Cottonwood Municipal Airport

MASTER PLAN UPDATE

Working Paper #4:
Alternatives

TABLE OF CONTENTS

TABLES

FIGURES

4.1. CHAPTER INTRODUCTION

This chapter presents development alternatives for various facilities and functional areas at Cottonwood Municipal Airport. These alternatives are intended to accommodate aviation demand forecasts and facility requirements developed and presented in **Chapter 2** and **Chapter 3** of this Master Plan Update, respectively. Feedback from the City, the FAA, the Master Plan's Planning Advisory Committee (PAC), various other stakeholders, and members of the public was also incorporated. The recommended alternative for each facility and functional area as well as the Airport's overall recommended development and land use plans are included in this chapter and in the ALP.

4.2. SUMMARY OF FACILITY REQUIREMENTS

Chapter 3 – Facility Requirements presents the facilities needed to accommodate forecast demand at the Airport over a 20-year planning horizon. **Table 4.1** on the following page provides a summary of these facility needs.

Table 4.1 - Summary of Facility Requirements

Facility Type	Recommendation
Airside Facilities	
Runway 14-32 Length	Extend Runway 14-32 to 5,100 feet
Runway 14-32 Width	Standard runway width for ADG II is 60'. The FAA indicated that a benefit-cost analysis may be performed to determine the financial feasibility of maintaining a 75' runway.
Runway 14-32 Orientation	Airport AWOS is being replaced. Airport should monitor wind data to identify if re-orienting Runway 14-32 or addition of a crosswind runway is justifiable.
Runway 14-32 Pavement Strength	Runway strength analysis should be conducted to determine existing weight bearing capacity. Runway strengthening will be required If analysis results in less than 12,500 lbs.
Runway 14-32 Blast Pads	Modify blast pad dimensions to meet FAA design standards (from 75' wide by 300' long to 80' wide by 60' long)
Runway PAPI PCUs	Relocate PAPI PCUs outside of ROFA (PAPI PCUs are not fixed-by-function)
Runway 32 REILs	Relocate Runway 32 REILs to be located 40' from runway edge
Taxiway Lighting	Replace taxiway reflectors with LED taxiway lighting (solar powered if FAA-funding eligible)
Taxiway System	Reconstruct taxiways to meet TDG 2 standard width of 35'
Taxiway A	Reconstruct parallel Taxiway A to appropriate strength, and full-length of Runway 14-32
Mitigate penetrations to Taxiway and Taxilane OFAs	Includes vegetation, helicopter operating area, and structures on eastern taxilane
Aircraft Parking Apron	Reconfigure apron to accommodate ADG II aircraft taxiing, eliminate direct runway access, and mitigate nonstandard separations (e.g., aircraft tiedowns, helicopter parking area)
Aircraft Parking Apron	Rehabilitate or reconstruct central and southern portions of apron
Helicopter Operating Area	Standardize markings and install standard lighting on helicopter operating area
Airspace Obstacles	Mitigate airspace obstacles, including vegetation, fencing, and structures
Landside Facilities	
Conventional Hangars	Construct additional 30,900 square feet of conventional hangars; preserve additional space for aircraft taxiing and maneuvering
T-Hangars	Construct additional 4,800 square feet of t-hangars (5 units); preserve additional space for aircraft taxiing and maneuvering
Support Facilities	
Airport Access	Extend Airport access roadway to new development as needed; remove AOA fence on west side of Airport access road and associated access gate off of Mingus Avenue
Vehicle Parking	Construct 45 vehicle parking spaces (8,100 square feet) adjacent to various facilities
Utilities	Extend utilities to new development as needed
Air Operations Fence	Upgrade existing fencing to prevent wildlife intrusions on airfield
Stormwater Management	Conduct stormwater management/drainage study

Source:
Kimley-Horn, 2022.

Notes:
ADG = Airplane Design Group
AWOS = Automated Weather Observing System
PAPI = Precision Approach Path Indicator
REIL = Runway End Identifier Lights
ROFA = Runway Object Free Area
TDG = Taxiway Design Group
OFA = Object Free Area

4.3. EVALUATION CRITERIA

Based on facility requirements and stakeholder input, the evaluation criteria described below were established to assess and compare development alternatives in a consistent manner. The development alternatives presented within this chapter were rated on a scale of 0 to 4 for each evaluation criteria, with each rating representing the following:

- **0 =** Negatively impacts existing condition
- **1 =** Little-to-no impact on existing condition
- **2 =** Slightly improves existing condition
- **3 =** Improves existing condition
- **4 =** Significantly improves existing condition

This evaluation is based on each alternative's ability to satisfy the criteria listed below. The sums of the ratings were then used to determine the recommended development alternatives for the Airport.

- **Enhances operational safety:** Development alternatives should aim to maintain or enhance Airport safety to the extent practical. Operational safety is considered for the safe and efficient flow of aircraft on the ground and in the air as well as the protection of pedestrians and property on and around the Airport.
- **Satisfies forecast demand:** Development alternatives should accommodate future demand volumes and aircraft fleet mix as analyzed and presented in **Chapter 2 – Aviation Forecasts**. Forecast demand must be accommodated while also adhering to FAA design standards—a critical factor when obtaining federal funding for airport improvement projects.
- **Minimizes off-airport impacts:** Development alternatives should minimize off-airport impacts such as the need for extensive land acquisition, the introduction of safety area penetrations, substantial increases in airport-related noise, and other adverse impacts to the community and natural environment.
- **Minimizes on-airport impacts:** Development alternatives should be compatible with existing and planned airside and landside facilities. Alternatives should also minimize the need for modifications to FAA design standards.
- **Feasible and cost effective:** Development alternatives should be feasible and cost effective in implementation. Alternatives should consider costs associated with design, environmental documentation, construction, ongoing maintenance and upkeep, and costs associated with potential off-airport impacts such as land acquisition or the relocation of existing infrastructure.

4.4. NO-DEVELOPMENT ALTERNATIVES

No-development alternatives were identified to establish a baseline of impacts that may occur as a result of inaction regarding the construction of needed facilities at the Airport. These evaluations consider whether facility improvements should occur at the Airport, or if another option would better serve existing and potential future tenants and users.

4.4.1. No-Build Alternative

The no-build alternative considers no additional landside, airside, or support facilities constructed at the Airport. No additional physical enhancements would be implemented, though routine maintenance would still be conducted to maintain the existing operational functionality of the Airport. This alternative does not satisfy projected levels of aviation demand identified in Chapter 2 and thus does not satisfy the subsequent facility requirements presented in Chapter 3. Additionally, the airfield (including critical safety areas) would not conform to the design standards of the future ARC of B-I (small), which limits the Airport's ability to provide appropriate separation clearances. Therefore, the no-build alternative is not recommended as a viable development strategy.

4.4.2. Relocation or Transfer of Aviation Activities

Another alternative examined is the transfer or relocation of specific or all aviation activities at Cottonwood Municipal Airport to another airport. Previous chapters of this Master Plan Update described the mix of tenants and users at the Airport, including flight schools, tour and medivac operators, and small corporate jet traffic. Relocation of these tenants is seen as an undesirable option. Additionally, several GA airports located near the City of Cottonwood are either at capacity or possess their own unique restraints that limit the ability to relocate services and/or tenants currently based at Cottonwood Municipal Airport. In addition to the direct economic benefits provided by users and tenants, the Airport acts as an economic driver within the community and provides a valuable service as a GA facility. Therefore, the relocation or transfer of aviation activities is not recommended as a viable option.

4.4.3. Construction of New Airport

In rare situations, a new airport may be constructed to alleviate congestion, enhance operational safety, or provide a lower cost option in the event of costly redevelopment at an existing airport. The availability of developable land combined with projected levels of activity mean that construction of a new airport is not recommended as a viable development alternative for the Airport. However, given feedback from previous public meetings about a consolidated airport to service GA traffic across multiple constrained airports in the area, this option is explored below.

Three GA airports are located near Cottonwood Municipal Airport, each possessing their own unique advantages and constraints: Sedona Airport (SEZ), Prescott Regional Airport (PRC), and Montezuma Airport

(19AZ). This alternative would create a consolidated airport in the region that would satisfy each individual airport's demand while eliminating their unique constraints. Brief descriptions of the advantages and constraints of the aforementioned airports are as follows:

Sedona Airport (SEZ)

- ***Advantage:*** This airport is located in an optimal location for GA flights to Sedona and is well-equipped with facilities and services to accommodate high-end business jet traffic.
- ***Constraint:*** Major turbulence is encountered near this airport due to its location on a 500-foot-high mesa, the surrounding area is noise sensitive, and birds/wildlife are specifically noted on and around the airport.

Prescott Regional Airport (PRC)

- ***Advantage:*** This airport is the third busiest airport in Arizona and the 23rd busiest airport in the United States in calendar year 2021 primarily due to Embry-Riddle Aeronautical University's flight training activity being based at PRC. Its three runways allow the airport to accommodate this capacity in addition to two commercial airline destinations.
- ***Constraint:*** Current demand for hangar space and covered tie-downs exceeds available supply, and a paid waitlist is active for these aircraft storage spaces.

Montezuma Airport (19AZ)

- ***Advantage:*** This private airport is a "fly-in" community, with each residence equipped with an aircraft hangar. Airport facilities are well-maintained and the community is regarded by its residents as being a nice place to live.
- ***Constraint:*** This airport is designated as private use and permission is required prior to landing at the airport. There is no transient parking available and aircraft may only park if they are an invited guest of a resident.

The constraints of these airports, combined with the general location of Cottonwood Municipal Airport with respect to adjacent residential development, have spurred discussions of a regional airport or a training airstrip intended to serve the Verde Valley. Although such a facility may be seen by area residents as desirable, a new airport would require a detailed siting analysis and environmental impact statement. These studies are costly and would require local investment as FAA Airport Improvement Program (AIP) funds may not be available to supplement the overall cost. It is not a recommendation of this Master Plan Update that a new airport be constructed. However, if the City of Cottonwood desires to explore the feasibility of these studies, it should work with nearby communities to determine if financial support may be available.

4.5. NO-ANALYSIS ALTERNATIVES

Generally, facility improvements may be categorized as those that require in-depth alternatives analyses and those that do not. For the purposes of this Master Plan Update, improvements that do not require in-depth analyses are primarily focused on upgrading existing Airport infrastructure and/or standardizing conditions per FAA guidance. These improvements typically do not offer alternatives as certain conditions are required be met and there are no other options to achieving the infrastructure improvements. Such recommended improvements at Cottonwood Municipal Airport are listed below and depicted in the Recommended Development Plan (RDP) (**Figure 4.20**).

- Extension of Taxiway A to provide a full parallel taxiway
- Addition of an aircraft runup area
- Standardization of taxiway fillets
- Standardization of blast pads
- Removal of nonstandard or unused airfield pavements
- Rehabilitation/strengthening of airfield pavement, as needed
- Mitigation of natural airspace obstacles (e.g., trees, shrubs)
- Relocation of PAPI PCUs outside of the ROFA (PAPI PCUs are not fixed-by-function)
- Relocation of Runway 32 REILs to be positioned 40 feet from the runway edge (consistent with Runway 14 REILs)
- Relocation of segmented circle with lighted wind indicator
- Standardization of markings and installation of standard lighting for the helicopter parking area
- Designation and preservation of apron space for future electric aircraft charging stations
- Installation of new airfield signage and LED lighting
- Extension of Airport access roadway and vehicle parking to new development, as needed
- Extension of utilities to new development, as needed
- Extension of AOA fence to new development, as needed
- Upgrading of existing AOA fence to prevent wildlife intrusions onto the airfield
- Removal of AOA fence on west side of access road and associated access gate off of Mingus Avenue
- Relocation of AOA fence on east side of Airport to mitigate airspace obstruction to Runway 32 20:1 obstacle clearing surface

4.6. RUNWAY 14-32 ALTERNATIVES

At Cottonwood Municipal Airport, future airside development and improvements are dependent upon the recommended runway alternative. Therefore, this section presents several alternatives for Runway 14-32, each of which incorporates the following no-analysis alternatives (introduced in **Section 4.5**) related to the Airport's airside facilities:

- Extension of Taxiway A to provide a full parallel taxiway
- Standardization of taxiway fillets
- Standardization of blast pads
- Removal of nonstandard or unused airfield pavements
- Addition of an aircraft runup area
- Rehabilitation/strengthening of airfield pavement, as needed
- Mitigation of airspace obstacles, including fence obstruction to 20:1 OCS
- Relocation of PAPI PCUs outside of the ROFA (PAPI PCUs are not fixed-by-function)
- Relocation of Runway 32 REILs to be positioned 40 feet from the runway edge (consistent with Runway 14 REILs)
- Installation of new airfield signage and LED lighting

As analyzed and presented in **Chapter 3 – Facility Requirements**, it is recommended that Runway 14-32 be extended to 5,100 feet in length to accommodate the Airport's forecast operational fleet. The Airport's future ARC of B-I (small) has a standard runway width of 60 feet. Although the current runway width is 75 feet, the FAA has indicated that a benefit-cost analysis should be conducted to determine the financial feasibility of narrowing Runway 14-32 to 60 feet wide. The ultimate runway width and subsequent funding for pavement maintenance are dependent upon the results of a future benefit-cost analysis.

Constraints considered during the development of these runway alternatives include the Airport's existing property boundary and the on- and off-airport land uses. Mingus Avenue intersects the Airport's boundary immediately north of the Runway 32 departure end and the Silver Springs Wash runs immediately south of the Runway 14 departure end. Additionally, residential land uses located to the north and south of the Airport present further constrains on runway extension and overall Airport expansion.

Five alternatives were developed and evaluated for Runway 14-32. These alternatives, along with the benefits and constraints of each, are described below and a recommended alternative is presented at the end of this section.

Runway Alternative 1: Base Alternative

Runway Alternative 1 represents the utilization of existing pavement and the application of the no-analysis alternatives listed above to meet FAA runway design standards. Shown in **Figure 4.1**, this alternative establishes Mingus Avenue to the north and the Silver Springs Wash to the south as the RSA controlling surfaces from which future runway ends may be determined. In other words, future runway ends are

determined by measuring 240 feet from each controlling surface, per B-I (small) design standards. This results in the future Runway 14 approach end located approximately 112 feet north from its existing location and the Runway 32 departure end located approximately 38 feet south of its existing location. As part of this alternative, the Airport's blast pads are standardized, Taxiway A is extended to create a full parallel taxiway, existing taxiway fillets are standardized, unused blast pad and taxiway pavement are removed, and an aircraft runup area is proposed to be constructed south of the main aircraft parking apron near the Runway 32 approach end.

The proposed runway ends described within this alternative provides a base for Runway Alternatives 2 through 5. Runway Alternative 1 on its own, however, only yields an additional 150 feet of usable runway length for a total runway length of 4,402 feet, 698 feet short of the recommended 5,100 feet. The advantages and disadvantage of Runway Alternative 1 are summarized below.

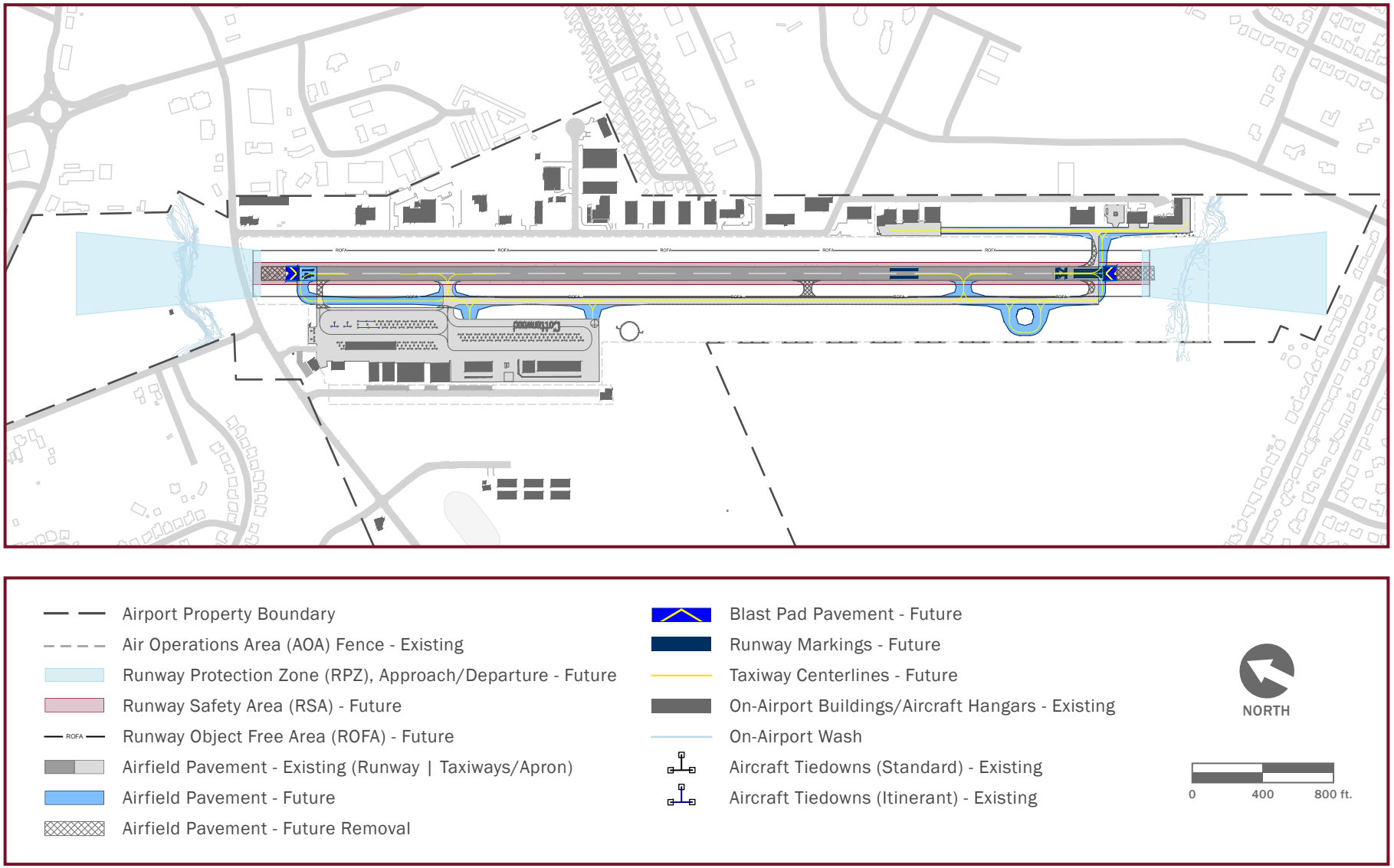
Advantages:

- Pending a pavement strength analysis, existing pavement is utilized for runway extension and standard blast pads.
- Cost effective when compared with Runway Alternatives 2 through 5.
- Minimal on- and off-Airport impacts

Disadvantage:

- Proposed runway length of 4,402 feet does not accommodate forecast aircraft fleet.

Figure 4.1 - Runway Alternative 1: Base Alternative



Source: Kimley-Horn, 2022.

Note: Standard runway width for ADG II is 60 feet. The FAA indicated that a benefit-cost analysis may be performed to determine the financial feasibility of maintaining a 75-foot runway.

Runway Alternative 2: Northern Extension

Runway Alternative 2, presented in **Figure 4.2**, utilizes the base alternative's Runway 32 approach end (approximately 38 feet south of the existing location) and proposes a northern runway extension of approximately 810 feet to achieve the recommended runway length of 5,100 feet.

Due to the northern runway extension and the associated extension of Taxiway A, this alternative requires the relocation, tunneling, or closure of Mingus Avenue and significant grading to address elevation changes north of the existing Runway 14 approach end. Additionally, as the Del Monte Wash runs north of the Airport, this alternative requires construction of a culvert to accommodate the extended runway, a costly and complex project with great structural and environmental constraints. An avigation easement is also required for the portion of the Runway 14 approach/departure RPZ that extends beyond the Airport's property boundary.

Although the future location of the Runway 14 approach end will allow aircraft taking off from Runway 14 to reach higher altitudes over the residential communities south of the Airport, the extended runway end introduces additional noise impacts to the land uses north of the Airport, including residential communities within the City of Cottonwood and the Town of Clarkdale.

The advantages and disadvantages of Runway Alternative 2 are summarized below.

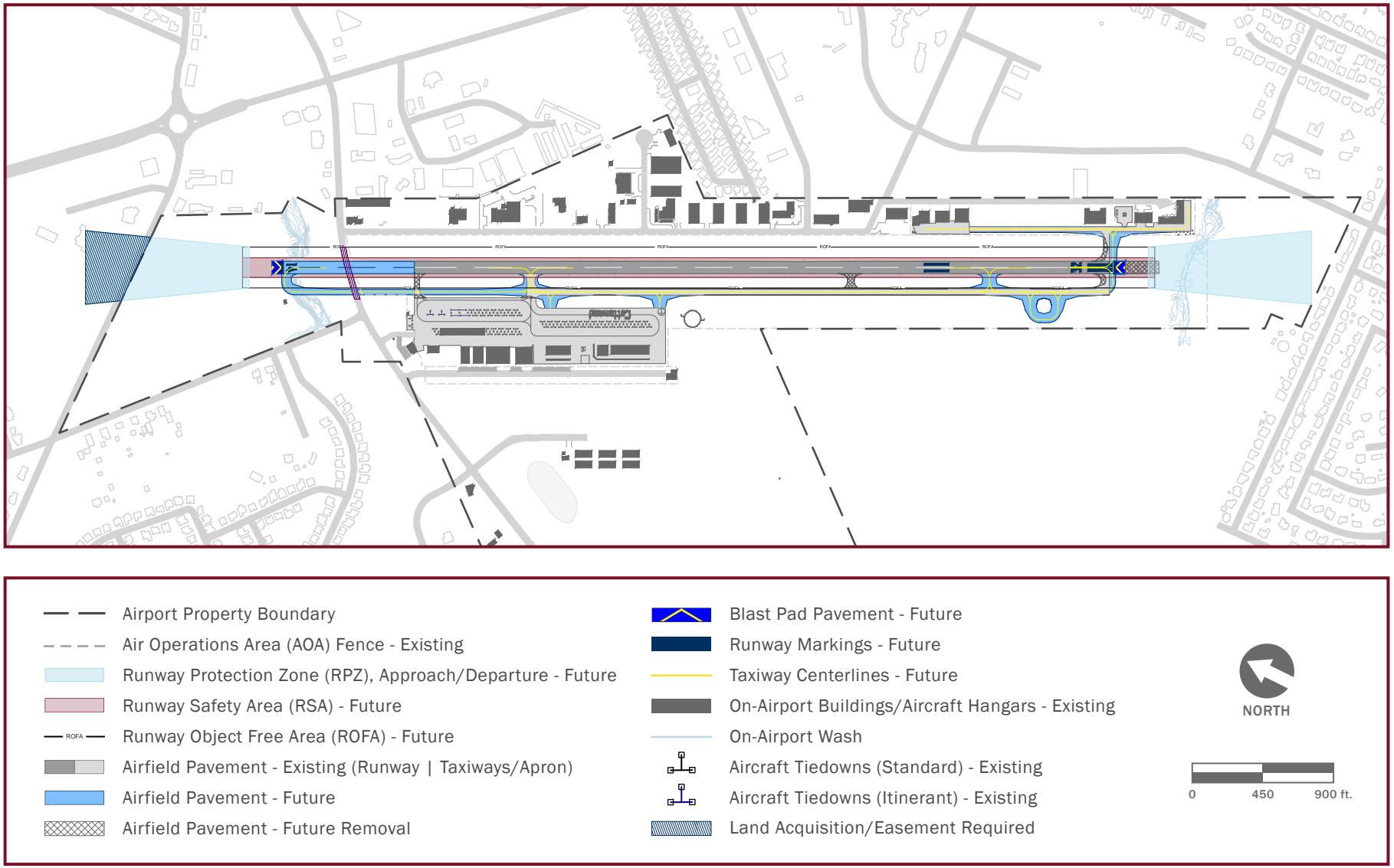
Advantages:

- Proposed runway length of 5,100 feet accommodates forecast aircraft fleet.
- Aircraft taking off from Runway 14 (i.e., southern operations) may reach higher altitudes over the residential communities south of the Airport.
- Proposed construction remains entirely on-Airport property.

Disadvantages:

- Proposed runway extension requires the rerouting, tunneling, or closure of Mingus Avenue and significant grading north of Runway 14.
- Proposed runway extension requires a culvert over the Del Monte Wash north of the Airport.
- Avigation easement required for portions of the Runway 14 RPZ due to its extension beyond the Airport's northern property boundary.
- Proposed Runway 14 approach end introduces additional noise impacts to residential community north of Airport.
- Aircraft landing on Runway 14 (i.e., southern operations) will reach lower altitudes over the residential communities north of the Airport.

Figure 4.2 - Runway Alternative 2: Northern Extension



Source: Kimley-Horn, 2022.

Note: Standard runway width for ADG II is 60 feet. The FAA indicated that a benefit-cost analysis may be performed to determine the financial feasibility of maintaining a 75-foot runway.

Runway Alternative 3: Southern Extension

Representing the reverse scenario of Runway Alternative 2, Runway Alternative 3 utilizes the base alternative's Runway 14 approach end (approximately 112 feet north of the existing location) and proposes a southern runway extension of approximately 736 feet to achieve the recommended runway length of 5,100 feet.

Due to the southern runway extension and associated extension of Taxiway A, this alternative requires construction of a culvert over the Silver Springs Wash. A previously noted, construction of a culvert to accommodate a runway, taxiway, and associated infrastructure is a costly and complex project with great structural and environmental constraints. This alternative also introduces residential land uses within the future Runway 32 approach/departure RPZ. RPZs are meant to enhance the protection of people and property on the ground, and according to the FAA, residential land uses are considered to be major incompatible land uses that conflict with safe operations at an airport and the safety of adjacent residents. Therefore, property acquisition and the rerouting or closure of residential roadways are required for the portion of the Runway 32 approach/departure RPZ that extends beyond the Airport's property boundary.

Although the future location of the Runway 32 approach end will allow aircraft taking off from Runway 32 to reach higher altitudes over the residential communities north of the Airport, the extended runway end introduces additional noise impacts to the residential communities south of the Airport.

Runway Alternative 3 is illustrated in **Figure 4.3**, and its advantages and disadvantages are summarized below.

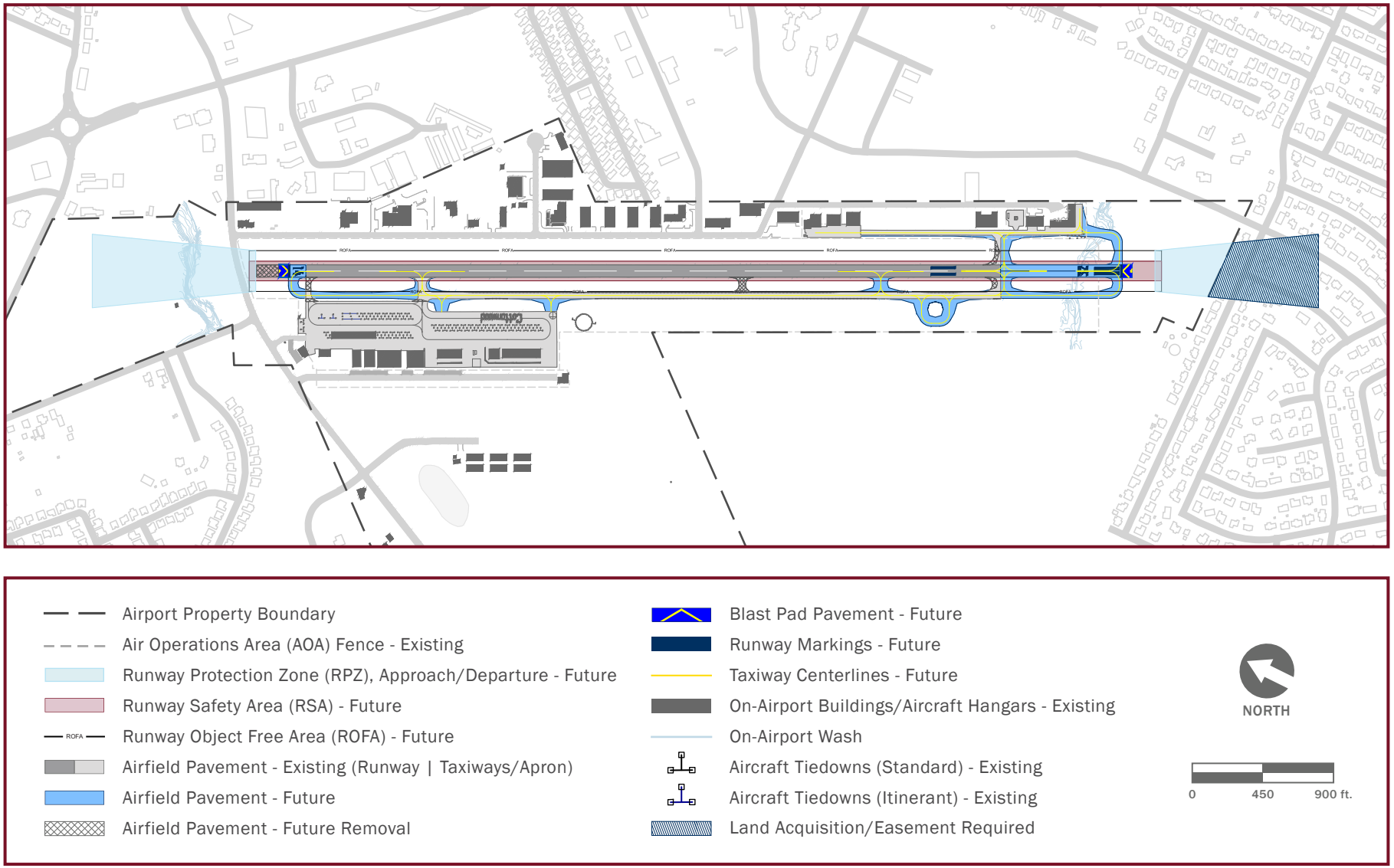
Advantages:

- Proposed runway length of 5,100 feet accommodates forecast aircraft fleet.
- Aircraft taking off from Runway 32 (i.e., northern operations) may reach higher altitudes over the residential communities north of the Airport.
- Proposed construction remains entirely on-Airport property.

Disadvantages:

- Proposed runway extension requires a culvert over the Silver Springs Wash south of the existing Runway 32 approach end.
- Property acquisition required for portions of the Runway 32 RPZ due to its extension beyond the Airport's south property boundary.
- Proposed Runway 32 approach end introduces additional noise impacts to residential community south of Airport.
- Aircraft landing on Runway 32 (i.e., northern operations) will reach lower altitudes over the residential communities south of the Airport.

Figure 4.3 - Runway Alternative 3: Southern Extension



Source: Kimley-Horn, 2022.

Note: Standard runway width for ADG II is 60 feet. The FAA indicated that a benefit-cost analysis may be performed to determine the financial feasibility of maintaining a 75-foot runway.

Runway Alternative 4: Southern Extension with Declared Distances

Runway Alternatives 4 and 5 differ from the first three runway alternatives in that they utilize declared distances to maximize usable runway length. Declared distances are published by the FAA to denote the usable length of runway available for aircraft takeoff and landings. Declared distances may be used to alter the length of the usable runway without physical improvements (e.g., pavement removal) to meet airport design standards, including RSAs, ROFAs, and ROFZs. Declared distances consist of the following components:

- **Take Off Run Available (TORA):** Declared length of a runway suitable for the ground run of an aircraft taking off. The TORA is measured from the start of the takeoff point to 200 feet from the beginning of the departure RPZ.
- **Take Off Distance Available (TODA):** Includes the declared length of the TORA and additional remaining clearway or runway beyond the end of the TORA (Cottonwood Municipal Airport is not equipped with clearways).
- **Accelerated Stop Distance Available (ASDA):** Declared runway length required for an aircraft to accelerate to a certain speed, and in case of engine failure, be able to come to a safe stop on the runway.
- **Landing Distance Available (LDA):** Declared length suitable for the ground run of an aircraft landing.

As shown in **Figure 4.4**, Runway Alternative 4 applies declared distances to the configuration presented in Runway Alternative 3. While utilizing the base alternative's Runway 14 approach end (approximately 112 feet north of the existing location) and a proposed a southern runway extension of approximately 736 feet to achieve the recommended runway length of 5,100 feet, Runway Alternative 4 implements declared distances to keep the Runway 32 approach/departure RPZ on Airport property and to avoid the need for land acquisition of the residential properties south of the Airport. The declared distances proposed in this runway alternative are shown in **Table 4.2**.

Table 4.2 - Runway Alternative 4 Declared Distances

Declared Distances	Runway 14	Runway 32
Take Off Run Available (TORA)	4,402 feet	5,100 feet
Take Off Distance Available (TODA)	5,100 feet	5,100 feet
Accelerate Stop Distance Available (ASDA)	5,100 feet	5,100 feet
Landing Distance Available (LDA)	5,100 feet	4,402 feet

Source: *Kimley-Horn, 2022.*

In this configuration, 5,100 feet of usable runway length is available for takeoff operations to the north (from Runway 32). However, the Runway 32 landing threshold remains in the base alternative's proposed location (approximately 38 feet south of the existing location), providing an LDA and TORA of 4,402 feet for Runway

32 landing and Runway 14 takeoff operations, respectively (i.e., northern operations). Airport management and members of the PAC have indicated that the majority of takeoff and landing operations occur on Runway 32, so the additional length available for Runway 32 operations would be considered a great benefit according to Airport stakeholders.

The future location of the Runway 32 approach end will also allow aircraft taking off from Runway 32 to reach higher altitudes over the residential communities north of the Airport, potentially decreasing noise impacts associated with takeoff operations to the north. Like Runway Alternative 3, however, Runway Alternative 4 requires the construction of a culvert over the Silver Springs Wash. As previously noted, the construction of a culvert for a runway extension and associated infrastructure (e.g., parallel taxiways, taxiway connectors, lighting, and signage) can be costly and complex with great structural and environmental constraints. Additionally, although the Runway 32 RPZ does not extend beyond the Airport's boundary in this alternative, the future runway end introduces increased noise impacts as it is located significantly closer to the residential community south of the Airport. The advantages and disadvantages of Runway Alternative 4 are summarized below.

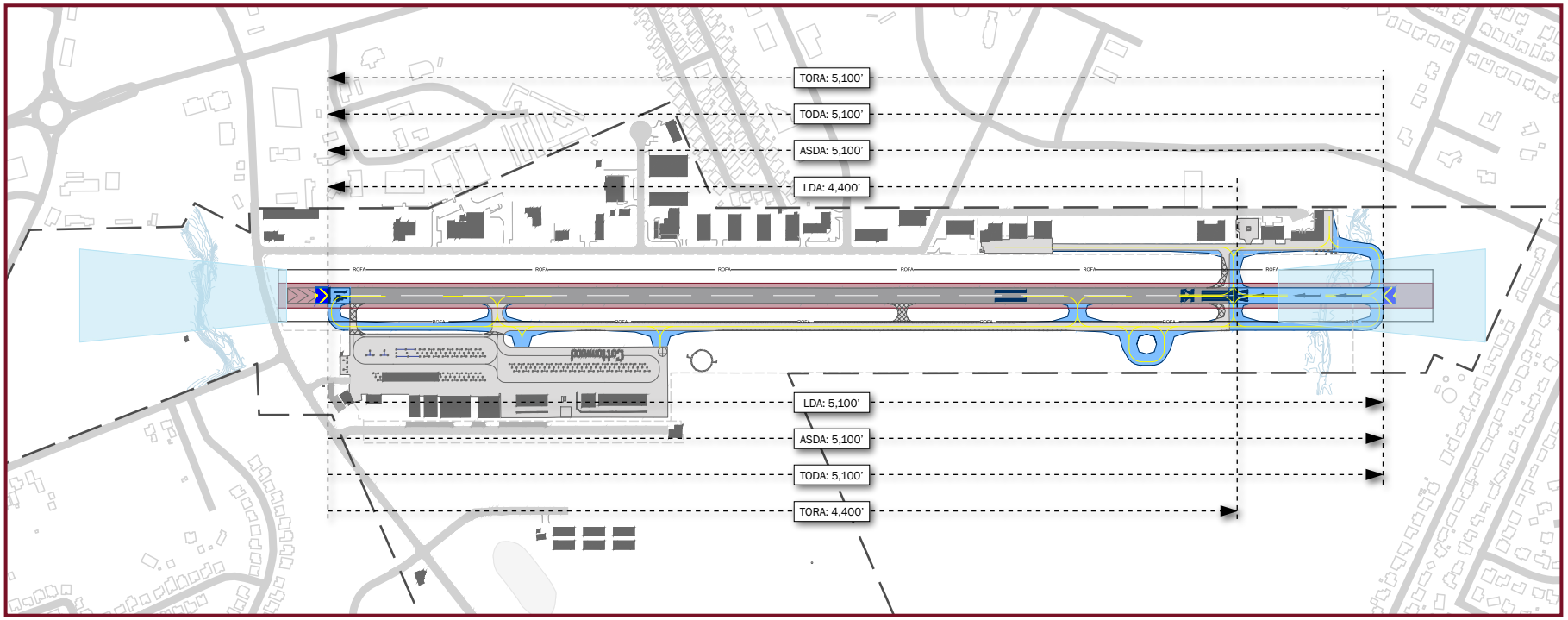
Advantages:

- Proposed runway length of 5,100 feet accommodates the forecast aircraft fleet for Runway 32 takeoffs *only* due to the implementation of declared distances.
- Aircraft taking off from Runway 32 (i.e., northern operations) may reach higher altitudes over the residential communities north of the Airport.
- Proposed construction remains entirely on-Airport property.

Disadvantages:

- Proposed runway extension requires a culvert over the Silver Springs Wash south of the existing Runway 32 approach end.
- Declared distances may require pilot education and training.
- Proposed Runway 32 approach end introduces additional noise impacts to residential community south of Airport.
- Declared distances do not allow for full use of runway pavement for takeoffs and landings in both directions.

Figure 4.4 - Runway Alternative 4: Southern Extension with Declared Distances



Source: Kimley-Horn, 2022.

Note: Standard runway width for ADG II is 60 feet. The FAA indicated that a benefit-cost analysis may be performed to determine the financial feasibility of maintaining a 75-foot runway.

Runway Alternative 5: Maximum Build Out with No Impacts to Mingus Avenue or Wash

Runway Alternative 5 represents the maximum runway build out without impacts to Mingus Avenue, Silver Springs Wash and minimal impacts to off-airport land uses. As presented in **Figure 4.5**, Runway Alternative 5 utilizes the base alternative's Runway 14 approach end (approximately 112 feet north of the existing location) and proposes a southern runway extension of 423 feet for a total runway length of 4,787 feet. Although the total runway length is 313 feet short of the recommended 5,100 feet, this alternative provides the greatest runway length while standardizing all runway facilities and limiting environmental and off-airport impacts. This runway configuration is capable of safely accommodating the Airport's future critical aircraft, although larger aircraft may be required to operate with lighter fuel loads during summer months.

In this alternative, the Runway 32 approach end is relocated to the extent practical as to avoid impacts to the Silver Springs Wash while ensuring a standard RSA and maximizing usable runway pavement. Additionally, declared distances are implemented so that the RSA does not intersect the wash and the Runway 32 approach/departure RPZ remains on Airport property. The future location of the Runway 32 approach end will allow aircraft taking off from Runway 32 to reach higher altitudes over the residential communities north of the Airport, potentially decreasing noise impacts associated with takeoff operations to the north. As shown in **Table 4.3**, declared distances provide 4,787 feet for takeoff operations on Runway 32 and 4,402 feet for takeoff operations on Runway 14. As previously noted, Airport management and members of the PAC have indicated that the majority of takeoff and landing operations occur on Runway 32, so the additional length for Runway 32 operations would be considered a great benefit.

Table 4.3 - Runway Alternative 5 Declared Distances

Declared Distances	Runway 14	Runway 32
Take Off Run Available (TORA)	4,402 feet	4,787 feet
Take Off Distance Available (TODA)	4,787 feet	4,787 feet
Accelerate Stop Distance Available (ASDA)	4,547 feet	4,787 feet
Landing Distance Available (LDA)	4,547 feet	4,402 feet

Source: *Kimley-Horn, 2022.*

The advantages and disadvantages of Runway Alternative 5 are summarized below.

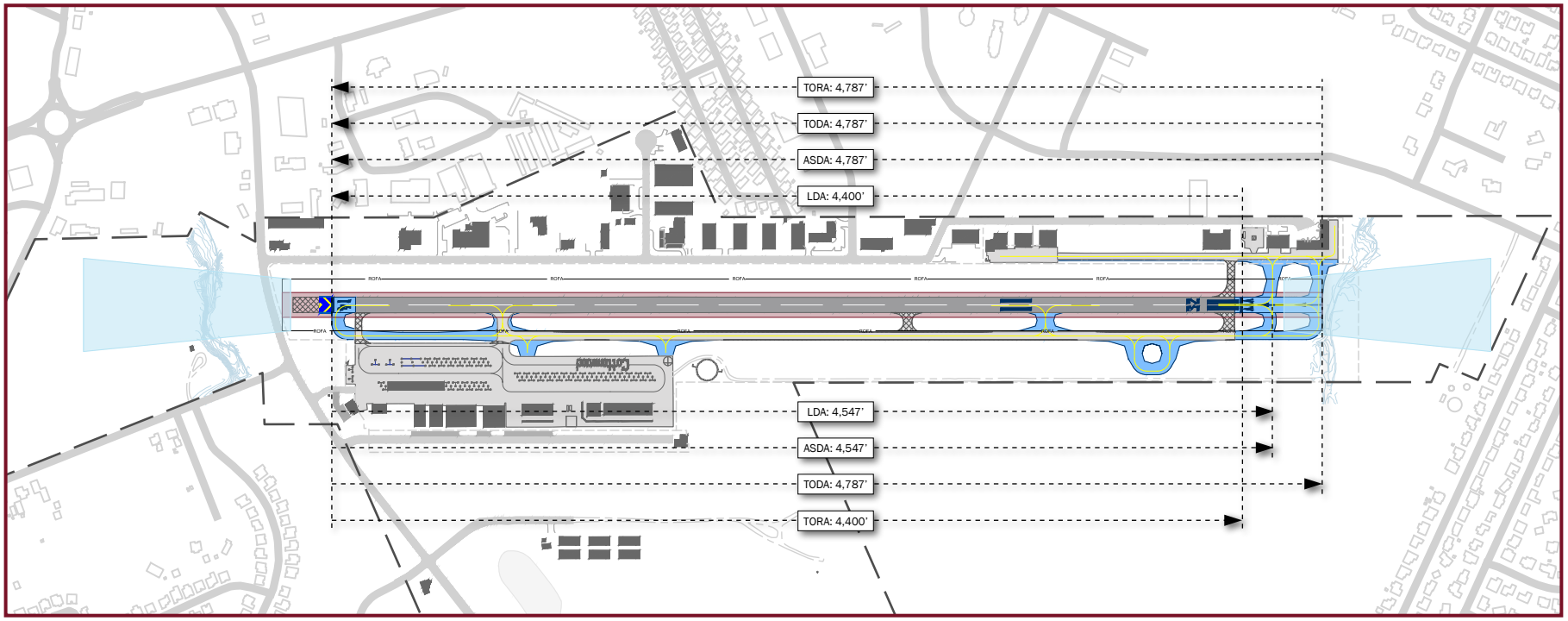
Advantages:

- Pending a pavement strength analysis, existing pavement is utilized for runway extension and standard blast pads.
- Cost effective when compared with Runway Alternatives 2 through 4.
- Aircraft taking off from Runway 32 (i.e., northern operations) may reach higher altitudes over the residential communities north of the Airport.
- Proposed construction remains entirely on-Airport property.

Disadvantages:

- Proposed runway length of 4,787 feet does not accommodate the forecast aircraft fleet.
- Declared distances do not allow for full use of runway pavement for takeoffs and landings in both directions.
- Declared distances may require pilot education and training.

Figure 4.5 - Runway Alternative 5: Maximum Build-Out with No Impacts to Mingus Avenue or Wash



Source: Kimley-Horn, 2022.

Note: Standard runway width for ADG II is 60 feet. The FAA indicated that a benefit-cost analysis may be performed to determine the financial feasibility of maintaining a 75-foot runway.

Recommended Runway Alternative

As described in **Section 4.3**, the runway development alternatives were rated on a scale of 0 to 4 for each evaluation criteria. The ratings are based on each alternative's ability to satisfy the evaluation criteria. The sums of the ratings were then used to determine the recommended runway development alternative for the Airport.

Table 4.4 - Evaluation of Runway Alternatives

Runway 14-32 Alternative	Enhances Operational Safety	Satisfies Forecast Demand	Minimizes Off-Airport Impacts	Minimizes On-Airport Impacts	Feasible and Cost Effective	Total Score
1	1	1	2	2	4	10
2	4	4	0	2	0	10
3	4	4	0	2	0	10
4	3	3	2	2	0	10
5	2	3	3	3	3	14

Source:
Kimley-Horn, 2022.

Scoring legend:
0 = Negatively impacts existing condition
1 = Little-to-no impact on existing condition
2 = Slightly improves existing condition
3 = Improves existing condition
4 = Significantly improves existing condition

As shown in **Table 4.4**, Runway Alternatives 2, 3, and 4 all received relatively low total scores despite their ability to achieve the 5,100-foot recommended runway length. These low scores are primarily due to significant on- and off-Airport impacts (e.g., land acquisition, avigation easements, increased airport-related noise impacts, relocation/tunneling or Mingus Avenue, culverting of Silver Springs Wash) as well as the feasibility and overall cost of each alternative.

Runway Alternative 5 yielded the highest score, which proposes a maximum runway buildout and the utilization of declared distances for minimal on- and off-airport impacts. Despite not achieving the 5,100-foot recommended runway length (a total runway length of 4,787 feet), Runway Alternative 5 provides the greatest runway length possible while avoiding impacts to Mingus Avenue, Silver Springs Wash, and adjacent residential properties. Alternative 5 also meets standards for RSA and ROFA dimensions, and keeps RPZs on Airport property. Overall, the use of declared distances provides a permanent and cost-effective solution to maximizing the length of usable runway. Additionally, the alternative's overall cost is significantly less than that of Runway Alternatives 2, 3, and 4 as land acquisition, roadway relocation/tunneling, and culverting are not necessary.

Based on this evaluation, the recommended runway alternative for Runway 14-32 is Runway Alternative 5: Maximum Build Out with No Impacts to Mingus Avenue or Wash. Of note, the FAA was consulted to determine feasibility, cost, and overall support of the runway alternatives. The FAA has expressed support for Runway Alternative 5 for the reasons previously stated.

4.7. AIRCRAFT APRON AND SUPPORT FACILITIES ALTERNATIVES

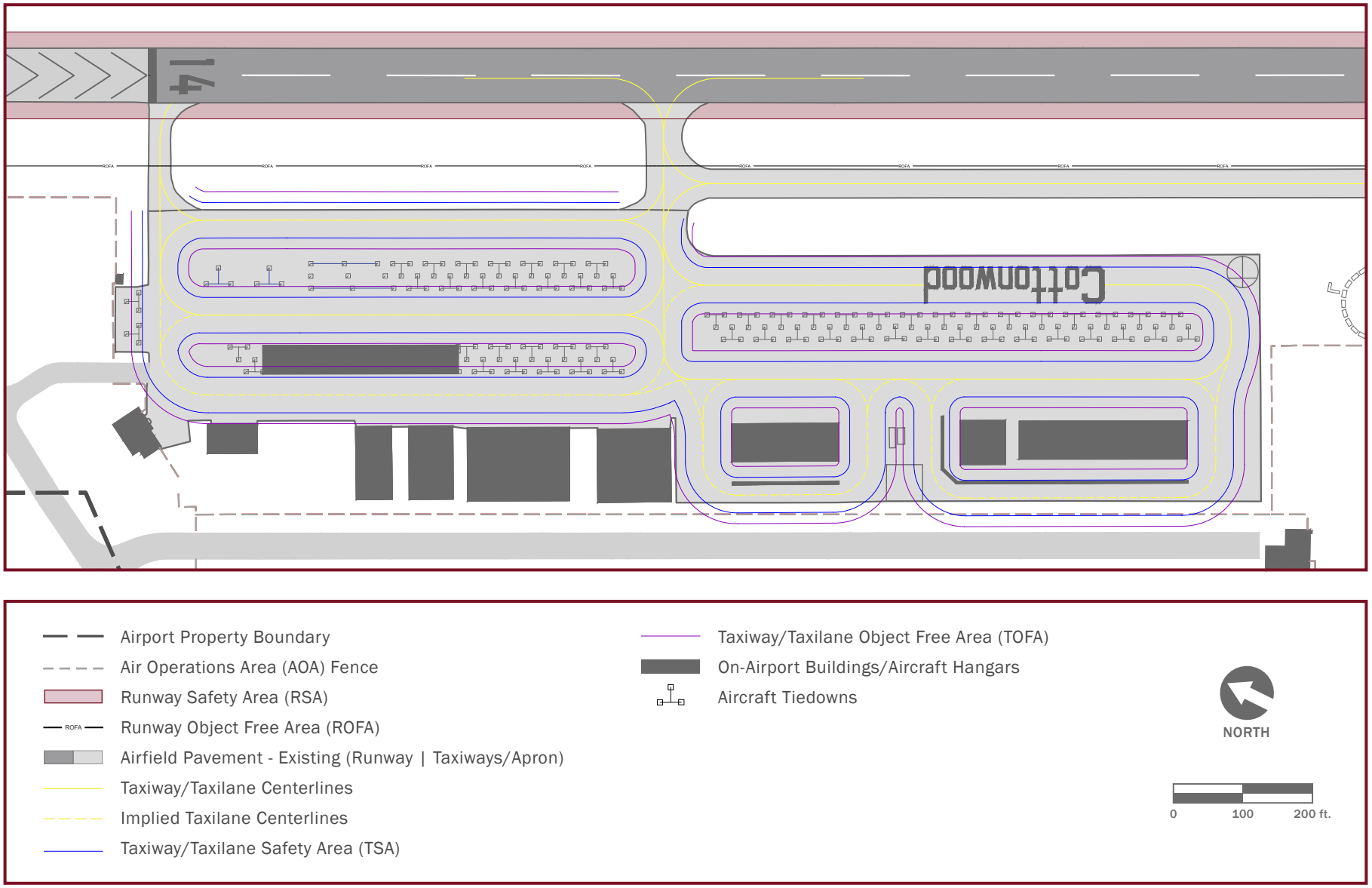
As described in **Chapter 3 – Facility Requirements**, the Airport's main apron has multiple inefficiencies and nonstandard conditions that require mitigation. The alternatives presented within this section address these inefficiencies and nonstandard conditions as well as various facilities on the main apron, including fuel tanks, helicopter parking area, aircraft tie-downs. The objectives of the apron alternatives are to ensure the Airport's main apron satisfies FAA design and safety standards, meets the operational needs of the Airport's existing and future users, and provides compatibility with the recommended runway alternative. The apron alternatives were rated based on the evaluation criteria to determine recommended alternatives for each facility.

Although alternatives will be evaluated for individual facilities (e.g., fuel tanks, helicopter parking area, t-shade), the ultimate locations of each facility will impact one another. It is critical that the recommended alternatives for each facility are conducive with one another and collectively will accommodate future demand. Therefore, the interconnectedness of all facilities was considered during the alternative evaluations and final recommendations.

4.7.1. Apron Configuration

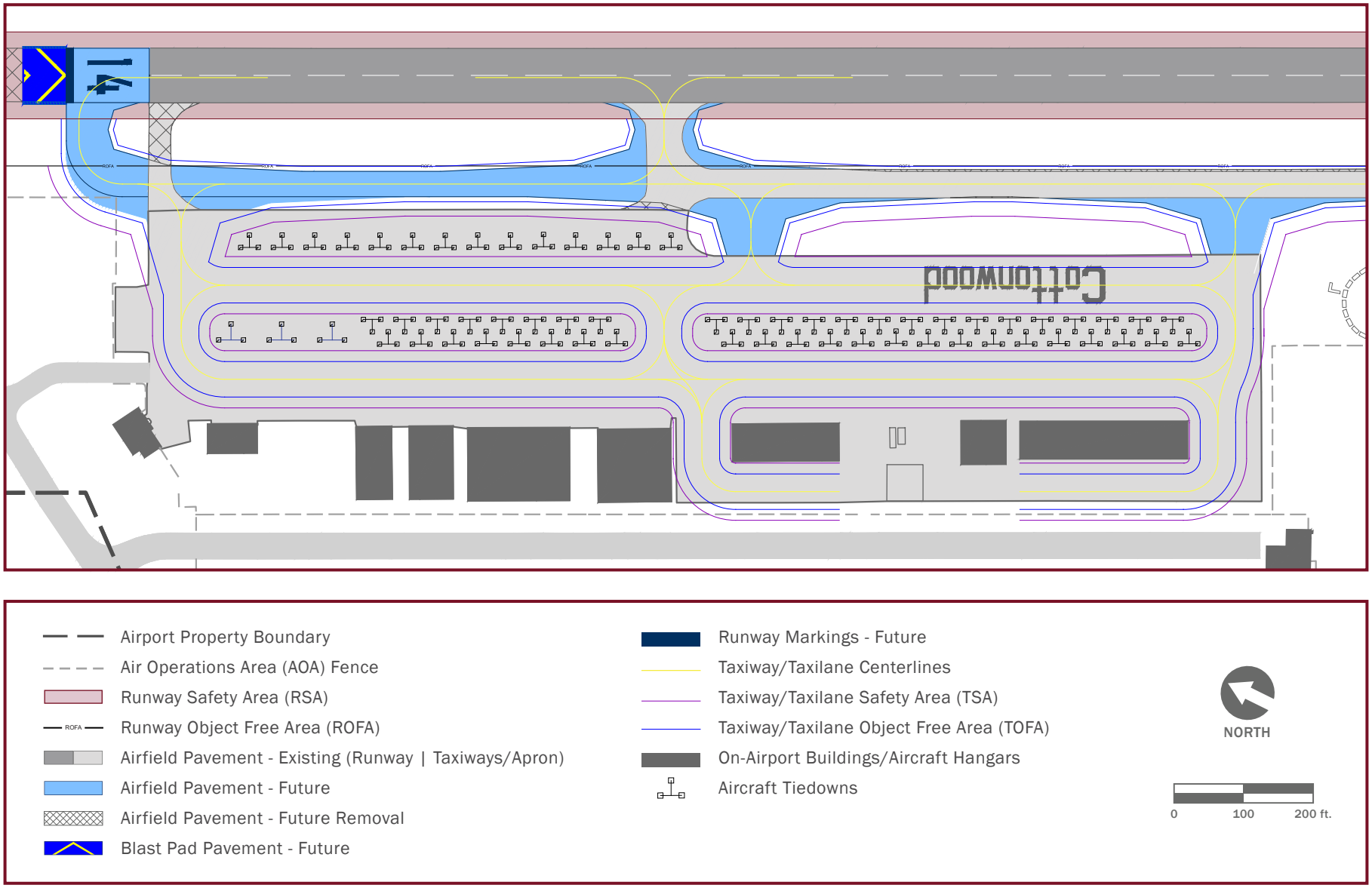
The existing configuration of the main aircraft parking apron and associated taxiway connectors yield multiple nonstandard conditions. As illustrated in **Figure 4.6**, aircraft tiedowns and other facilities penetrate TOFAs, the two taxiway connectors provide direct access between the apron and runway, and the overall circulation is not conducive for efficient movement of the future critical aircraft. **Figure 4.7** presents a reconfiguration of the apron, which mitigates the aforementioned nonstandard conditions while providing a consistent and efficient circulation pattern throughout the apron. To achieve this, the existing taxilane centerlines on the northern half of the apron are extended south to create two parallel taxilanes that span the length of the apron. Additionally, aircraft tiedowns are slightly shifted to mitigate penetrations to the TOFAs. The existing taxiway connectors have been modified to eliminate direct apron to runway access and to align with the recommended runway alternative. A third taxiway connector has been added on the southeast corner of the apron to improve apron access and promote efficient traffic flow. The reconfigured apron, or "base apron configuration," will be used as a foundation for the remaining alternatives within this chapter.

Figure 4.6 - Aircraft Parking Apron Existing Configuration



Source: Kimley-Horn, 2022.

Figure 4.7 - Aircraft Parking Apron Base Configuration



Source: Kimley-Horn, 2022.

4.7.2. Fuel Tanks

Two 10,000-gallon fuel tanks are located on the south portion of the main apron in between the six-unit t-hangar and a conventional hangar. While the type of fuel and storage capacity are adequate to satisfy future demand, the tanks in their existing location penetrate the TOFA. And although there are no marked taxilane centerlines, pilots frequently utilize the apron pavement on both sides of the fueling facility to access the west side of the t-hangars. Therefore, an "implied" taxilane and associated TSA and TOFA are accounted for, as previously shown in **Figure 4.6**. In addition to penetrating the TOFA, the existing location of the fuel tanks represents an advantageous area for future hangar development. Proposed alternatives to relocate the fuel tanks will mitigate TOFA penetrations and free up apron space for possible hangar development in the future. As previously noted, the fuel tank alternatives utilize the base apron configuration (**Figure 4.7**) as the basis from which alternatives are derived.

Fuel Tank Alternatives 1a and 1b

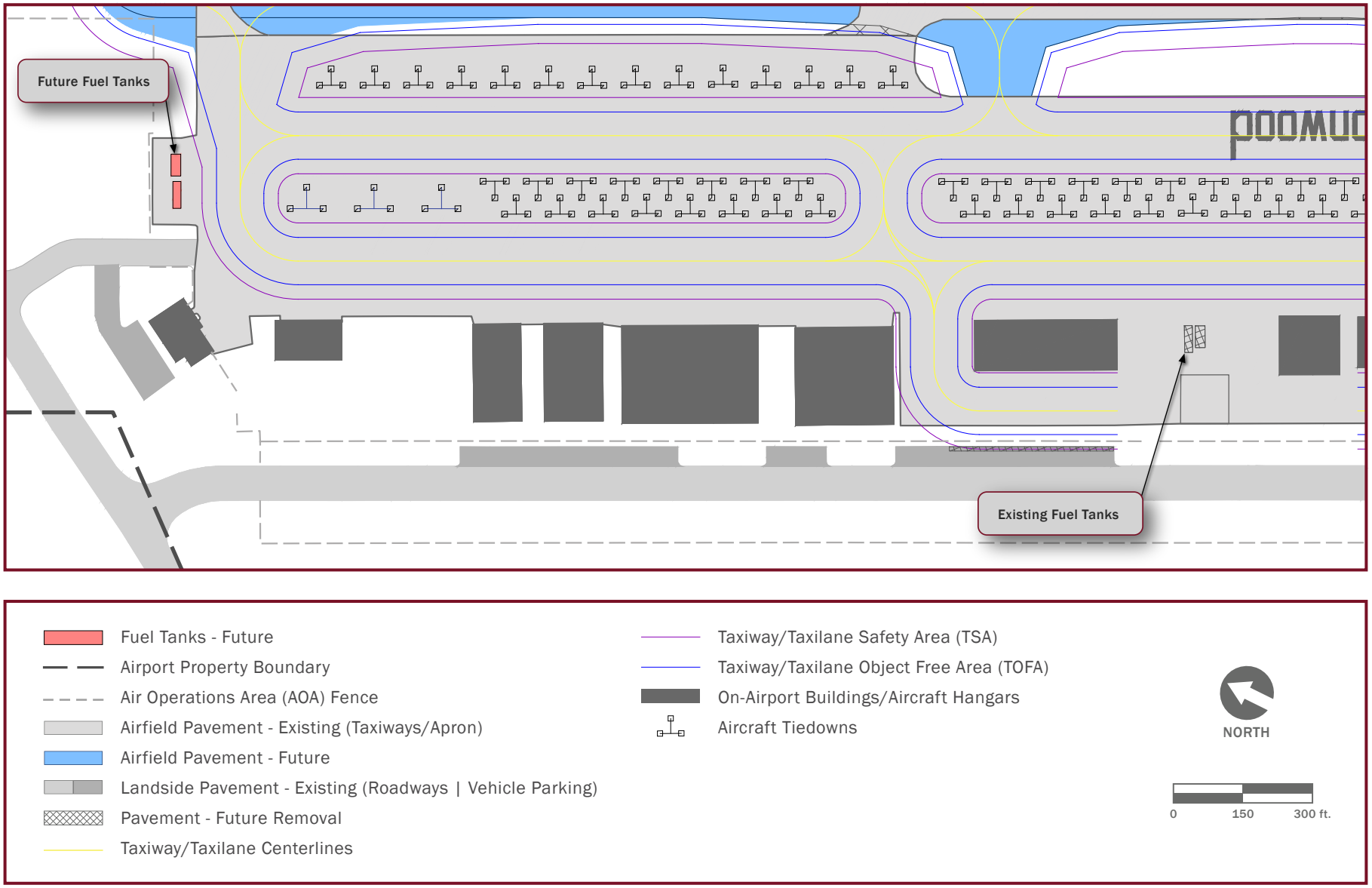
As illustrated in **Figures 4.8** and **4.9**, Fuel Tank Alternatives 1a and 1b propose the relocation of the fueling facilities to the northern end of the apron on an existing slab of pavement. This location is advantages as no new pavement is required for fuel tank installation. Additionally, the location is convenient for refueling trucks and maintenance vehicles as it is adjacent to an Airport access road. The aforementioned existing pavement slab is currently occupied by two aircraft tiedowns. However, the Airport is equipped with more tiedowns than future demand requires.

Fuel Tank Alternative 1a utilizes the base apron configuration presented at the beginning of this section. In this scenario, the fuel tanks are relocated as shown in **Figure 4.8** with no modifications to the base apron configuration. Alternatively, Fuel Tank Alternative 1b (**Figure 4.9**) introduces a slight modification to the base apron configuration by adding a taxilane bypass south of the new fueling location. This bypass creates a designated aircraft fueling and queuing area adjacent to the fuel tanks while providing an alternative taxilane for taxiing aircraft. It should be noted that the taxilane bypass does necessitate the loss of 3 additional aircraft tiedowns. However, the total number of tiedowns available in Fuel Tank Alternative 1b (59 tiedowns) still accommodate future demand.

Fuel Tank Alternative 2

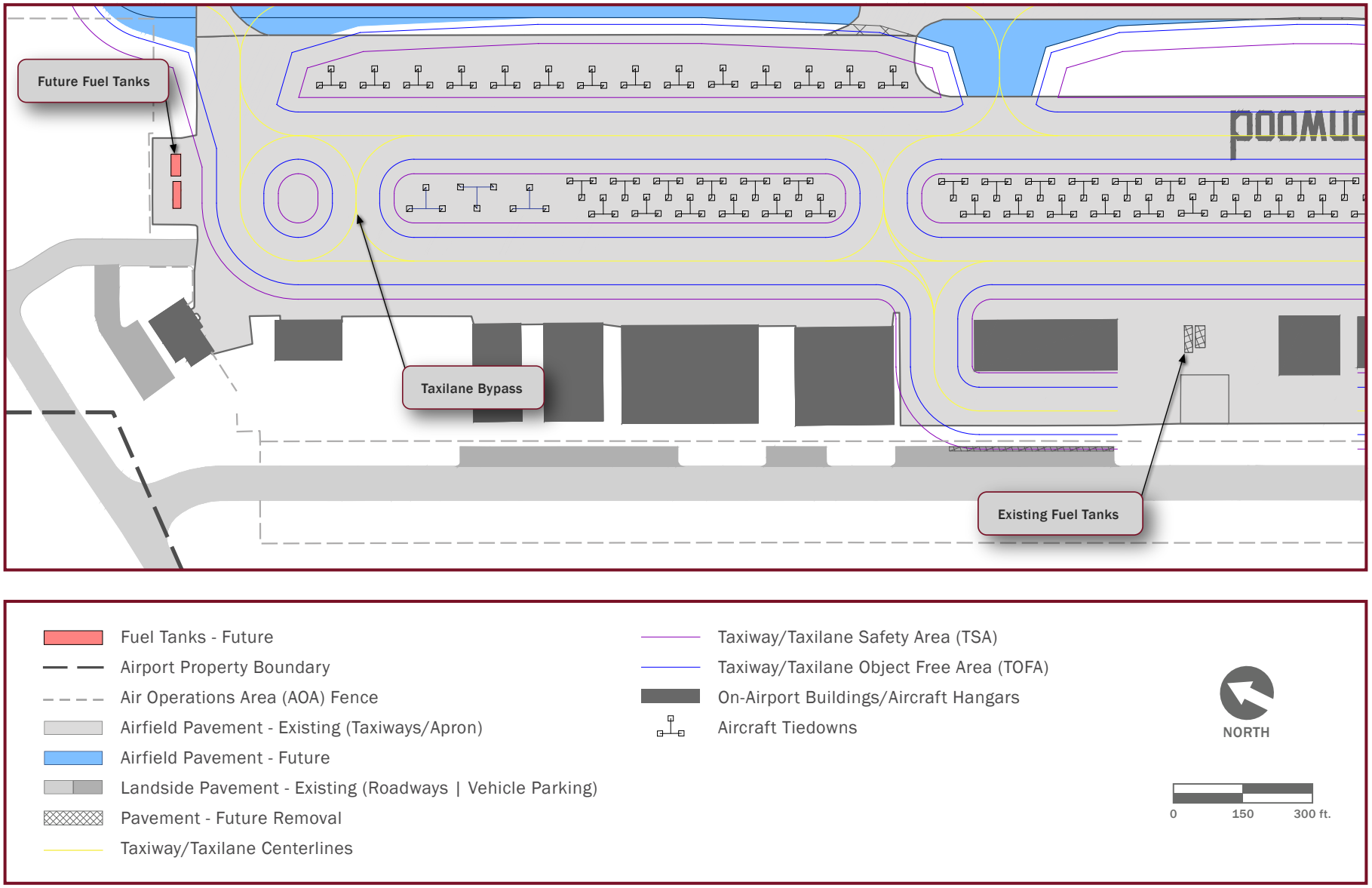
Fuel Tank Alternative 2 proposes the relocation of the fuel tanks in between two existing hangars south of the terminal building. This location is currently unpaved, so Fuel Tank Alternative 2 requires grading and new pavement construction to accommodate the fueling facilities, as illustrated in **Figure 4.10**. Additionally, a light pole is currently located on the edge of the apron pavement in this area and will need to be removed or relocated to make room for the fuel tanks. Like Fuel Tank Alternative 1, this location is convenient for refueling trucks and maintenance vehicles as it is adjacent to an Airport access road. However, this apron-adjacent vacant land near the terminal building represents a prime location for future hangar development. Relocating the fuel tanks to this location restricts future hangar development in this high traffic area.

Figure 4.8 - Fuel Tank Alternative 1a



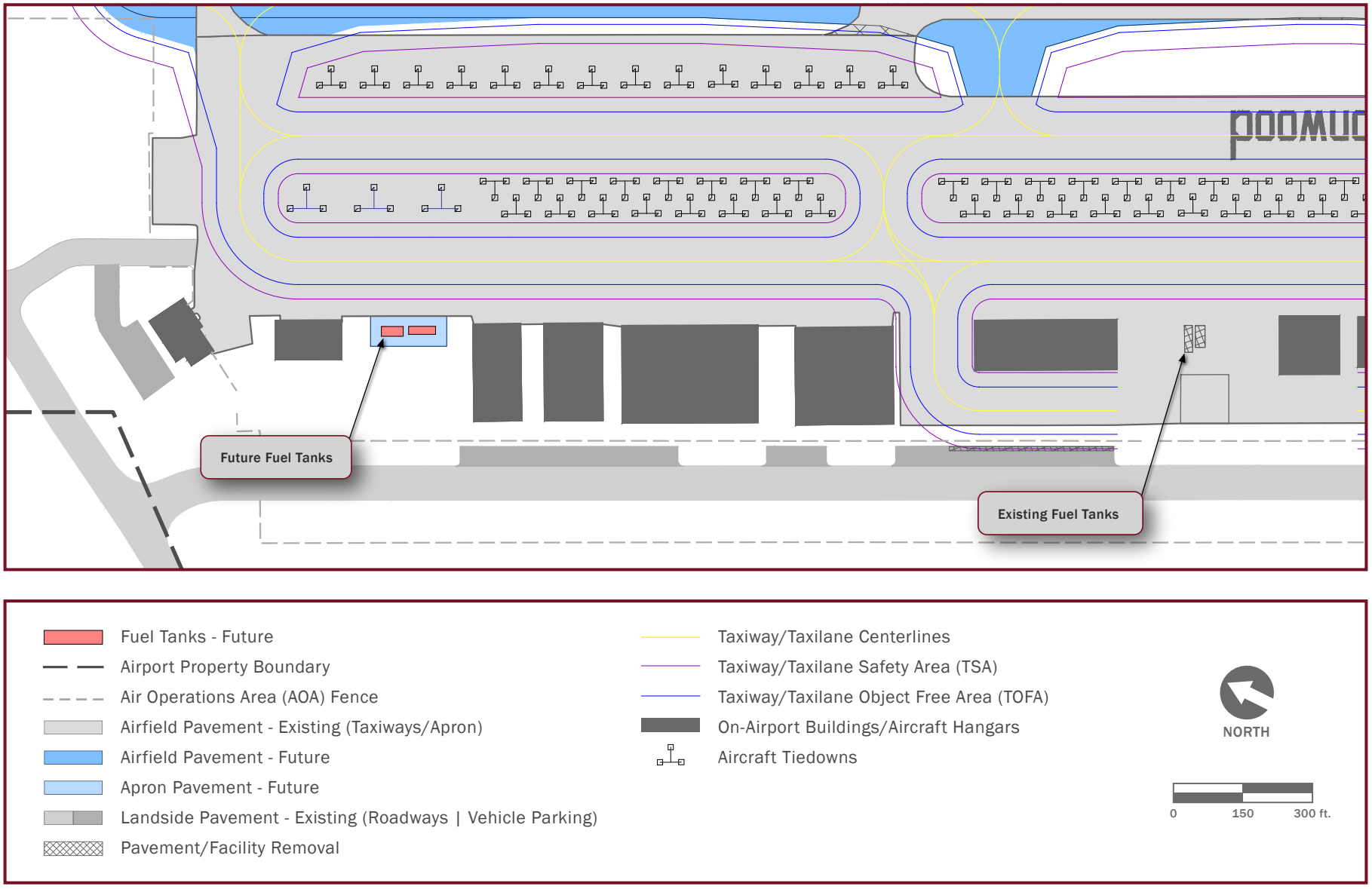
Source: Kimley-Horn, 2022.

Figure 4.9 - Fuel Tank Alternative 1b



Source: Kimley-Horn, 2022.

Figure 4.10 - Fuel Tank Alternative 2



Source: Kimley-Horn, 2022.

Fuel Tank Recommended Alternative

Fuel tank alternatives were analyzed based on the evaluation criteria presented in **Section 4.3**. As shown in **Table 4.5**, the sums of the ratings were used to determine the recommended alternative for the location of the Airport's fuel tank facilities and associated improvements. The evaluation shows the main differentiators between the three alternatives are operational safety, on-airport impacts, and feasibility and cost effectiveness.

Fuel Tank Alternatives 1a and 2 scored lower than Fuel Tank Alternative 1b in operational safety and on-airport impacts due to the fact that aircraft utilizing the fueling facilities would be required to stop in the middle of an active taxilane or maneuver close to the fueling area as to not block the taxilane. Taxing aircraft may attempt to maneuver around fueling aircraft and pedestrians, potentially compromising safety. The proposed bypass in Alternative 1b, however, provides an alternate taxilane option for those aircraft wanting to taxi around fueling aircraft. A dedicated taxilane bypass would prevent traffic delays, the possibility of aircraft attempting to taxi around fueling aircraft, or the need for aircraft to taxi south in order to access Taxiway A.

Fuel Tank Alternative 2 scored lower than Fuel Tank Alternatives and 1a and 1b in feasibility and cost effectiveness for two reasons: 1) Fuel Tank Alternative 2 requires grading and construction of new pavement to accommodate the fuel tanks whereas Fuel Tank Alternatives 1a and 1b utilize existing apron pavement; and 2) The location of the fuel tanks in Fuel Tank Alternative 2 represents an ideal location for future hangar development as it is proximate to the administration building and airport access road. The Airport may miss out on potential hangar development opportunities by utilizing this location for fuel tanks.

For these reasons, Fuel Tank Alternative 1b is the recommended alternative for the Airport's fueling facilities and associated improvements.

Table 4.5 - Evaluation of Fuel Tank Alternatives

Fuel Tank Alternative	Enhances Operational Safety	Satisfies Forecast Demand	Minimizes Off-Airport Impacts	Minimizes On-Airport Impacts	Feasible and Cost Effective	Total Score
1a	2	4	1	3	4	14
1b	4	4	1	4	4	17
2	3	4	1	2	2	12

Source:
Kimley-Horn, 2022.

Scoring legend:
0 = Negatively impacts existing condition
1 = Little-to-no impact on existing condition
2 = Slightly improves existing condition
3 = Improves existing condition
4 = Significantly improves existing condition

4.7.3. Helicopter Parking Area

A marked helicopter parking area is located on the southeast corner of the Airport's main apron. As previously noted, the helicopter parking area penetrates the TOFA associated with the existing and future adjacent taxilanes and therefore must be relocated. Additionally, the City, the PAC, and other Airport users have expressed interest in siting the helicopter parking area in a location that enhances safety and efficiency of operations. In its existing location, the adjacent aircraft tiedowns experience impacts from helicopter operations, including rotor wash and FOD. Presented below, proposed alternatives for the helicopter parking area provide dedicated areas for helicopter operations while considering impacts to all Airport users.

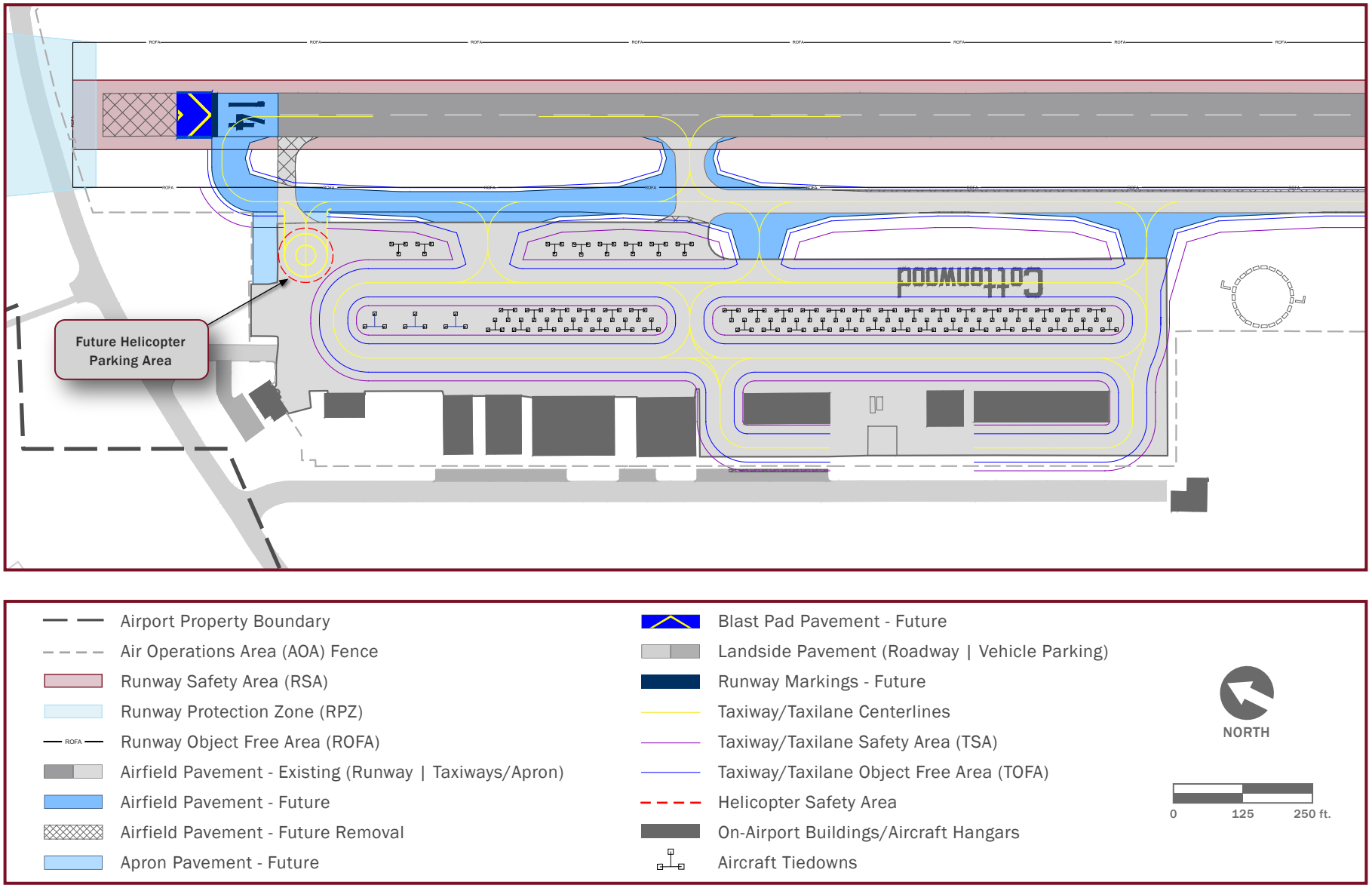
Helicopter Parking Area Alternative 1

Helicopter Parking Area Alternative 1 proposes a relocation to the northeastern corner of the main apron. As shown in **Figure 4.11**, the parking area itself utilizes existing apron pavement. However, some new pavement is required north of the parking area to reduce rotor wash, dust, and FOD associated with helicopter operations. The proximity to the Runway 14 end provides short taxi routes for helicopters and the location near an Airport access road is conducive for medevac and tour operators. Conversely, the location also introduces potential impacts from noise, rotor wash, dust, and FOD to the adjacent aircraft tiedowns, the terminal building, the recommended future location of the fuel tanks, and to vehicle and pedestrian traffic near Mingus Avenue. Nine aircraft tiedowns are also removed to make room for the helicopter parking area ain this location.

Helicopter Parking Area Alternative 2

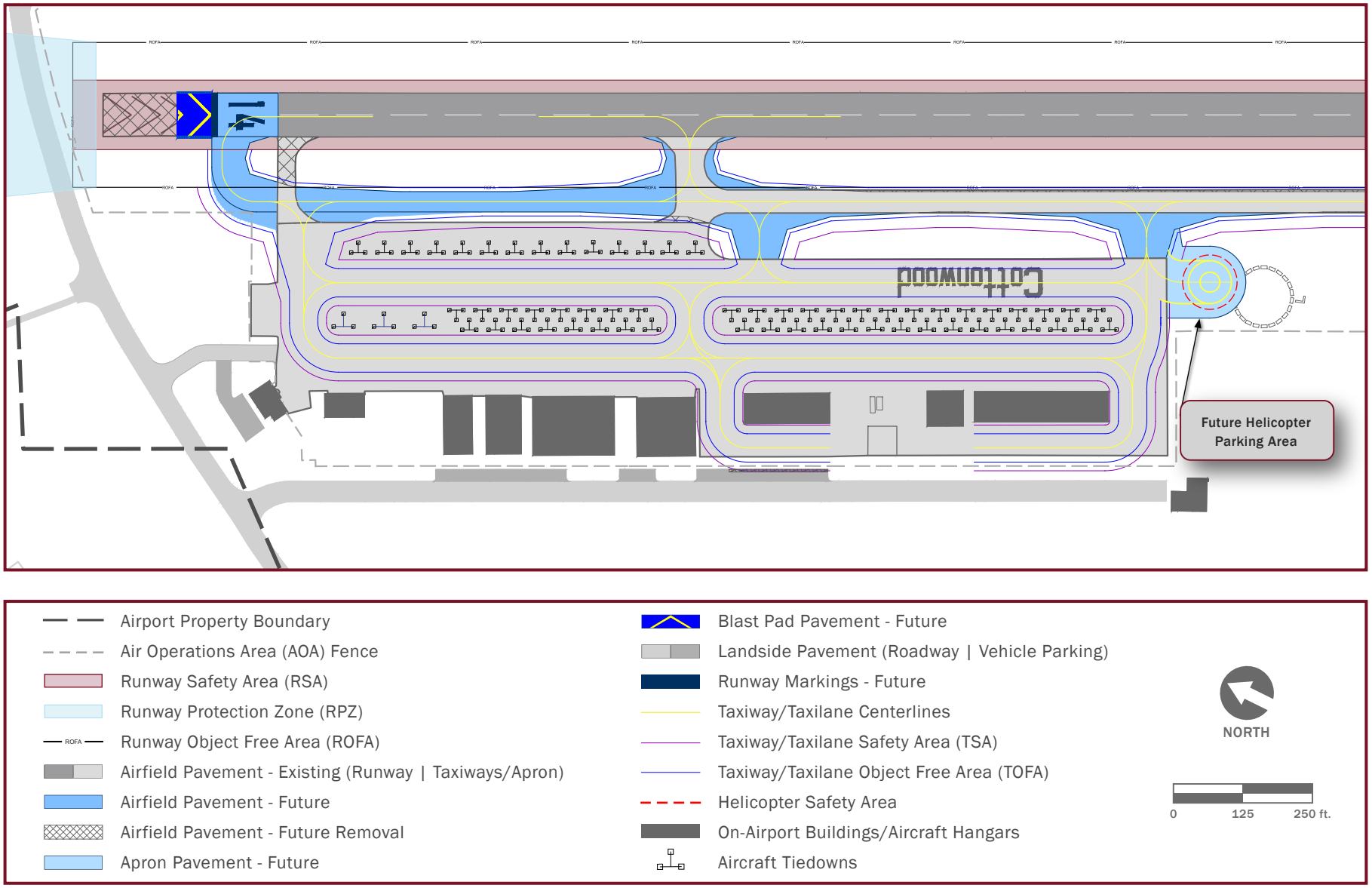
Helicopter Parking Area Alternative 2, illustrated in **Figure 4.12**, proposes the construction of new pavement immediately south of the existing location to accommodate the relocated helicopter parking area. Although grading and pavement construction are required, this location keeps noise, rotor wash, dust, and FOD away from pedestrian and future fueling areas. This alternative does not impact existing aircraft tiedowns, but is located further from the Runway 14 approach end when compared to the previous alternative. However, this location promotes consistency with current operations and procedures due to its proximity to the existing helicopter parking area. Additionally, this alternative requires the relocation of the segmented circle with lighted wind indicator—a project in which the Airport has already expressed interest.

Figure 4.11 - Helicopter Parking Area Alternative 1



Source: Kimley-Horn, 2022.

Figure 4.12 - Helicopter Parking Area Alternative 2



Source: Kimley-Horn, 2022.

Helicopter Parking Area Recommended Alternative

Helicopter parking area alternatives were analyzed based on the evaluation criteria presented in **Section 4.3**. The sums of the ratings were used to determine the recommended alternative for the Airport's helicopter parking area and associated improvements. According to the evaluation presented in **Table 4.6**. the main differentiators between the two alternatives are operational safety, off-airport impacts, and on-airport impacts. Alternative 1 scored lower than Alternative 2 in these areas due to the proposed location of the helicopter parking area in Alternative 1, which may introduce noise, rotor wash, dust, and FOD to the adjacent aircraft tiedowns, the terminal building, the future location of the fuel tanks, and vehicle and pedestrian traffic near Mingus Avenue. Conversely, the proposed location of the helicopter parking area in Alternative 2 maintains helicopter operations near the existing helicopter parking area and away from fueling and pedestrian activity. For these reasons, Alternative 2 is the recommended alternative for the Airport's helicopter parking area and associated improvements.

Table 4.6 - Evaluation of Helicopter Parking Area Alternatives

Helicopter Parking Area Alternative	Enhances Operational Safety	Satisfies Forecast Demand	Minimizes Off-Airport Impacts	Minimizes On-Airport Impacts	Feasible and Cost Effective	Total Score
1	2	4	0	1	3	10
2	4	4	4	4	2	18

Source:
Kimley-Horn, 2022.

Scoring legend:
0 = Negatively impacts existing condition
1 = Little-to-no impact on existing condition
2 = Slightly improves existing condition
3 = Improves existing condition
4 = Significantly improves existing condition

4.7.4. T-Shade

A t-shade provides 12 covered aircraft tiedown positions on the Airport's main apron. In its existing location, the structure penetrates the TOFA and will restrict the movement of the future critical aircraft. The following alternatives mitigate the TOFA penetration and accommodate future traffic at the Airport.

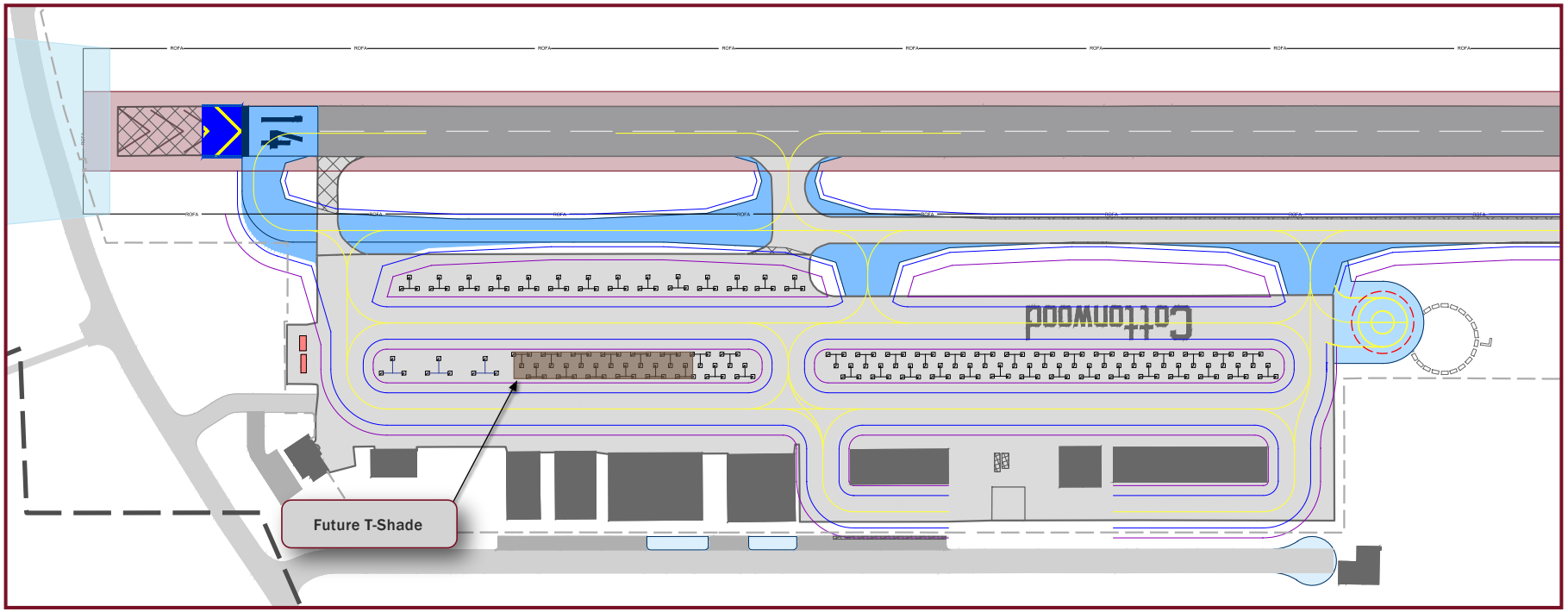
T-Shade Alternative 1: Relocation on Existing Apron Pavement

Alternative 1 proposes relocation of the t-shade to a location on the main apron to avoid TOFA penetrations and meet FAA design standards. While the illustration in **Figure 4.13** shows a t-hangar relocation that is adjacent to its existing position, T-Shade Alternative 1 represents a relocation of the structure to *any location* on the apron that meets FAA standards, including on the southern portion of the main apron. While this alternative proposes a relocation of the t-shade atop existing pavement, the FAA views t-shade structures as hangars and therefore requires local funding for improvements and associated pavement maintenance.

T-Shade Alternative 2: Relocation to New Apron Pavement

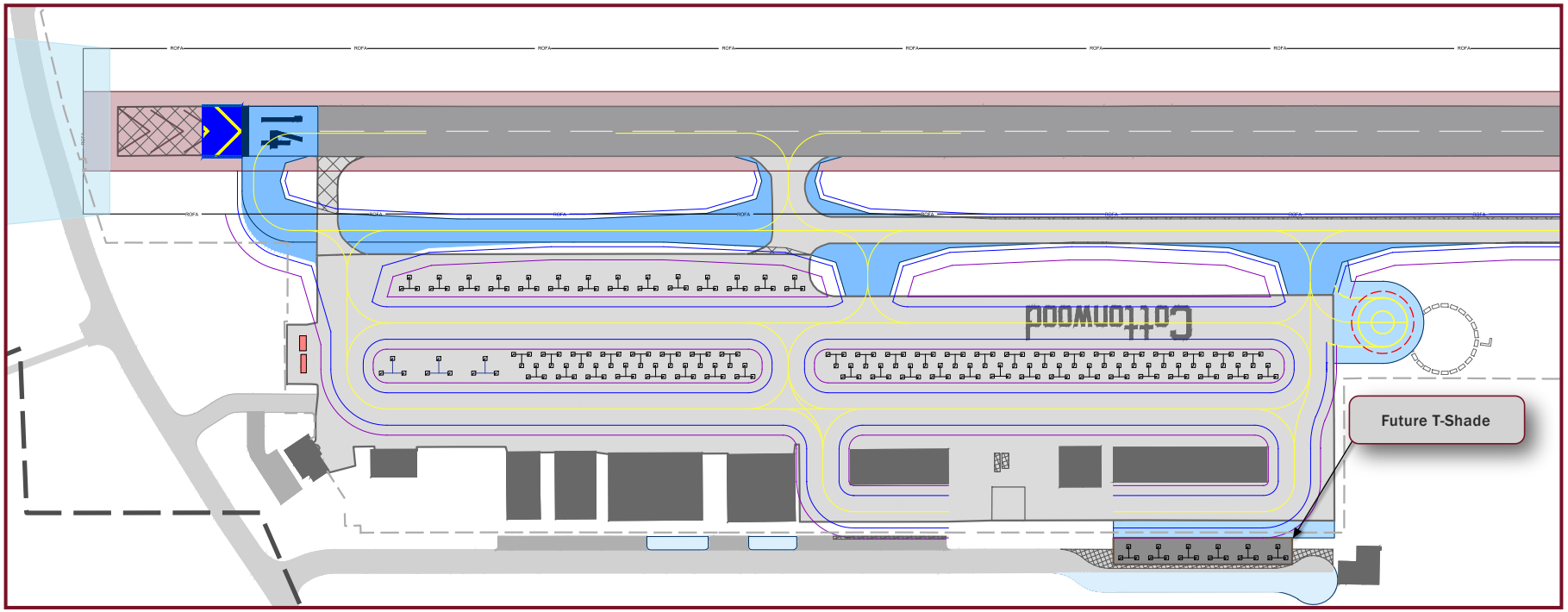
T-Shade Alternative 2 proposes a repositioning of the structure to a location *off of* the existing apron. **Figure 4.14** illustrates a relocation of structure to the west of the access road near the EAA building. This alternative requires grading and pavement construction, the installation of new aircraft tiedowns, and the repositioning of the Airport's access roadway. Although T-Shade Alternative 2 results in a net gain of aircraft tiedown positions when compared to T-Shade Alternative 1 (six additional aircraft tiedowns), a nested tiedown configuration is not possible with this configuration due to constrained space for aircraft taxing. A nested tiedown configuration requires the taxilane to wrap around the t-shade structure to provide access to its western side. However, there is not enough space to accommodate the taxilane and associated TSA and TOFA. Therefore, T-Shade Alternative 2 provides six covered tiedown positions, whereas T-Shade Alternative 1 may provide up to 12 covered tiedown positions. This alternative represents the costliest of the three t-shade alternatives due to the need for grading, construction, and roadway repositioning.

Figure 4.13 - T-Shade Alternative 1



Source: Kimley-Horn, 2022.

Figure 4.14 - T-Shade Alternative 2



- Airport Property Boundary
- Air Operations Area (AOA) Fence
- Runway Safety Area (RSA)
- Runway Protection Zone (RPZ)
- Runway Object Free Area (ROFA)
- Airfield Pavement - Existing (Runway | Taxiways/Apron)
- Landside Pavement - Existing (Roadway | Vehicle Parking)
- Pavement - Future (Airfield | Apron | Roadway/Parking)
- Pavement - Future Removal
- Blast Pad Pavement - Future
- T-Shade Structure and Associated Apron Pavement - Future
- Fuel Tanks - Future
- Runway Markings - Future
- Taxiway/Taxilane Centerlines
- Taxiway/Taxilane Safety Area (TSA)
- Taxiway/Taxilane Object Free Area (TOFA)
- Helicopter Safety Area
- On-Airport Buildings/Aircraft Hangars
- Aircraft Tiedowns

NORTH

0 125 250 ft.

Source: Kimley-Horn, 2022.

T-Shade Alternative 3: Structure Removal

Alternative 3 proposes removal of the existing t-shade structure. While it is recognized that there is a strong desire for covered aircraft parking, especially in warm climates, t-shades are often subject to federal grant eligibility complications and can be expensive to relocate. As previously noted, the FAA recognizes t-shades as hangars and, therefore, the apron pavement underneath the structure may not be federal-grant eligible if maintenance or reconstruction is needed.

T-Shade Recommended Alternative

T-shade alternatives were analyzed based on the evaluation criteria presented in **Section 4.3**. The sums of the ratings were used to determine the recommended alternative. As shown in **Table 4.7**, T-Shade Alternative 2 scored the lowest of the three alternatives primarily due to the costs associated with structure relocation, apron pavement construction, and airport access road rerouting. Additionally, T-Shade Alternative 2 only provides six covered aircraft tiedown positions, whereas T-Shade Alternative 1 provides 12. Although the aviation forecasts prepared for this Master Plan Update do not consider covered aircraft tiedowns, forecast demand for the purposes of this analysis represents the expressed desires of the City, the PAC, and other Airport users to maintain covered aircraft tiedowns. Therefore, T-Shade Alternative 3 scored lower than Alternatives 1 and 2 in satisfying forecast demand and on-airport impacts. For these reasons, T-Shade Alternative 1 is the recommended alternative for the Airport's T-shade relocation and associated improvements.

Table 4.7 - Evaluation of T-Shade Alternatives

T-Shade Alternative	Enhances Operational Safety	Satisfies Forecast Demand*	Minimizes Off-Airport Impacts	Minimizes On-Airport Impacts	Feasible and Cost Effective	Total Score
1	4	4	1	3	1	13
2	4	0	0	2	0	6
3	4	0	1	0	2	7

Source:
Kimley-Horn, 2022.

Note:
* = Covered aircraft tiedowns are not considered in aviation forecasts. Therefore, for the purposes of this analysis, this category represents the expressed desires of the City, the PAC, and various Airport users to maintain covered aircraft tiedowns.

Scoring legend:
0 = Negatively impacts existing condition
1 = Little-to-no impact on existing condition
2 = Slightly improves existing condition
3 = Improves existing condition
4 = Significantly improves existing condition

4.8. HANGAR DEVELOPMENT ALTERNATIVES

As noted in **Table 4.1**, the Airport requires an additional 30,900 square feet of conventional hangar space and 4,800 square feet of t-hangar space to accommodate forecast demand. Plans for future hangar development at the Airport should incorporate adequate space, flexibility in design and implementation, and opportunities for future growth beyond the 20-year planning horizon of this Master Plan Update. Additionally, FAA design standards, operational efficiency and safety, and vehicle and pedestrian access are important considerations.

The base apron alternative, illustrated in **Figure 4.7**, serves as the basis from which the hangar development alternatives were created. The recommended alternative for the helicopter parking area, illustrated in **Figure 4.12**, is also shown in each of the hangar development alternative exhibits (**Figures 4.15** through **4.19**). Additionally, the exhibits include representations of the 20-foot and 35-foot building restriction lines (BRL). BRLs are a function of the Part 77 Transitional Surface and indicate the maximum height of a structure as to not penetrate the Transitional Surface and create an airspace obstruction. The 20-foot and 35-foot BRLs suggest that structures (e.g., aircraft hangars) may not surpass 20 feet and 35 feet in height, respectively, before penetrating the Transitional Surface.

Five hangar alternatives were developed and evaluated. These alternatives, along with the benefits and constraints of each, are described below and a recommended alternative is presented at the end of this section. Like the Runway 14-32 alternatives, each hangar development alternative incorporates the following no-analysis alternatives as introduced in **Section 4.5**:

- Standardization of markings and installation of standard lighting for the helicopter parking area
- Installation of new airfield signage and LED lighting
- Extension of Airport access roadway to new development, as needed
- Construction of vehicle parking near new development
- Extension of utilities to new development, as needed
- Extension of AOA fence to new development, as needed
- Upgrading of existing AOA fence to prevent wildlife intrusions onto the airfield
- Removal of AOA fence on west side of Airport access road and associated access gate off of Mingus Avenue

It is critical to note that the hangar alternatives presented within this document are a representation of forecast demand over the 20-year planning horizon and available space for development at the Airport. The exact number, size, and layout of hangars will ultimately be determined based on a developer's preferred concept so long as it is consistent with the ALP. However, a recommended hangar configuration is important to include in the ALP and to ultimately guide future development.

Hangar Development Alternative 1

Hangar Development Alternative 1 represents a southern extension of the existing taxilane centerlines on the southern portion of the apron. Shown in **Figure 4.15**, this alternative provides aircraft with two access points to a new apron south of the Airport's existing main apron (approximately three acres of new pavement) with a 360-degree taxilane configuration around an island of hangars. Of significant note, Hangar Development Alternative 1 requires land acquisition (approximately 0.6 acres) to accommodate hangars and apron pavement. Additionally, the doors of six box hangars and three t-hangar units open to the east and face the future helicopter parking area. The tenants of these hangars may be impacted by rotor wash and potential FOD as a result of adjacent helicopter operations. Ideally, hangars should be oriented in a way that is conducive to being located in proximity to helicopter operations. The advantages and disadvantages of Hangar Development Alternative 1 are summarized below.

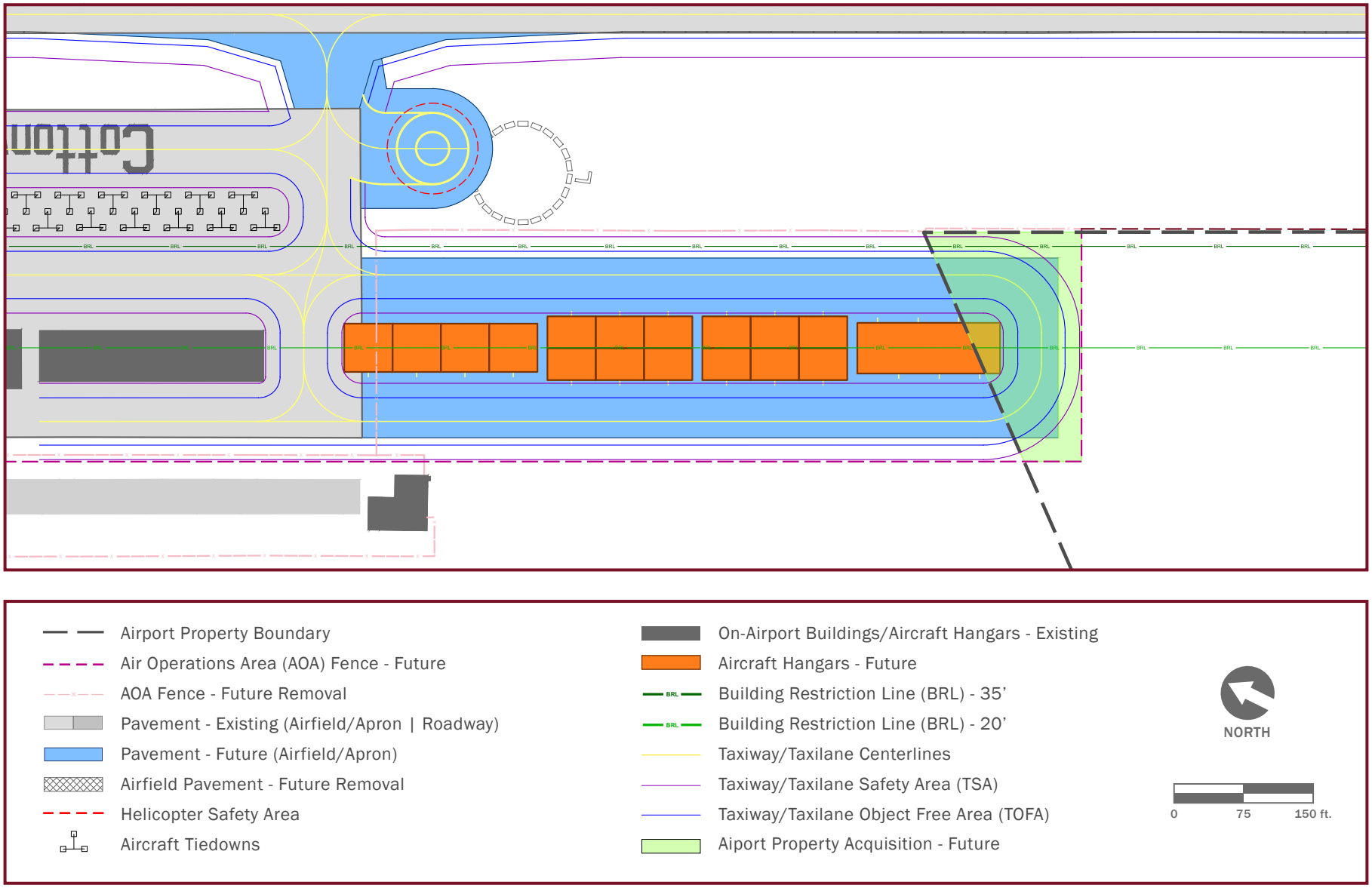
Advantages:

- Efficient taxilane circulation
- Multiple access points (enhances safety)

Disadvantages:

- Requires property acquisition
- Potential impacts from rotor wash and FOD
- Requires grading and utility extension

Figure 4.15 - Hangar Development Alternative 1



Source: Kimley-Horn, 2022.

Hangar Development Alternative 2

Hangar Development Alternative 2 proposes a slight variation to Hangar Development Alternative 1. Shown in **Figure 4.16**, the taxilane circulation is similar to Alternative 1, but the hangars are rearranged so that new development may remain on existing Airport property, eliminating the need for land acquisition. The new apron comprises of approximately 2.7 acres of pavement. In this alternative, the doors of three box hangars and three t-hangar units open to the east and face the future helicopter parking area. Like Hangar Development Alternative 1, the tenants of these hangars may be impacted by rotor wash and potential FOD as a result of adjacent helicopter operations.

The location of the hangars on the western side of the apron affords greater flexibility in hangar size due to increased distance from the 35-foot BRL and more available space west of the proposed apron. Hangar Development Alternative 2 is conducive with future development beyond the 20-year planning horizon as additional hangars and associated taxilanes and infrastructure may connect to the southwestern corner of the proposed apron. The advantages and disadvantage of Hangar Development Alternative 2 are summarized below.

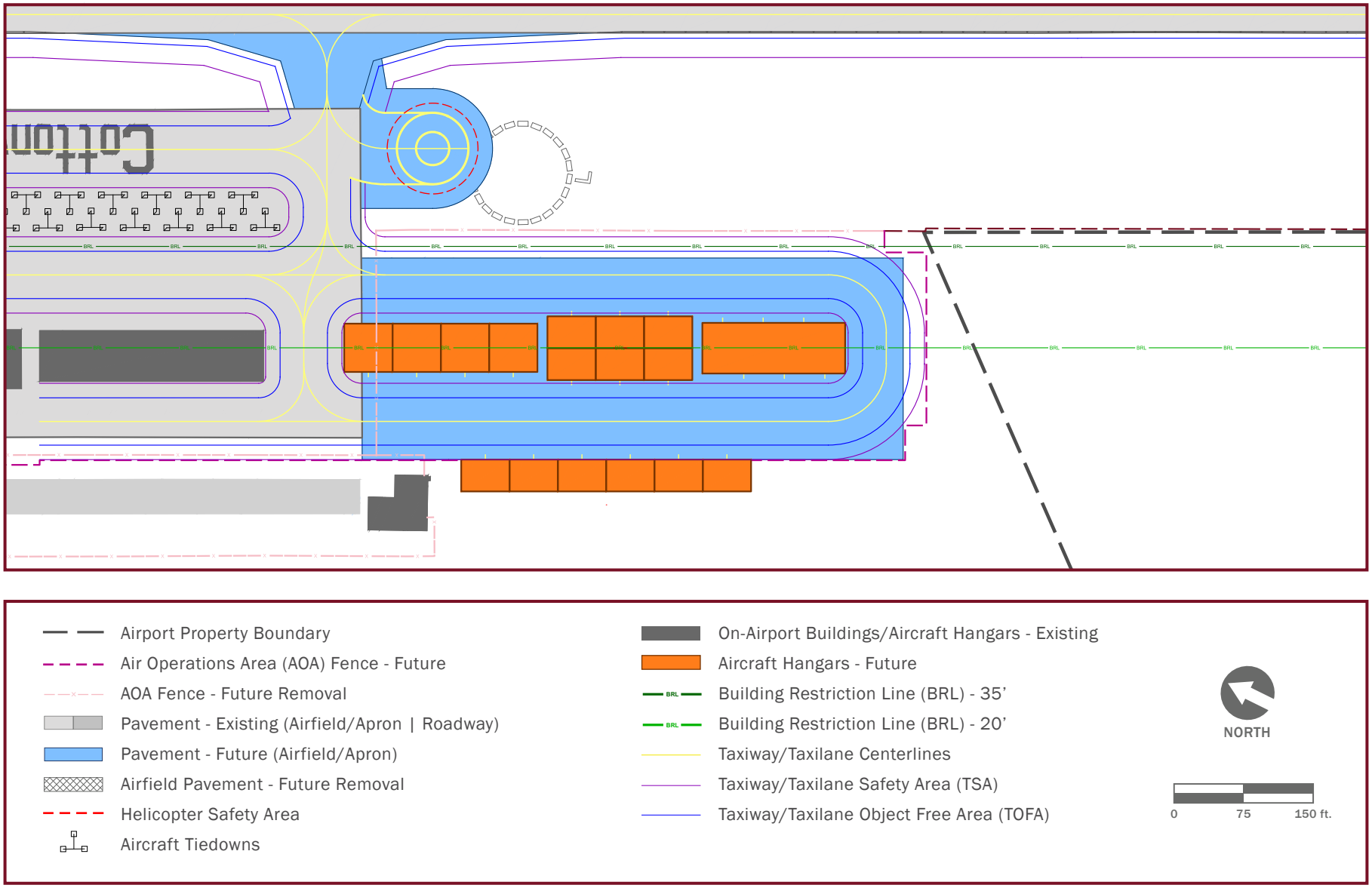
Advantages:

- Efficient taxilane circulation
- Flexibility in sizing of western hangars
- Multiple access points (enhances safety)

Disadvantage:

- Potential impacts to southern hangars from rotor wash and FOD
- Requires grading and utility extension

Figure 4.16 - Hangar Development Alternative 2



Source: Kimley-Horn, 2022.

Hangar Development Alternative 3

Illustrated in **Figure 4.17**, Hangar Development Alternative 3 proposes an approximately 2.6-acre apron containing a 360-degree taxilane configuration around an island of hangars with additional hangars located on the western and eastern sides of the apron. Unlike Hangar Development Alternatives 1 and 2, Hangar Development Alternative 3 strategically orients hangars so that hangar doors do not directly face the helicopter parking area. Although the t-hangars have eastern-facing doors, they are protected from rotor wash and potential FOD by the box hangars to the east. As previously noted, there is increased sizing flexibility with the hangars located on the western side of the apron due to their distance from the 35-foot BRL and more available space west of the proposed apron.

This alternative provides one access point to the proposed apron in order to accommodate hangars east of the apron and to avoid TSA/TOFA impacts to the existing EAA building. The single access point creates an unconventional taxilane intersection north of the proposed apron. Hangar Development Alternative 3 is conducive with future development beyond the 20-year planning horizon as additional hangars and associated taxilanes and infrastructure may connect to the southwestern corner of the proposed apron.

The advantages and disadvantages of Hangar Development Alternative 3 are summarized below.

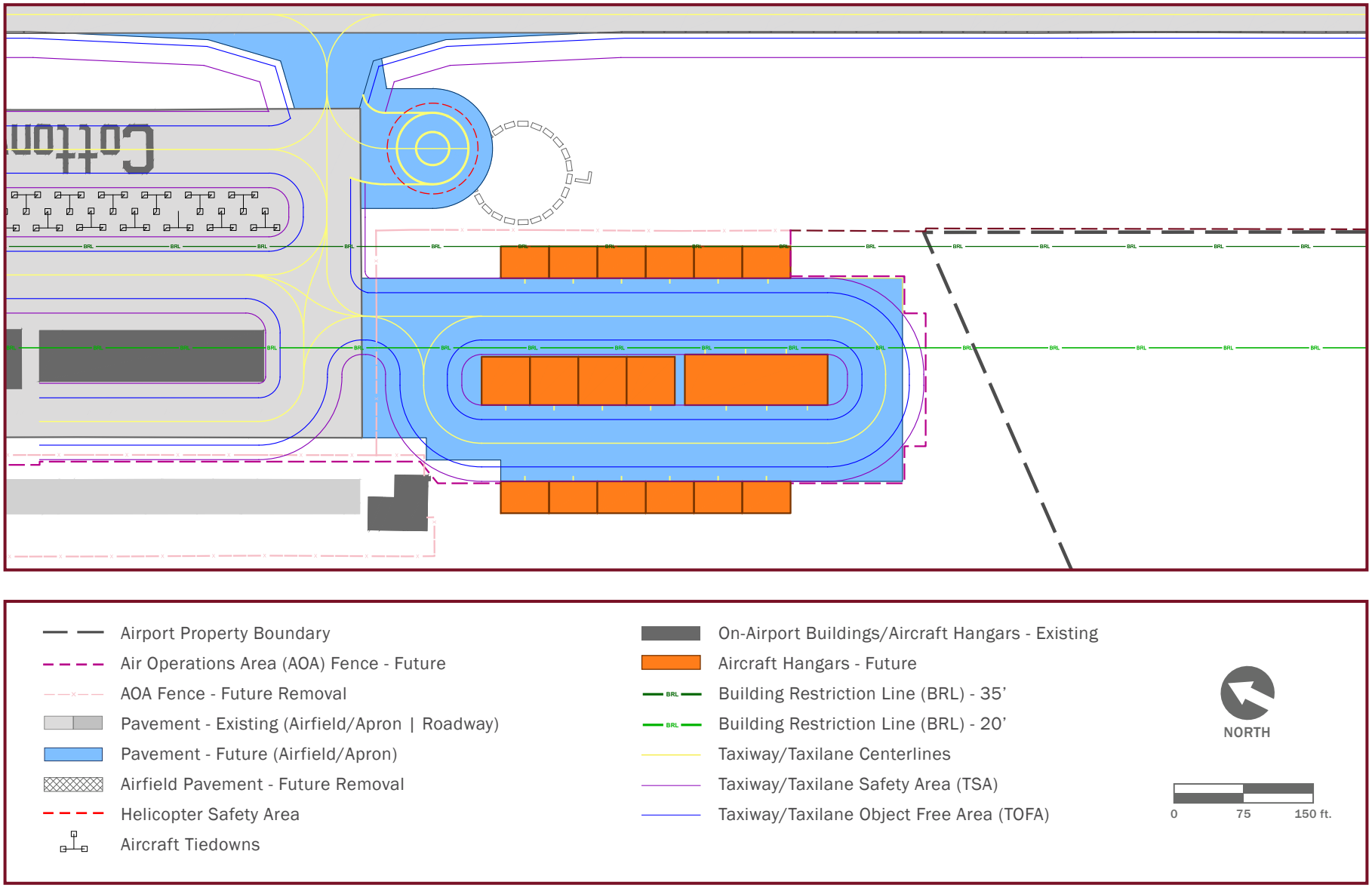
Advantages:

- Avoids impacts from rotor wash and potential FOD
- Flexibility in sizing of western hangars

Disadvantages:

- Single access point
- Unconventional taxilane intersection
- Requires grading and utility extension

Figure 4.17 - Hangar Development Alternative 3



Source: Kimley-Horn, 2022.

Hangar Development Alternative 4

Hangar Development Alternative 4 proposes a new apron south of the Airport's existing main apron (approximately 2.6 acres of new pavement) and is similar to Hangar Development Alternatives 1 and 2 in that it represents a southern extension of the existing taxilane centerlines and provides a 360-degree circulation pattern with two access points. As illustrated in **Figure 4.18**, the conventional hangars in the middle of the taxilane are strategically oriented so that hangar doors do not directly face the helicopter parking area. And while three t-hangars units have eastern-facing doors, they are located on the southernmost portion of the proposed apron to avoid significant impacts from rotor wash and potential FOD associated with helicopter operations. The remaining hangars are entirely located on the west side of the proposed apron, allowing for greater flexibility in hangar size due to increased distance from the 35-foot BRL and more available space west of the proposed apron. Due to the positioning of the hangars, the eastern taxilane may be underused when compared with the western taxilane from which the majority of the hangars may be accessed. However, a 360-degree taxilane configuration enhances efficiency and safety by providing multiple taxiing routes and access points. Hangar Development Alternative 4 is conducive with future development beyond the 20-year planning horizon as additional hangars and associated taxilanes and infrastructure may connect to the southwestern corner of the proposed apron.

The advantages and disadvantages of Hangar Development Alternative 4 are summarized below.

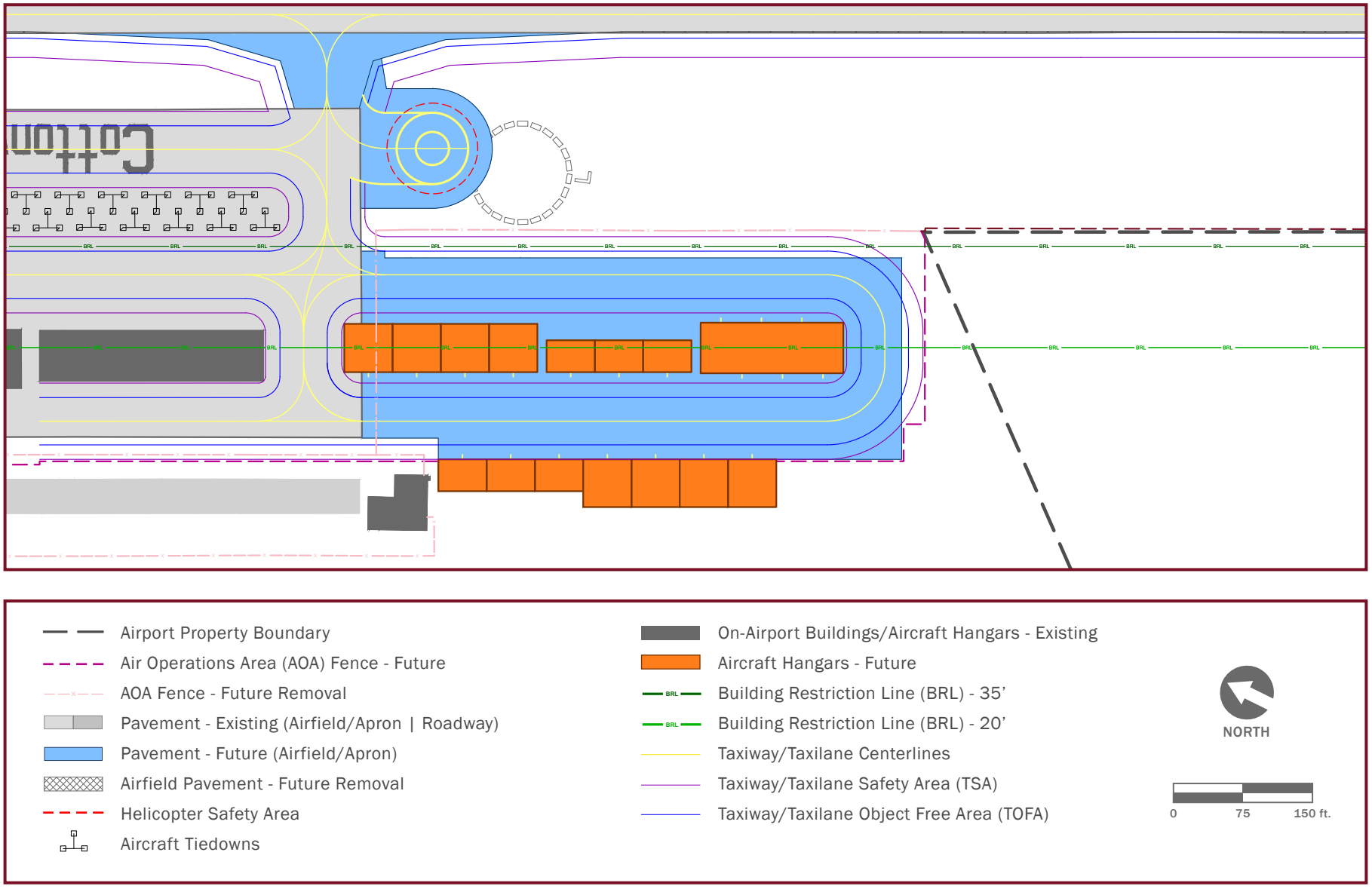
Advantages:

- Avoids significant impacts from rotor wash and potential FOD
- Efficient taxilane circulation
- Flexibility in sizing of western hangars
- Multiple access points (enhances safety)

Disadvantage:

- Potential underutilized east taxilane
- Requires grading and utility extension

Figure 4.18 - Hangar Development Alternative 4



Source: Kimley-Horn, 2022.

Hangar Development Alternative 5

Hangar Development 5, illustrated in **Figure 4.19**, presents a unique configuration when compared to Hangar Development Alternatives 1 through 4. This alternative proposes a new apron (approximately 2 acres of new pavement) with one access point from the Airport's existing apron. Hangars are located on each side of the taxilane with the eastern hangar doors facing away from the helicopter parking area. On the south portion of the prosed apron, a 360-degree taxilane configuration that is perpendicular to the runway provides access to the t-hangar unit and additional conventional hangars. The single access point to the hangar area creates an unconventional taxilane intersection where the proposed apron meets the existing apron, and the single taxilane may cause periodic congestion during periods of high activity. Hangar Development Alternative 5 is conducive with future development beyond the 20-year planning horizon as additional hangars and associated taxilanes and infrastructure may connect to the southwestern corner of the proposed apron.

The advantages and disadvantages of Hangar Development Alternative 5 are summarized below.

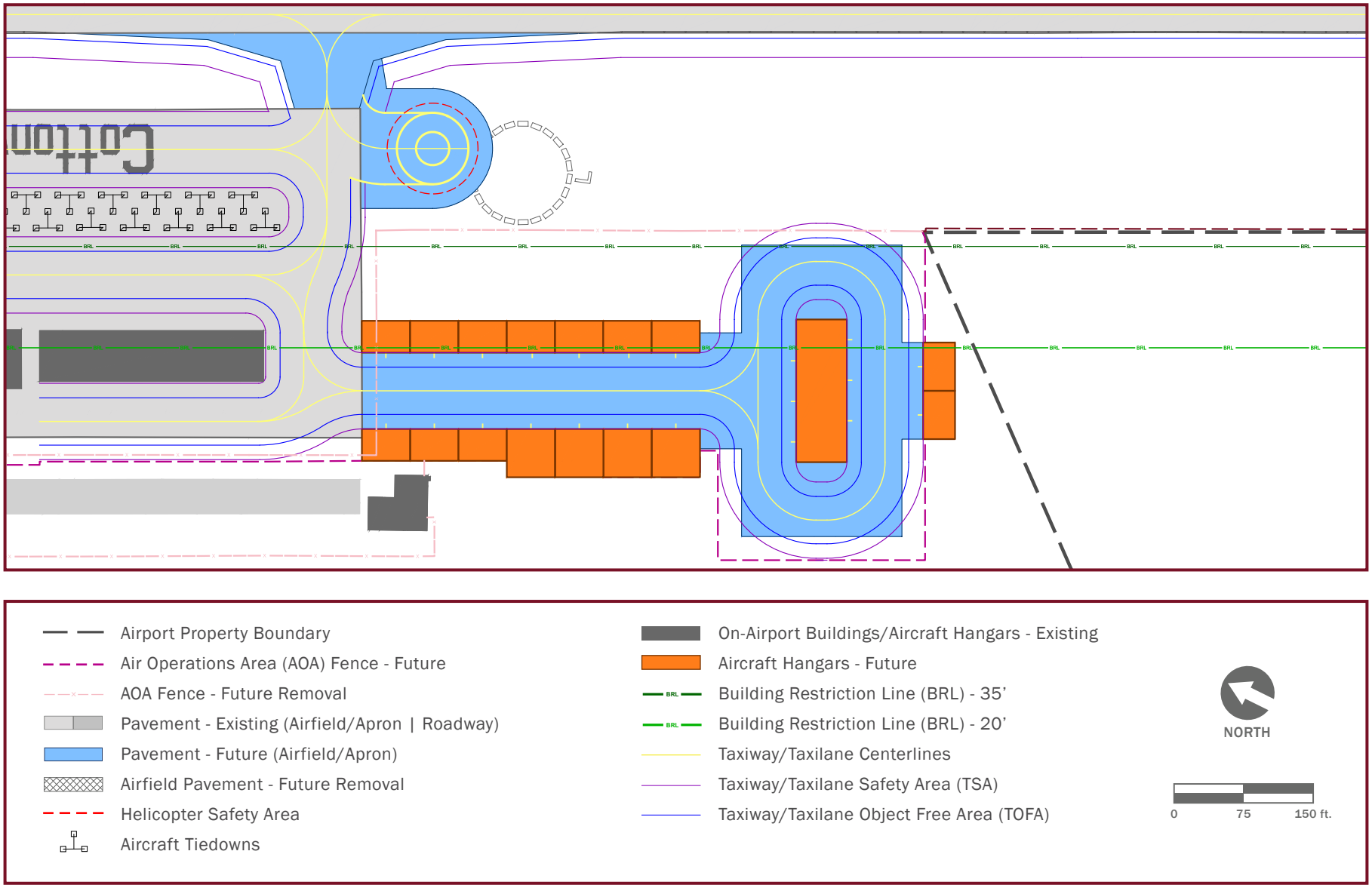
Advantages:

- Avoids impacts from rotor wash and potential FOD
- Flexibility in sizing of western hangars
- Conducive for phased development (north to south)

Disadvantages:

- Single access point
- Unconventional taxilane intersection
- Requires grading and utility extension

Figure 4.19 - Hangar Development Alternative 5



Source: Kimley-Horn, 2022.

Hangar Development Recommended Alternative

Hangar development alternatives were analyzed based on the evaluation criteria presented in **Section 4.3**. Shown in **Table 4.8**, Hangar Development Alternative 1 scored notably lower than Alternatives 2 through 4, primarily due to compromises in operational safety (i.e., the number of hangar doors facing the helicopter parking area), required land acquisition, and a lack of flexibility to exceed forecast demand. Conversely, Hangar Development Alternatives 2 through 4 scored relatively similar across all evaluation criteria. These alternatives were determined to enhance operational safety for taxing aircraft and provide flexibility to exceed forecast demand. When comparing the alternatives to one another, however, Hangar Development Alternatives 3 and 4 require slightly more grading and pavement construction, leading to lower scores in feasibility and cost effectiveness. Similarly, the unique apron layout and taxilane intersections of Hangar Development 5 yields a lower score in on-airport impacts. Therefore, Hangar Development Alternative 2 yielded the highest score. Along with support from stakeholders, the PAC, and the City, Alternative 2 is the recommended alternative to guide future hangar development at the Airport.

Table 4.8 - Evaluation of Hangar Development Alternatives

Hangar Development Alternative	Enhances Operational Safety	Satisfies Forecast Demand*	Minimizes Off-Airport Impacts	Minimizes On-Airport Impacts	Feasible and Cost Effective	Total Score
1	2	3	0	3	0	8
2	3	4	1	3	3	14
3	3	4	1	3	2	13
4	3	4	1	3	2	13
5	3	4	1	2	3	13

Source:
Kimley-Horn, 2021.

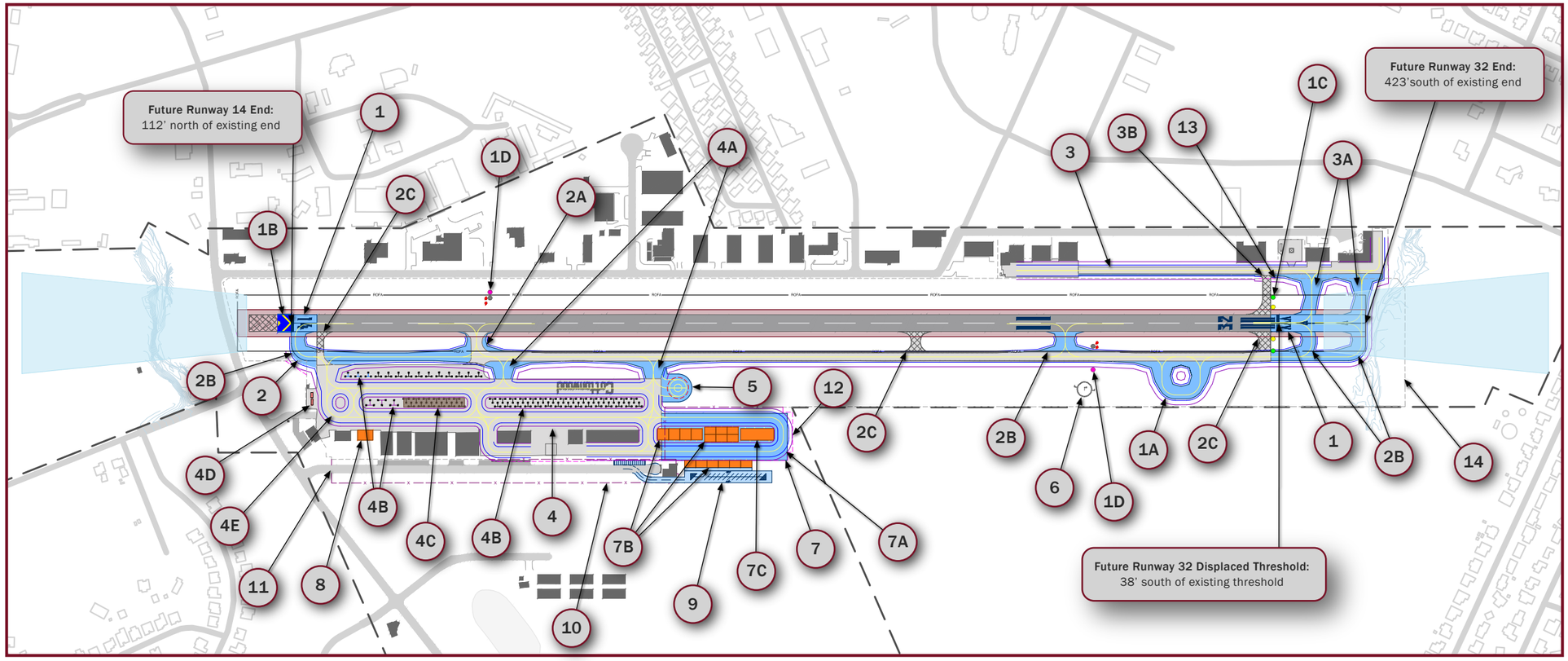
Note:
* = Alternatives that score 4 in this category provide flexibility to exceed forecast demand.

Scoring legend:
0 = Negatively impacts existing condition
1 = Little-to-no impact on existing condition
2 = Slightly improves existing condition
3 = Improves existing condition
4 = Significantly improves existing condition

4.9. RECOMMENDED DEVELOPMENT PLAN

This chapter of the Master Plan Update presents several development alternatives to address aviation forecasts and facility needs over the 20-year planning horizon. The RDP, shown in **Figure 4.20**, combines the no-analysis alternatives (presented in **Section 4.3**) and the individual recommended alternatives for various facilities at the Airport (as identified throughout this chapter). The RDP represents the ultimate conditions of Cottonwood Municipal Airport at the end of the 20-year planning period, which are also depicted on the ALP. A phased implementation plan for these improvements, as well as cost estimates and potential funding sources, are presented in **Chapter 5 – Implementation Phasing Plan**.

Figure 4.20 - Recommended Development Plan



- Airport Property Boundary
- Air Operations Area (AOA) Fence - Existing
- AOA Fence - Removal
- AOA Fence - Future
- Runway Protection Zone (RPZ), Approach/Departure - Future
- Runway Safety Area (RSA) - Future
- Runway Object Free Area (ROFA) - Future
- Airfield Pavement - Existing (Runway | Taxiways/Apron)
- Airfield Pavement - Future
- Airfield Pavement - Future Removal
- Blast Pad Pavement - Future
- Runway Markings - Future
- Taxiway Centerlines - Future
- Taxiway/Taxilane Safety Area (TSA) - Future
- Taxiway/Taxilane Object Free Area (TOFA) - Future
- Helicopter Operating Area Safety Area - Future
- On-Airport Buildings/Aircraft Hangars - Existing
- Aircraft Hangars - Future
- Fuel Tanks - Future
- Off-Airport Buildings
- Relocated T-Shade Structure
- Paved Roads | Vehicle Parking - Existing
- Paved Roads/Vehicle Parking - Future
- On-Airport Wash
- Aircraft Tiedowns (Standard) - Future
- Aircraft Tiedowns (Itinerant) - Future
- Aircraft Tiedowns (Electric Charging Stations) - Future
- Runway End Identifier Lights (REILs) - Existing
- REILs - Future
- Precision Approach Path Indicator (PAPI) - Existing/Future
- PAPI Power Control Units (PCU) - Existing
- PAPI PCUs - Future

0 275 550 1,100 ft.

NORTH

DECLARED DISTANCES

Existing Runway 14-34 Dimensions	4,252' x 75'
Future Runway 14-32 Dimensions	4,787' x 75'

Future Declared Distances	Rwy 14	Rwy 32
Take Off Run Available (TORA)	4,402'	4,787'
Take Off Distance Available (TODA)	4,787'	4,787'
Accel. Stop Distance Available (ASDA)	4,547'	4,787'
Landing Distance Available (LDA)	4,547'	4,402'

PROJECT LIST

1. **Design & Construct Runway Extension & Strengthening**
   - 1A. Design & Construct Run-up Area
   - 1B. Standardize Runway 14 Blast Pad
   - 1C. Relocate Runway 32 Runway End Identifier Lights (REILs)
   - 1D. Relocate Precision Approach Path Indicator (PAPI) Power Control Units (PCUs)
2. **Design & Construct Taxiway A Extension & Narrowing**
   - 2A. Standardize Existing Taxiway Connectors
   - 2B. Design & Construct 4 Taxiway Connectors
   - 2C. Remove Taxiway Pavement
3. **Design & Construct East Taxilane Modifications**
   - 3A. Design & Construct 2 Taxiway Connectors
   - 3B. Remove Taxiway Pavement
4. **Design & Construct Apron Reconfiguration**
   - 4A. Design & Construct 2 Taxiway Connectors
   - 4B. Relocate Aircraft Tiedowns
   - 4C. Relocate T-Shade Structure
   - 4D. Relocate Fuel Tank
   - 4E. Restripe Taxilane Centerlines
5. **Design & Construct Relocated Helicopter Operating Area**
6. **Relocate Segmented Circle with Lighted Wind Indicator**
7. **Design & Construct Hangar Development Area**
   - 7A. Design & Construct Taxilane (includes Grading)
   - 7B. Design & Construct 16 Box Hangars
   - 7C. Design & Construct Six-Unit T-Hangar
8. **Design & Construct Box Hangar**
9. **Design & Construct Roadway & Vehicle Parking**
10. **Remove AOA Fence**
11. **Remove Access Gate**
12. **Construct AOA Fence**
13. **Lower AOA Fence**
14. **Install Wildlife Skirting on AOA Fence**

Source: Kimley-Horn, 2022.

Note: Standard runway width for ADG II is 60 feet. The FAA indicated that a benefit-cost analysis may be performed to determine the financial feasibility of maintaining a 75-foot runway.

4.10. ON-AIRPORT LAND USE

The recommended On-Airport Land Use Plan defines future land use for occupied and vacant land within the Airport's boundaries. This plan provides a framework for development that is compatible with existing and proposed facilities as presented in the RDP (**Figure 4.20**). For undeveloped areas, the plan does not indicate immediate development or relocation of facilities but designates the areas where facilities would be developed as needs arise. The specific layouts of airside, landside, and support facilities within the identified areas will be informed by the RDP and as individual facilities are designed and constructed.

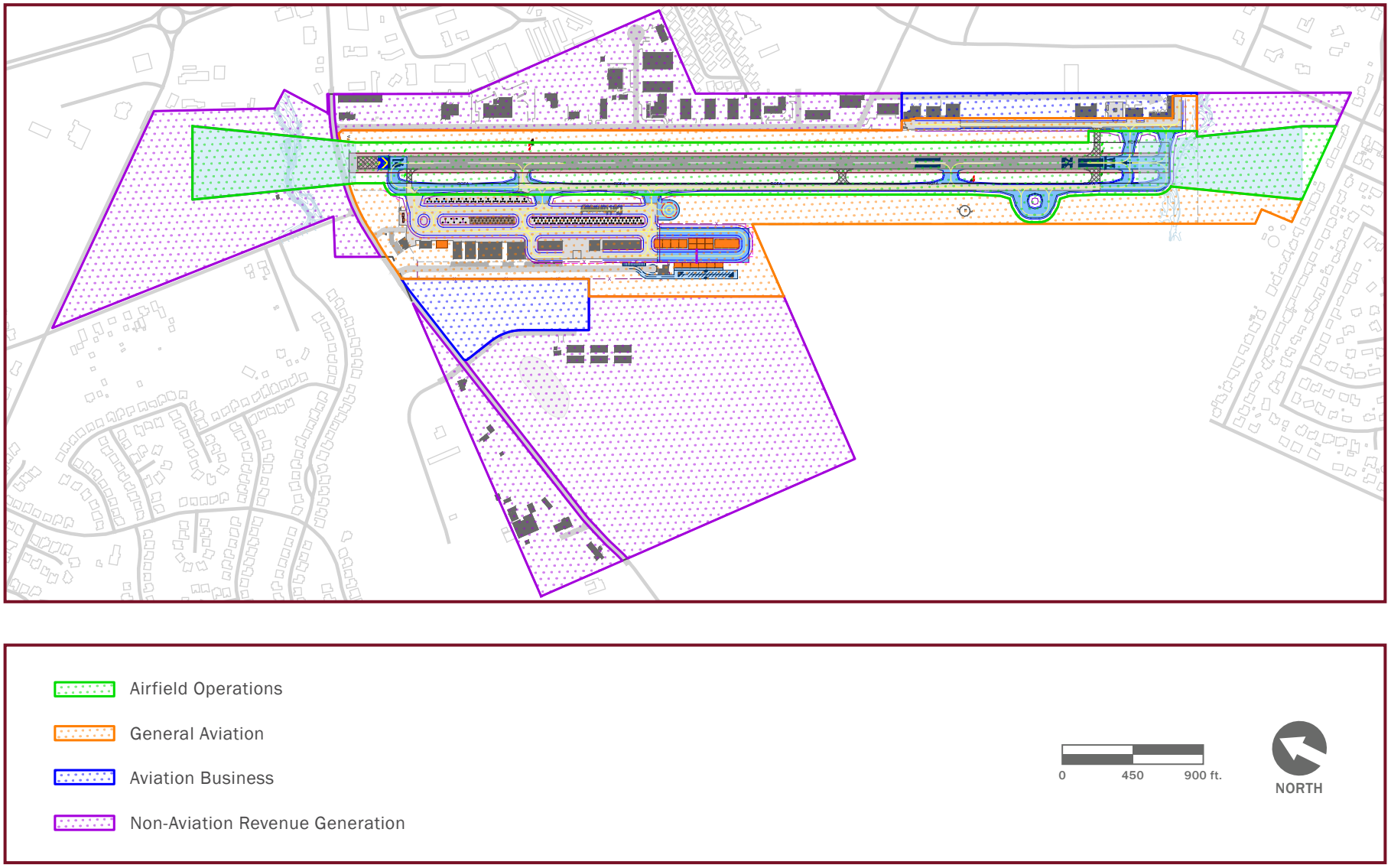
As presented in **Figure 4.21**, the On-Airport Land Use Plan identifies four functional categories of land use:

Table 4.9 - Airport Land Use Categories

Land Use	General Description	Example of Uses
Airfield Operations	Areas within the movement area dedicated to aircraft takeoff, landing, and taxing operations.	Runway 14-32, taxiways, run-up areas, Airport property within runway and taxiway protection areas (e.g., RSA, RPZs, TSAs).
General Aviation	Areas dedicated to aircraft storage, fueling, and maintenance.	Aircraft parking aprons, hangars, tie-down areas, taxilanes, associated vehicle parking facilities.
Aviation Business	Areas dedicate for businesses related to aviation activity and services.	Flight training, aviation-related manufacturing/repair, FBO, associated vehicle parking.
Non-Aviation Revenue Generation	Areas not needed for long-term aviation purposes that could generate revenue for the airport.	Commercial, retail, general industrial/manufacturing.

Source: *Kimley-Horn, 2022.*

Figure 4.21 - Future On-Airport Land Use



Source: Kimley-Horn, 2022.