TOFA - 124')
ADG II Taxilane Object Free Area (TLOFA - 110')
35' Building Restriction Line (BRL)
Proposed Pavement
Proposed Building
Ultimate Security Fencing
Ultimate Road/Vehicle Parking
Temporary Self-Service Fuel
150' X 150'
35' Building Restriction Line
Runway 3-21 (3,597' x 58')
Ultimate Apron (13,400 sy)
Ultimate Apron (18,700 sy)
100' X 100'
Ultimate Apron (11,000 sy)
Self-Service Fuel
AWOS and Segmented Circle to be Relocated
35' Building Restriction Line
Runway 12-30 (6,004' x 100')
E
F
A
N
0
200
SCALE IN FEET
Photo Source: Google Earth 08/2024


LEGEND
Airport Property Line
Taxiway Designation
ADG II Taxiway Object Free Area (TOFA - 124')
ADG II Taxilane Object Free Area (TLOFA - 110')
35' Building Restriction Line (BRL)
Proposed Pavement
Proposed Building
Ultimate Security Fencing
Ultimate Road/Vehicle Parking
N
0
200
SCALE IN FEET
Photo Source: Google Earth 08/2024
Self-Service Fuel
150' X 150'
E
35' Building Restriction Line
F
Ultimate Apron (12,100 sy)
Ultimate Apron (9,900 sy)
Ultimate Apron (8,200 sy)
100' X 100'
100' X 150'
Runway 3-21 (3,597' x 58')
Ultimate Apron (11,000 sy)
A
AWOS and Segmented Circle to be Relocated
Runway 12-30 (6,004' x 100')

East Landside Alternatives

The east landside areas primarily consist of undeveloped property along Airport Loop. These areas of the airport are more difficult to develop for aeronautical use because of the rising terrain; some areas range between 20 to 30+ feet higher than the elevation of the terminal apron. Construction in these areas could require significant cutting to meet FAA longitudinal grading standards for taxiways/taxilanes, which will increase development costs. This area also includes property that is segregated from the airfield, which will make it difficult to develop for aeronautical purposes. The following alternatives consider reserving some of this property for non-aeronautical purposes, such as commercial/industrial development. Another possibility is utilization of some of this property for on-site electricity generation via a solar farm. If AAM service is established at ERV, electricity demands will increase significantly and a solar farm would help support some of the demands of these aircraft.

East Landside Alternative 1

East Landside Alternative 1 is depicted on **Exhibit 4F** and is based on the recommended development plan from the previous master plan. This alternative considers the following:

- Development of a series of taxilanes supports the construction of a variety of box and conventional style hangars that range in size between 3,000 sf and 15,000 sf. This alternative adds 294,150 total sf of hangar capacity. The mix of hangar types allows for larger airplane design group (ADG) II aircraft to operate in the new hangar areas; however, it may be difficult for larger aircraft to access these new hangar areas due to the steeper grades.
- New vehicle access roads extend from Airport Loop to the proposed hangar developments. Most new hangars have dedicated vehicle parking lots.
- A vertiport and associated AAM terminal facility are located east of an Airport Loop extension in an area that is less accessible to fixed-wing aircraft operations. The vertiport is accessible to a ramp with two VTOL parking spaces.
- Approximately 7.6 acres of undeveloped property east of Airport Loop are reserved for non-aeronautical uses, including commercial/industrial/solar farm developments.

East Landside Alternative 2

East Landside Alternative 2 is depicted on **Exhibit 4G** and considers the following:

- Hangar development for smaller aircraft is focused in the areas with higher grades, including five new box hangars and four new 10-unit T-hangars. Five new 10,000-sf hangars are shown along Taxiway F, which could accommodate larger aircraft. This alternative includes 140,625 total sf of new hangar capacity.
- A 6,000-sf expansion of the terminal building provides more area for general aviation services and leasable office space.
- Expansion of the fuel farm includes another Jet A fuel tank and a 100UL fuel tank.

- A vertiport and AAM terminal are developed along Airport Loop.

- Approximately 16.3 acres of undeveloped property are reserved for non-aeronautical uses, including commercial/industrial/solar farm developments.

North Landside Alternatives

The north side of the airport is relatively level compared to the east side, which makes it a potentially more appealing option for new development. This area contains approximately 26 acres of developable property situated along the Runway 3-21 flight line, which bodes well for facilities that cater to smaller general aviation aircraft. Aside from the Mooney hangar complex, no other aircraft services or facilities are available, so utility infrastructure expansion and a dedicated fuel farm will be necessary additions.

North Landside Alternative 1

North Landside Alternative 1 is depicted on **Exhibit 4H** and is based on the recommended development plan from the previous master plan. This alternative considers the following:

- Development includes a series of box hangars that range in size from 2,400 sf to 3,600 sf, as well as six 12-unit T-hangars, one 10-unit T-hangar, and two 2-unit box hangars. A 10,000-sf hangar that is already planned for development is also shown on the south end of the area adjacent to the Mooney complex. This alternative adds 182,700 total sf of new hangar space. The development of these new facilities also requires the removal of an existing box hangar (the former paint hangar used by Mooney).

- A partial-parallel taxiway is constructed on the west side of Runway 3-21. The taxiway shown is at a 225-foot separation distance from the runway centerline, which meets A/B-I design standards but exceeds the 150-foot separation standard for A/B-I (small aircraft) design standards. The increased separation distance reduces the development potential of the area and provides limited utility because existing Taxiway F also does not meet the 225-foot separation distance.

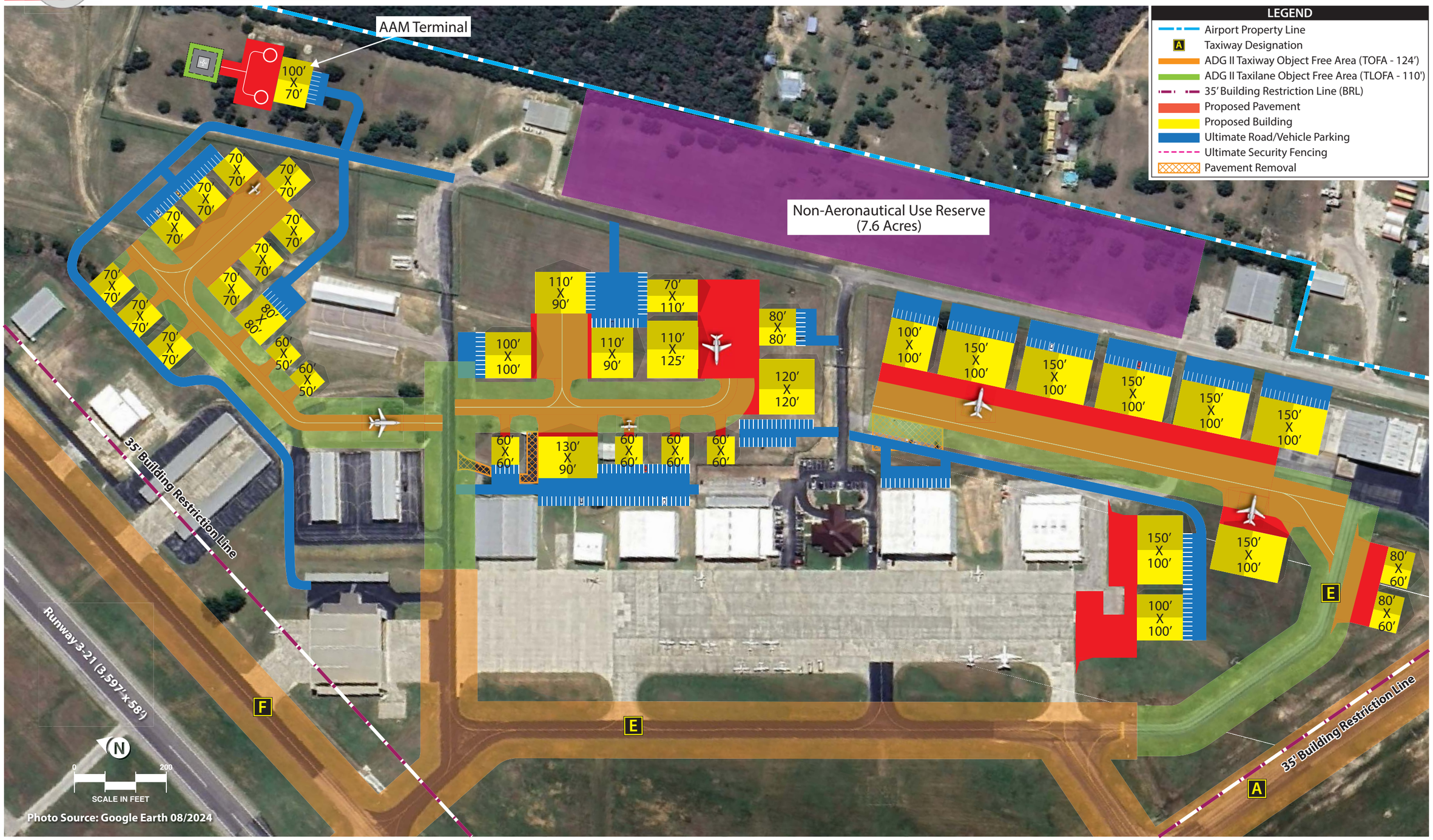
- A self-service fuel island provides fuel services to aircraft based in this area. Without fuel storage facilities in this area, fuel trucks would be required to cross the airfield or aircraft would have to taxi to the terminal area to get fuel.

- A small vehicle parking lot is located adjacent to Peterson Farm Road to serve the hangar complex.

North Landside Alternative 2

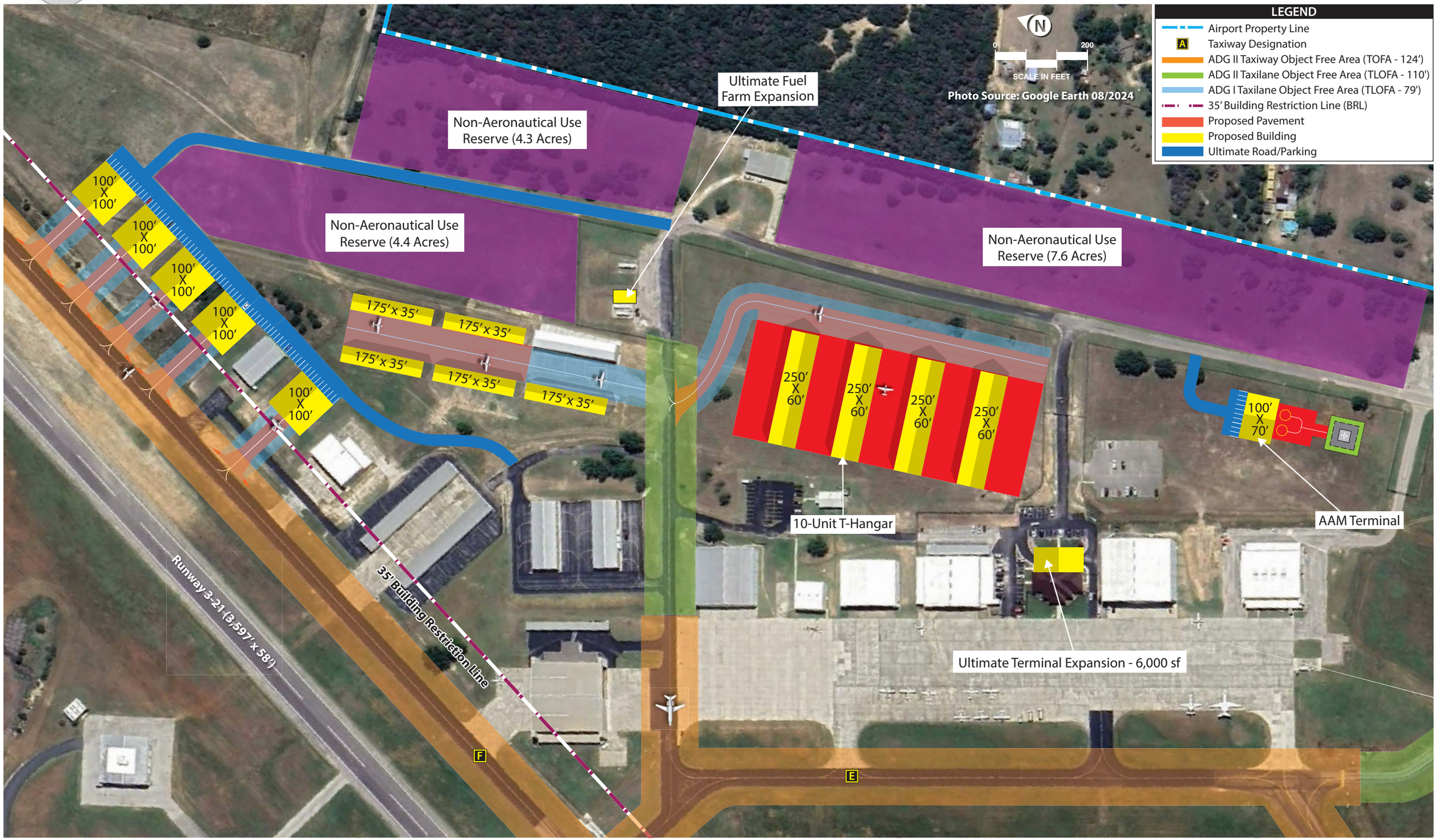
North Landside Alternative 2 is depicted on **Exhibit 4J** and considers the following:

- A partial-parallel taxiway is constructed at a 150-foot separation distance, which meets A/B-I (small aircraft) design standards. The 150-foot separation distance allows for a deeper apron (20,100 sy) for aircraft parking/circulation compared to the first alternative.

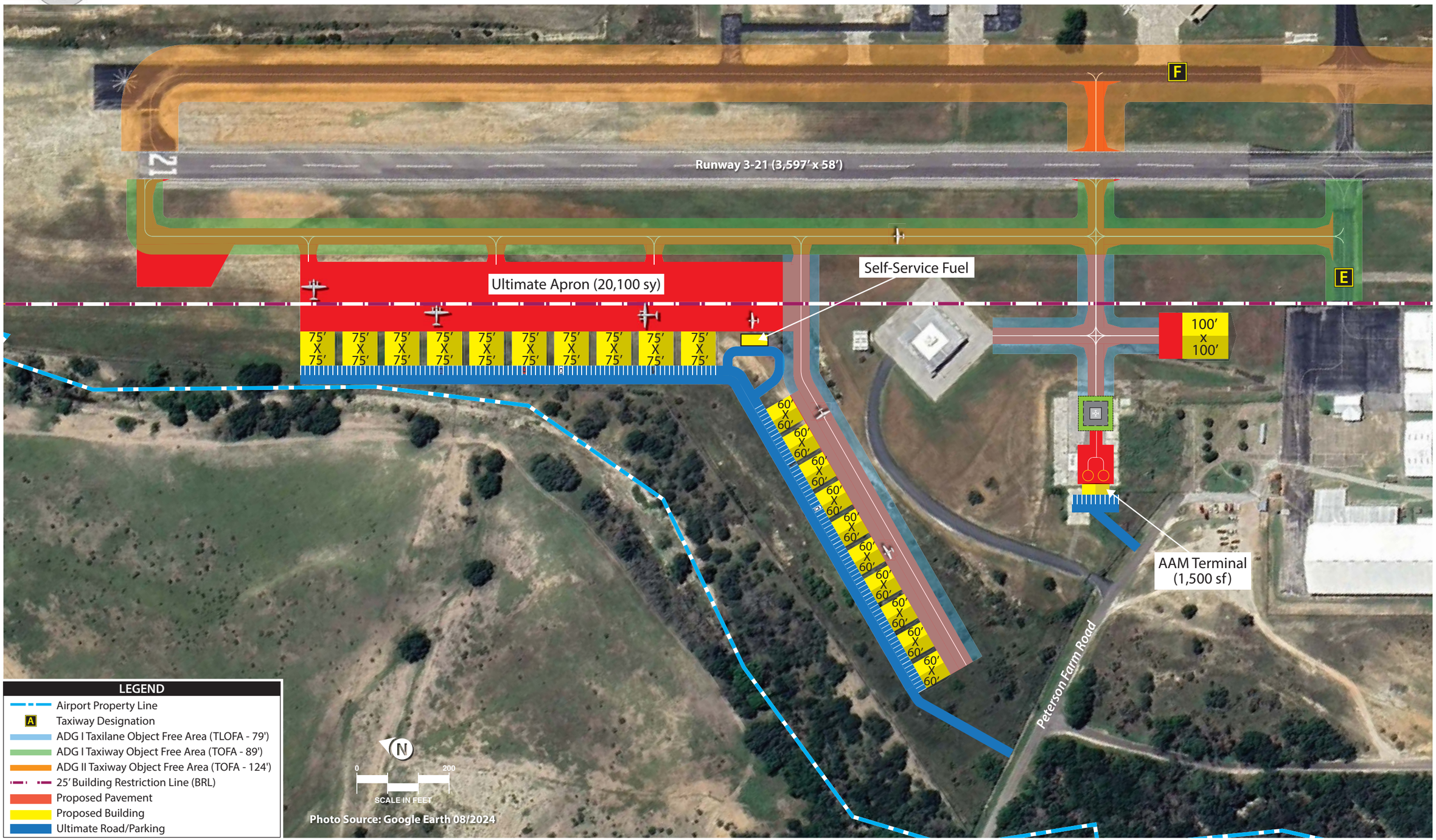


LEGEND

- Airport Property Line
- A — Taxiway Designation
- ADG II Taxiway Object Free Area (TOFA - 124')
- ADG II Taxilane Object Free Area (TLOFA - 110')
- 35' Building Restriction Line (BRL)
- Proposed Pavement
- Proposed Building
- Ultimate Road/Vehicle Parking
- Ultimate Security Fencing
- Pavement Removal


LEGEND
Airport Property Line
A Taxiway Designation
ADG II Taxiway Object Free Area (TOFA - 124')
ADG II Taxilane Object Free Area (TLOFA - 110')
ADG I Taxilane Object Free Area (TLOFA - 79')
35' Building Restriction Line (BRL)
Proposed Pavement
Proposed Building
Ultimate Road/Parking
N
0
200
SCALE IN FEET
Photo Source: Google Earth 08/2024
Ultimate Fuel Farm Expansion
Non-Aeronautical Use Reserve (4.3 Acres)
Non-Aeronautical Use Reserve (4.4 Acres)
Non-Aeronautical Use Reserve (7.6 Acres)
100' X 100'
175' x 35'
250' X 60'
100' X 70'
10-Unit T-Hangar
AAM Terminal
Ultimate Terminal Expansion - 6,000 sf
Runway 3-21 (3,597' x 58')
35' Building Restriction Line
F
E


F
E
12
Runway 3-21 (3,597' x 58')
Self-Service Fuel
40' X 60'
50' x 290'
50' x 230'
50' x 130'
100' X 100'
60' X 60'
Peterson Farm Road
LEGEND
Airport Property Line
A Taxiway Designation
ADG I Taxilane Object Free Area (TLOFA - 79')
ADG I Taxiway Object Free Area (TOFA - 89')
ADG II Taxiway Object Free Area (TOFA - 124')
25' Building Restriction Line (BRL)
Proposed Pavement
Proposed Building
Ultimate Road/Parking
N
0
200
SCALE IN FEET
Photo Source: Google Earth 08/2024


F
12
Runway 3-21 (3,597' x 58')
E
Ultimate Apron (20,100 sy)
Self-Service Fuel
75' X 75'
100' x 100'
60' X 60'
AAM Terminal
(1,500 sf)
Peterson Farm Road
LEGEND
Airport Property Line
A Taxiway Designation
ADG I Taxilane Object Free Area (TLOFA - 79')
ADG I Taxiway Object Free Area (TOFA - 89')
ADG II Taxiway Object Free Area (TOFA - 124')
25' Building Restriction Line (BRL)
Proposed Pavement
Proposed Building
Ultimate Road/Parking
N
0
200
SCALE IN FEET
Photo Source: Google Earth 08/2024

- Development includes 10 5,625-sf box hangars and 10 3,600-sf box hangars. A 10,000-sf hangar that is already planned for development is also shown on the south end of the area adjacent to the Mooney complex. This alternative adds 102,250 total sf of new hangar space. An advantage of this alternative is that the existing box hangar (the former paint hangar) would remain.

- A self-service fuel island provides fuel services to aircraft based in this area. Without fuel storage facilities in this area, fuel trucks would be required to cross the airfield or aircraft would have to taxi to the terminal area to get fuel.

- A vertiport and AAM terminal are developed with access to Peterson Farm Road. This option includes taxilane access to the airfield in the event a VTOL/eVTOL aircraft needs to utilize the runway environment for approach/departure.

SUMMARY

This chapter presents an analysis of various options that may be considered for specific airport elements. The need for alternatives is typically spurred by projections of aviation demand growth and/or by the need to resolve non-standard airport elements. Several development alternatives related to both the airside and the landside have been presented.

The next step in the master plan development process is to arrive at a recommended development concept. Participation of the PAC and the public will be important considerations. Additional consultation with the FAA and TxDOT may also be required. Once a consolidated development plan is identified, a 20-year capital improvement program will be presented that includes a prioritized list of projects tied to aviation demand and/or necessity. Finally, a financial analysis will be presented to identify potential funding sources and show airport management what local funds will be necessary to implement the plan.