TUCSON AIRPORT AUTHORITY RYAN AIRFIELD

Chapter Three

Facility Requirements

CHAPTER 3 - FACILITY REQUIREMENTS

INTRODUCTION

This chapter identifies facility recommendations and requirements to accommodate the forecasted level of demand at Ryan Airfield (RYN). The recommendations and requirements are developed in coordination with the aviation activity forecasts presented in **Chapter 2 - Aviation Activity Forecasts**, Tucson Airport Authority (TAA) management and stakeholders, and Federal Aviation Administration (FAA) Advisory Circulars (AC) 150/5070-6B, *Airport Master Plans*; AC 150/5300-13A, *Airport Design*; and AC 150/5060-5, *Airport Capacity and Delay*. This chapter is organized into the following sections:

- Airside Facilities
- Landside Facilities
- Aeronautical Use Facilities
- Non-Aeronautical Uses Facilities
- Summary

AIRSIDE FACILITIES

Facility requirements are identified to resolve existing deficiencies, to accommodate projected growth, and to satisfy TAA development goals. Recommendations for improvements are generally demand driven rather than planned for a specific year, except when facilities are nearing the end of their useful life and need to be reconstructed or replaced. Facility requirements are determined through the use of airport planning standard practices and FAA design standards. The FAA is responsible for the overall safety of civil aviation in the United States, and, therefore, FAA design standards focus on safety, with secondary goals of efficiency and utility. Because the TAA accepts federal funding to improve RYN, TAA is obligated to maintain airport facilities in line with FAA design standards.

AIRPORT AND RUNWAY CLASSIFICATIONS

The FAA has established aircraft classifications that group aircraft types based on performance and geometric characteristics. These classification systems, described below and shown in **Table 3-1**, are used to determine the appropriate airport design standard for specific runway, taxiway, apron, or other facilities as described in FAA Advisory Circular AC 150/5300-13A, *Airport Design*.

- Aircraft Approach Category (AAC): a grouping of aircraft based on approach speed.

- Airplane Design Group (ADG): a classification of aircraft based on wingspan and tail height. When the aircraft wingspan and tail height fall in different groups, the higher group is used.
- Approach Visibility Minimums: relates to the visibility minimums expressed by Runway Visual Range (RVR) values in feet of 1200, 1600, 2400, 4000, and 5000 (corresponding to lower than 1/4 mile, lower than 1/2 mile but not lower than 1/4 mile, lower than 3/4 mile but not lower than 1/2 mile, lower than 1 mile but not lower than 3/4 mile, and not lower than 1 mile, respectively).
- Runway Design Code (RDC): a classification based on the AACC, ADG, and the runway instrument approach visibility minimums. The most demanding AAC and ADG at an airport sets the Airport Reference Code (ARC).

Table 3-1: Runway Design Code Classification Systems

Aircraft Approach Category (AAC)		
AAC	Approach Speed	
A	Approach Speed less than 91 knots	
B	Approach speed 91 knots or more but less than 121 knots	
C	Approach speed 121 knots or more but less than 141 knots	
D	Approach speed 141 knots or more but less than 166 knots	
E	Approach speed 166 knots or more	
Airplane Design Group (ADG)		
Group Number	Wingspan (in feet)	Tail Height (in feet)
I	< 49	< 20
II	49 - < 79	20 - < 30
III	79 - < 118	30 - < 45
IV	118 - < 171	45 - < 60
V	171 - < 214	60 - < 66
VI	214 - < 262	66 - < 80
Approach Visibility Minimums		
RVR (Feet)	Flight Visibility Category (statute miles)	
VIS	Runways designed for visual approach use only	
5000	Not lower than 1 mile	
4000	Lower than 1 mile but not lower than ¾ mile	
2400	Lower than ¾ mile but not lower than ½ mile	
1600	Lower than ½ mile but not lower than ¼ mile	
1200	Lower than ¼ mile	

Bold indicates RDC for RYN

Source: FAA AC 150/5300-13A, *Airport Design*.

CRITICAL AIRCRAFT

The critical aircraft is the most demanding aircraft type or group of aircraft with similar characteristics that regularly use an airport with more than 500 annual operations. An operation is defined as either a takeoff or a landing. An aircraft that performs a touch and go is a landing and a takeoff and counts as two operations. There can be different critical aircraft for different runways based on intended design and use. **Table 3-2** shows the expected critical aircraft for each runway at RYN, based on the analysis in **Chapter 2 - Aviation Activity Forecasts**.

Table 3-2: Critical Aircraft and Applicable Design Criteria

Critical Aircraft RDC and TDG					
Runway	**Condition**	**Critical Aircraft**	**Aircraft Approach Category**	**Airplane Design Group**	**Taxiway Design Group**
6R/24L	Existing /Future	Cessna Citation	B	II	2
6L/24R	Existing/Future	King Air 350	B	II	2
15/33	Existing /Future	King Air B100	B	I (Small)	I

Source: Mead & Hunt

RUNWAY REQUIREMENTS

Runway design standards are based on the requirements to safely conduct aircraft operations for existing and forecasted users of RYN. Facilities must be sized and located appropriately and designed to meet the needs of the critical design aircraft, minimize environmental impact, and consider ongoing operation and maintenance. The design standards include safety areas, object free areas, runway protection zones, and runway setbacks for taxiways and other airport facilities. Runway length will be assessed separately and is driven by aircraft performance and fleet mix operating at RYN.

Airport Operational Capacity

The annual capacity of the runway system, known as the Annual Service Volume (ASV), is the number of aircraft operations that can be accommodated in a year. Existing and forecast annual demand is compared with the ASV to determine the percentage capacity at which an airport is operating and to gauge the timing of future airfield capacity improvements. As annual demand approaches ASV, delays increase, and capacity improvements may be warranted.

With a dual runway configuration combined with a lack of heavy aircraft in the fleet mix, RYN has a design ASV of 355,000 operations. As shown in **Chapter 2 - Aviation Activity Forecasts**, the forecasted growth in traffic by 2038 will result in 115,000 operations, or 33 percent of ASV. Plans to improve capacity should begin when operations reach 60 percent of ASV.

Airfield Capacity Factors

The method used to calculate RYN's ASV and hourly capacity comes from FAA AC 150/5060-5, *Airport Capacity and Delay*. The Airport Cooperative Research Program (ACRP) Report 79, *Evaluating Airfield Capacity,* was an additional reference used to select the appropriate airfield configuration and additional delay factors. The ASV was calculated based on RYN's annual, monthly, and hourly operational levels for these factors:

- Mix Index (aircraft types, weight categories, and operational mix usage)
- Runway orientation and utilization
- Taxiway system configuration
- Runway traffic volume and utilization during peak periods
- Runway instrumentation and lighting systems
- Meteorological weather conditions (visual, instrument, low instrument-airport closed)

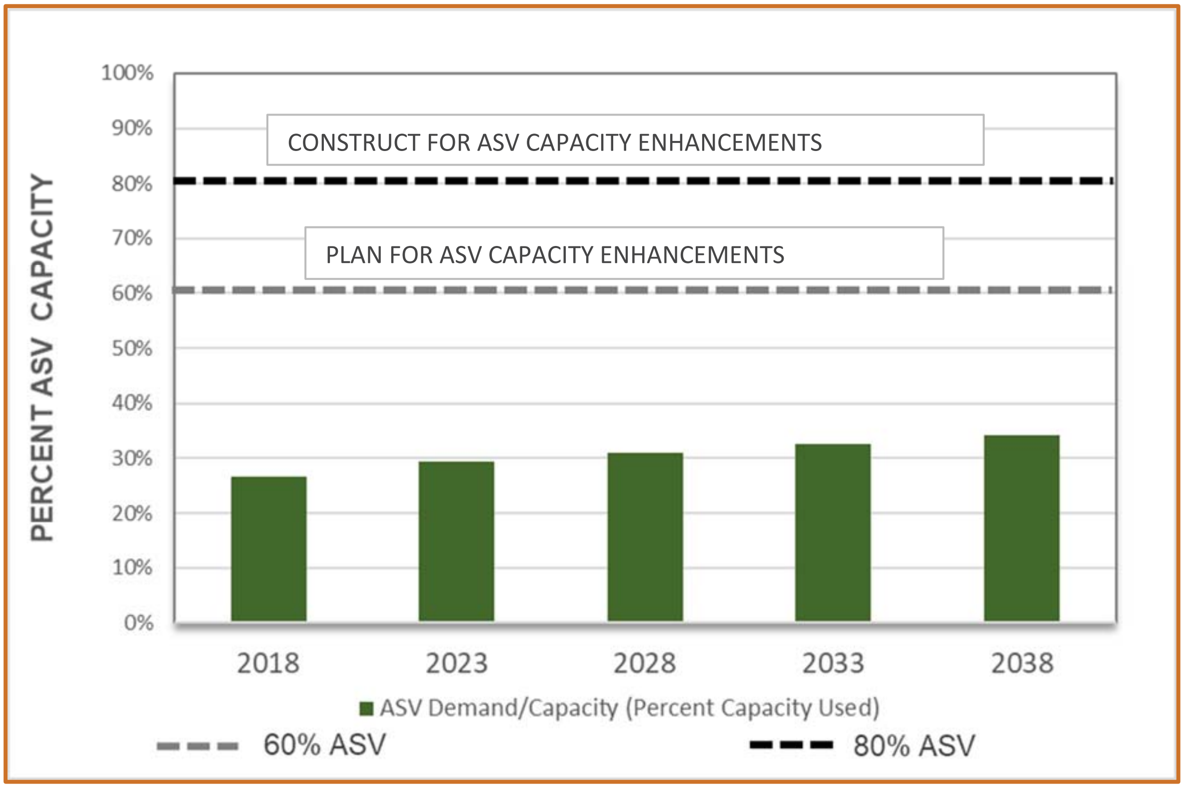
Aircraft Mix Index

The RYN aircraft mix index score of 20 results from operations by aircraft over 12,500 pounds compromising less than 20 percent of total operations. With runway configuration of dual parallel runways separated by 700 feet, the ASV is 355,000 operations. The hourly capacity for Visual Flight Rules (VFR) is 197 operations and during Instrument Flight Rules (IFR) is up to 59 operations per hour.

In **Figure 3-1**, the ASV findings are summarized to indicate that the airfield is at 26.7 percent of annual capacity in 2018 and will be at 34.3 percent of annual capacity in 2038. The figure also compares the calculated ASV to the existing and projected aircraft operations expressed as a percentage of ASV. When 60 percent of the ASV is reached, an airport should begin planning ways to increase capacity, and when 80 percent of the ASV is reached, construction of facilities to increase capacity should be initiated.

The ASV analysis does not indicate areas of systemic airfield capacity challenges occurring annually, so the existing airfield configuration does provide adequate capacity for the operations forecasted for 2038. Future operations are not expected to exceed the 60 percent threshold to trigger planning for airfield capacity improvements.

Figure 3-1: ASV Demand/Capacity Percent



Source: Mead & Hunt

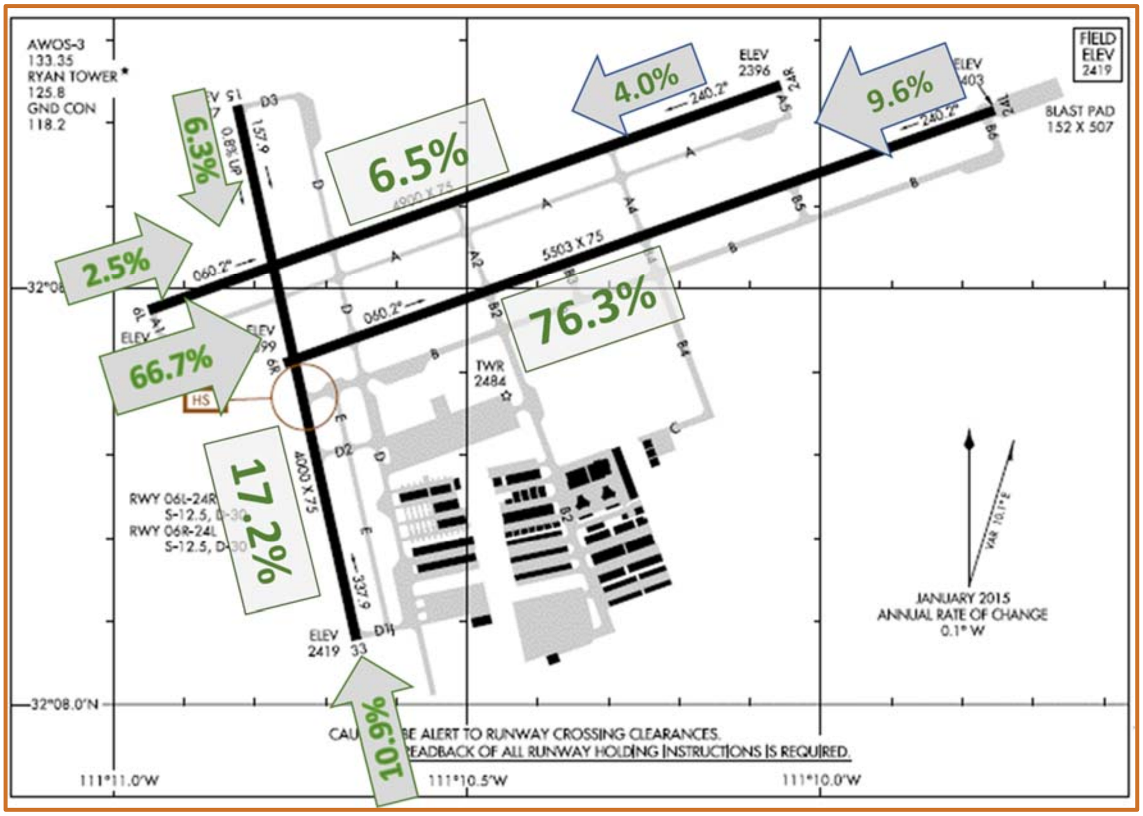
Runway Utilization Based on Wind Coverage

Ten years of wind observations from the RYN Automated Weather Observing System (AWOS) were analyzed to determine prevailing wind direction. The percentage of time the wind aligns with existing runways is shown in **Figure 3-2.** Wind speeds below seven knots are classified as calm or light conditions. The primary runway the air traffic control tower (ATCT) uses during calm conditions is Runway 6R. Parallel Runways 6R/24L and 6L/24R account for 82.8 percent of runway utilization based on wind coverage. The RYN ATCT reports that when the wind shifts in the afternoons, the preferred runway becomes either Runway 24L or 24R.

ARC B-I small aircraft have a maximum crosswind component of 10.5 knots. The crosswind utilization of 17.2 percent (**Figure 3-2**) represents the percentage of the time wind direction and wind speeds would require light aircraft the use crosswind Runway 15/33.

FAA Handbook 7031.2C, *Airway Planning Standard Number One – Terminal Air Navigation and Air Traffic Control Services* (7031.2C), states that if actual aircraft utilization counts for operations to each runway end are not recorded and no better estimate is available, the primary runway is assumed to have 70 percent of operations while the secondary runway(s) have 30 percent. Based on this guidance, the runway utilization for Runway 6R/24L is 70 percent and Runway 6L/24R is 30 percent when the wind is aligned with Runway 6/24.

Figure 3-2: **Runway Wind Coverage**



Source: Mead & Hunt; NOAA, and Contract ATCT count estimates

Runway Length Analysis

The runway length analysis determines the length necessary to meet existing and future demand. The analysis considers aircraft characteristics and annual activity of fleet mix aircraft categories. Runway length analysis is based on the most demanding aircraft, or group of aircraft with similar characteristics, that are expected to use a runway. Assessment on how the recommended runway length can be accommodated at RYN is discussed in **Chapter 4 - Improvement Alternatives**.

The runway length analysis was performed using the following steps:

- Definition of applicable design guidance
- Definition of Five-Step Runway Length Analysis Process
- Interpretation of analysis results
- Recommendation of runway length for the Airport

Applicable Design Guidance

AC 150/5325-4B, *Runway Length Requirements for Airports Design* (AC 5325-4B), provides guidance for this assessment. AC 5325-4B contains three methods for assessing runway length, and the appropriate method depends on the Maximum Takeoff Weight (MTOW) of the aircraft under consideration. The MTOW categories are:

- Small aircraft (MTOW of less than 12,500 pounds)
- Large aircraft (MTOW of between 12,500 pounds and 60,000 pounds)
- Aircraft with a MTOW of more than 60,000 pounds

RYN does not have regular use by aircraft over 60,000 pounds, so the runway length methodology will not include evaluation for that category of aircraft.

Key Terminology: Critical Aircraft

From AC 150/5000-17. It means the most demanding aircraft (or group of aircraft with similar characteristics) to exceed the 500 operations per year. It is used to determine appropriate design standards and pavement characteristics except for runway length.

FAA AC 150/5000-17, Section 3.2.1, states, "In some cases, the Critical Aircraft for runway length may be different from the Critical Aircraft that establishes the most demanding RDC for the runway."

Based on this guidance, for the RYN Master Plan the RDC is set by the "RDC critical aircraft" and runway length is set by the "runway length critical aircraft."

FIVE-STEP PROCESS FOR RUNWAY LENGTH ANALYSIS

Each step of the process is conducted for each runway because the critical aircraft are different for each:

1. Select the Critical Aircraft
2. Find Appropriate Runway Length Method
3. Input Factors That Influence Runway Length
4. Determine the Recommended Runway Length
5. Assess Existing Runway Length and Gauge Extension Benefit

Step 1: Select the Critical Aircraft.

- **Runway 6R/24L:** The size of turbine aircraft that operate at RYN fall with the 75 percent fleet operating at under 60,000 pounds MTOW. Corporate turbine aircraft such as the Cessna Citation Bravo, Bombardier Learjet 45, and Bombardier Challenger 300 fall within this group.
- **Runway 6L/24R**: The secondary runway serves small airplanes (under 12,500 pounds MTOW) with more than 10 passenger seats, which includes the critical aircraft Beechcraft King Air 350.
- **Runway 15/33:** The crosswind typically serves light aircraft and does not need to be built to the same dimension standards as the primary and secondary runways. The representative critical aircraft is the Beechcraft King Air B100.

Step 2: Find the Appropriate Runway Length Assessment Method.

Determination methods for runway length vary depending on the category of aircraft based on weight and expected performance for load factors. AC 5325-4B provides runway length performance charts for aircraft classes and load factors. The fleet mix associated with the lightest aircraft performance chart included twin engine aircraft with up to 10 passenger seats and does not accurately represent the critical aircraft for Runway 15/33. As a result, specific aircraft performance charts are used to determine takeoff performance. The following runway length curve charts were chosen for the runway length analysis:

- **Runway 6R/24L:** FAA AC 5325-4B, Figure 3-1, 75 Percent Fleet at 60 or 90 Percent Useful Load
- **Runway 6L/24R:** FAA AC 5325-4B, Figure 2-2, Small Airplanes Having 10 or More Passenger Seats
- **Runway 15/33:** FAA AC 5325-4B, Figure 2-1, Small Airplanes with Fewer than 10 Passenger Seats

Step 3: Input the Factors that Influence Runway Length.

Aircraft takeoff performance is influenced by environmental factors (elevation, temperature, and runway surface conditions), aircraft settings (engine thrust setting, takeoff weight, flap setting, etc.), and FAA aircraft certification requirements that account for safety margins including obstacle clearance and stopping distance after a rejected takeoff.

Elevation

Aircraft performance changes with altitude. Air density decreases with increase in altitude, reducing aircraft performance and resulting in a longer takeoff roll distance.

Temperature

Temperature affects air density, and runway length requirements are greater during hotter temperatures than they are during cooler temperatures – all other factors being equal. Because temperature varies throughout the year, AC 5325-4B recommends that runway length assessment uses the mean high temperature of the hottest month. The hottest month at RYN is June when the maximum mean temperature is 100 degrees Fahrenheit (°F).

Step 4: Determine the Recommended Runway Length.

Runway Length Assessment Inputs	
Data Point	Input
Temperature (June)	100°F
Elevation	2,418.9’

As mentioned in **Step 2**, the selected performance charts are used to analyze the different runways based on the types of aircraft that typically use each runway. The results are the recommended runway lengths summarized in **Table 3-3**, and the analysis is shown on the following pages.

Table 3-3: Runway Length Findings by Useful Load

Findings by Useful Load			
RUNWAY	**Length at Useful Load 1**	**Length at Useful Load 2**	**Recommended Runway Length**
Primary 6R/24L	5,500'	8,300'	8,300'
Secondary 6L/24R	N/A	N/A	4,900'
Crosswind Runway 15/33	4,500'	5,000'	4,000'

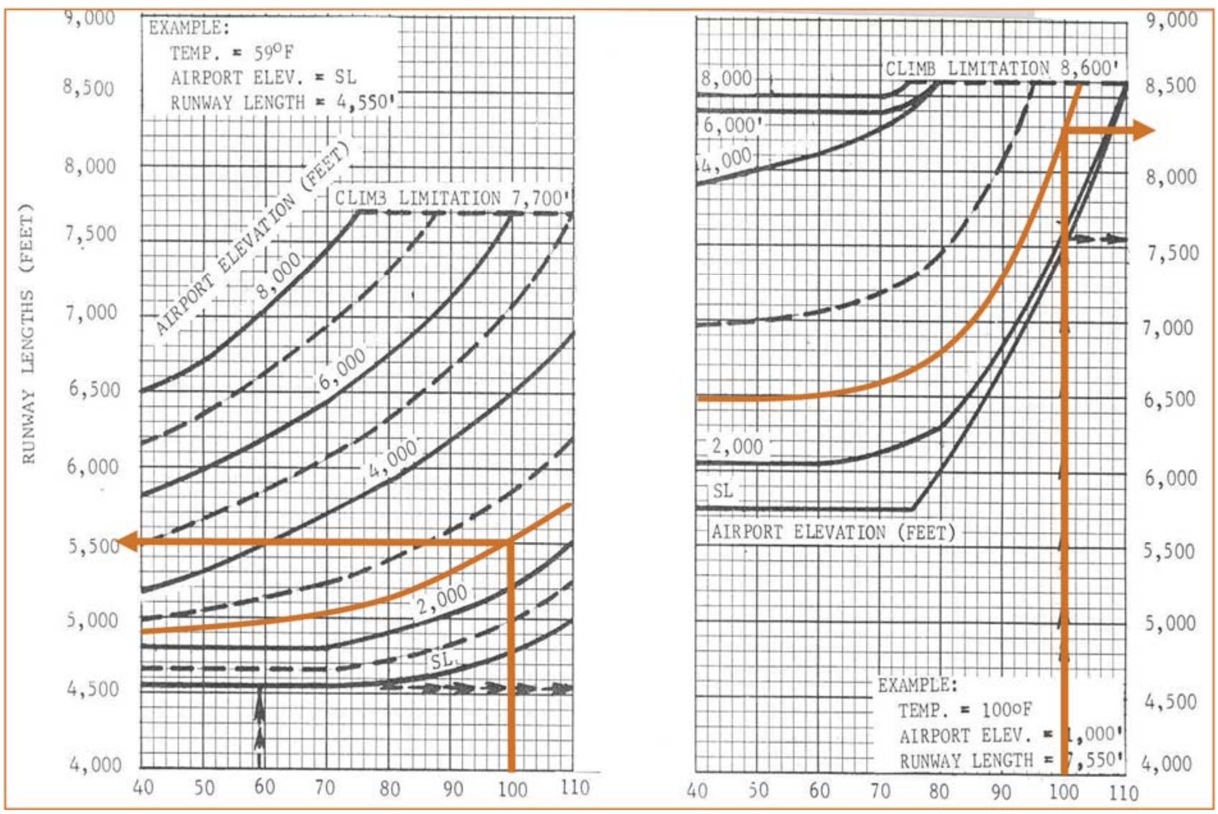
Note: AC 5325-4B does not apply "useful load" to runway length analysis for small airplanes with more than 10 passenger seats, so these fields are "N/A" for Runway 6L/24R.
Useful loads for Runway 6R/24L are 60 and 90 percent and the useful loads for Runway 15/33 are 95 and 100 percent.
Recommended lengths are presented as "up to," and utility may be gained by a shorter runway extension if there are other runway siting criteria under consideration (for example, meeting FAA design criteria and avoiding obstructions).
Source: FAA AC 5325-4B

Primary Runway 6R/24L

Figure 3-3 presents the performance curve charts for 75 percent of the large GA fleet with MTOWs under 60,000 pounds at 60 percent useful load (left chart) and 90 percent useful load (right chart). The 90 percent useful load runway length is used for the recommended runway length.

The recommended runway length for the Primary Runway 6R/24L is up to 8,300 feet.

Figure 3-3: 75 Percent of Fleet at 60 or 90 Percent Useful Load (100°F)



60 percent useful load

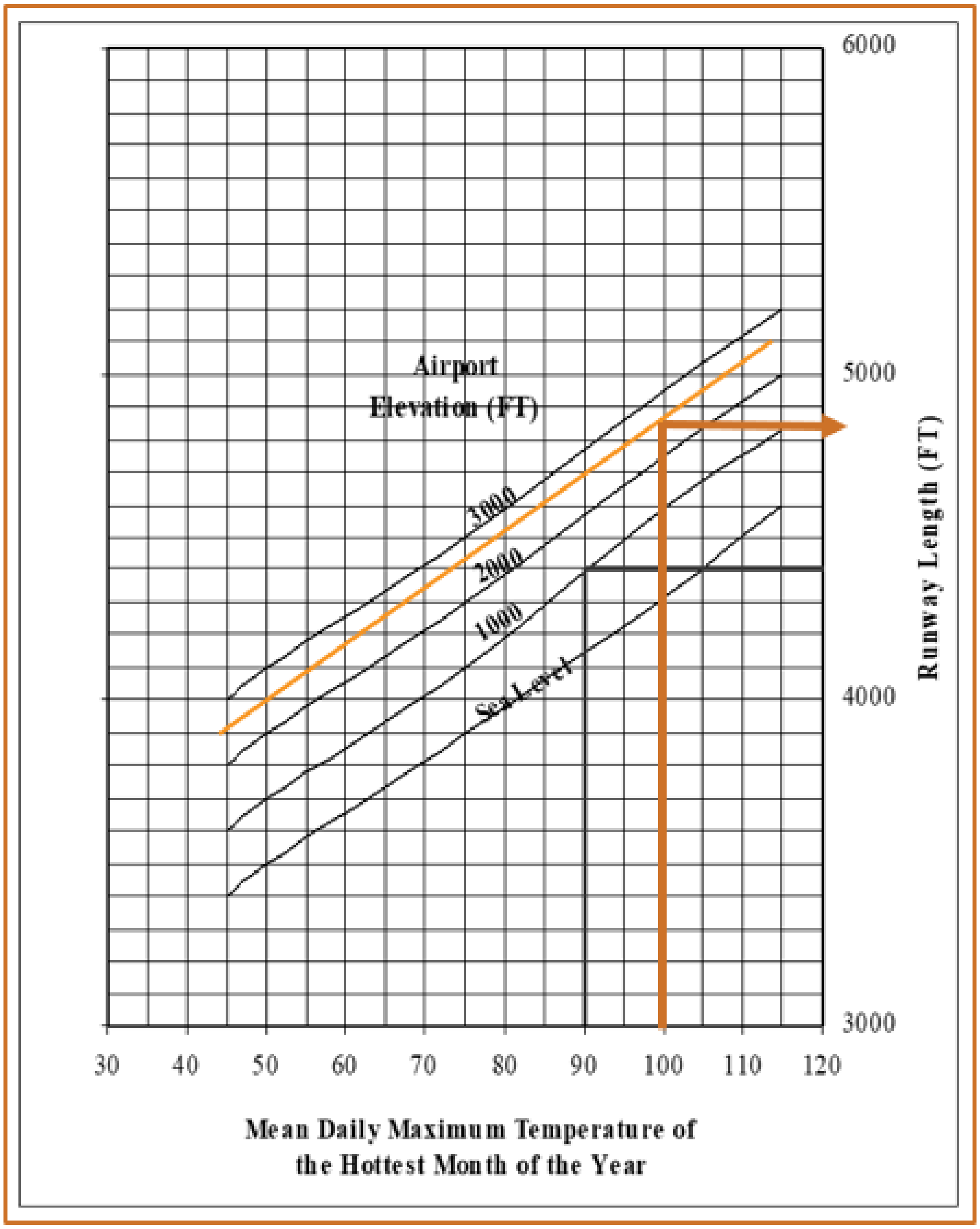
90 percent useful load

Source: NOAA Climate Center, FAA AC 5325-4B

Secondary Runway 6L/24R

Figure 3-4 is the FAA performance curve chart for small aircraft having more than 10 seats and shows a recommended runway length of 4,850 feet. Runway 6L/24R is currently 4,900 feet long and has adequate length to support small aircraft with 10 or more passenger seats when the temperature is 100° F. The recommendation for the Secondary Runway 6L/24R runway length is to retain the existing 4,900 feet length.

Figure 3-4: Small Airplanes Having 10 or More Passenger Seats

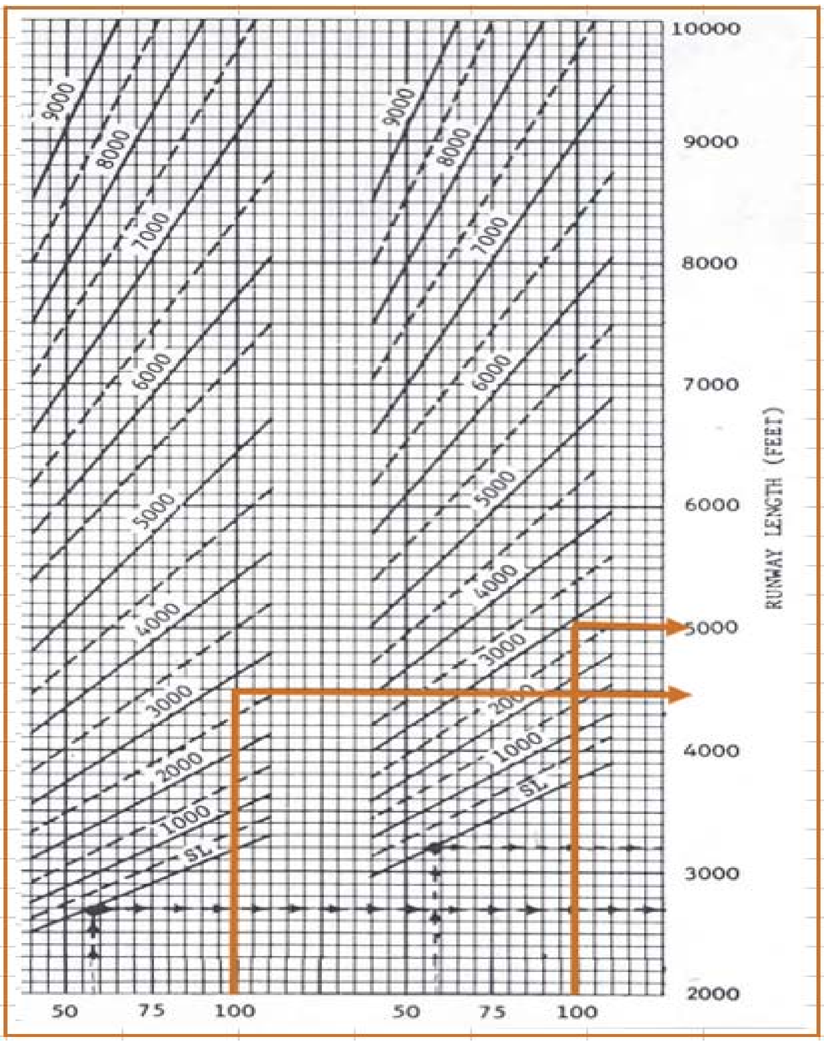


Source: FAA AC 5325-4B

Crosswind Runway 15/33

Figure 3-5 is the FAA performance curve chart for small airplanes with fewer than 10 passenger seats and presents performance charts for 95 and 100 percent of the fleet with MTOW of 12,500 pounds or less. The crosswind runway currently sits at 4,000 feet long and 75 feet wide and is designed to B-I (Small) RDC standards. Based on the figure below, the identified runway length is 4,500 feet for 95 percent and 5,000 feet for 100 percent of the fleet. Due to RYN having lengthier parallel runways, maintaining the runway length of 4,000 feet is the more prudent option. The critical aircraft for Runway 15/33 and others like it (ADG I/II) are supported by the 4,000-foot runway length. The ADG III crosswind component is covered by the longer parallel runways.

Figure 3-5: **Small Airplanes with Fewer than 10 Passenger Seats**



95 % useful load

100 % useful load

Source: FAA AC 5325-4B

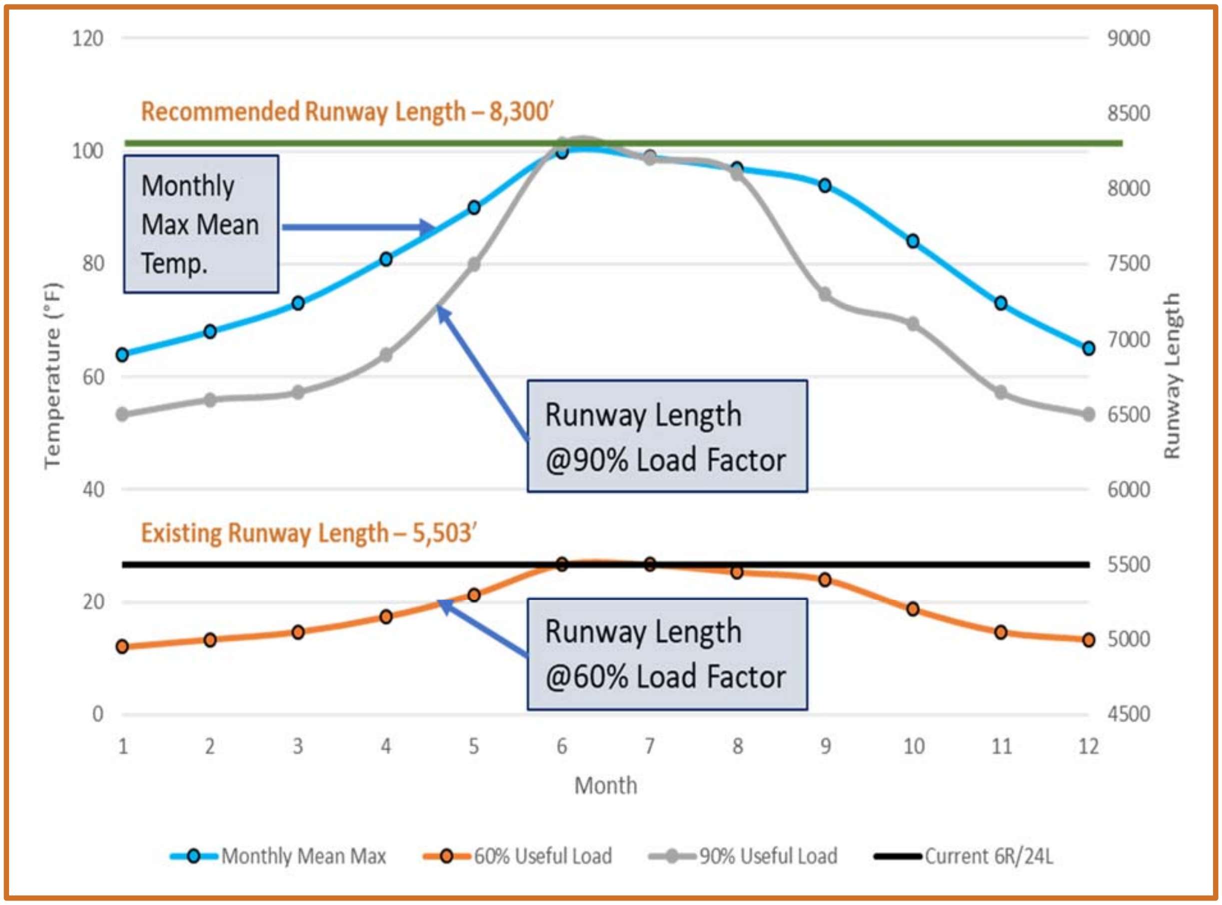
The FAA's runway/takeoff length calculator is also useful when looking into recommended runway length. This calculator is helpful when only the runway length at sea level is known for a specific aircraft. The King Air Beechcraft B100 requires 2,951 feet of runway at sea level to take off. Using this information, along with the average mean maximum temperature of 100°F and the difference of runway elevation, the recommended runway length is 4,000 feet.

Step 5: Assess the Existing Runway Length and Gauge the Benefit of Extension.

The potential benefit of a runway extension is determined by the conditions where aircraft operations at RYN become limited due to inadequate runway length. **Figure 3-6** shows the effects of temperature on runway length needed for large GA aircraft under 60,0000 pounds and the runway length needed for the 75 percent fleet at 60 and 90 percent load factors.

The existing runway length of 5,503 feet is inadequate for 90 percent load factor at any temperature. When ambient temperatures are at 100° F, turbine aircraft can expect to have weight limitations above the 60 percent load factor.

Figure 3-6: Temperature Effects on Runway Length for Large GA Aircraft Under 60,000 pounds



Source: NOAA Climate Center, FAA AC 5325-4B

Runway Length Recommendations

- **Primary Runway Length:** It is recommended that the length of the primary runway, Runway 6R/24L, be up to 8,300 feet. This will be evaluated in **Chapter 4 - Improvement Alternatives.**
- **Secondary Runway Length:** It is recommended that Runway 6L/24R remain at its current length of 4,900 feet.
- **Crosswind Runway Recommendation:** It is recommended that the crosswind runway, Runway 15/33, remain at 4,000 feet. This will be evaluated in **Chapter 4 - Improvement Alternatives.**

Hot Spots

A hot spot is a location in an airport movement area where heightened attention by pilots and drivers is necessary due to the risk of collision or runway incursion. The FAA has identified one hot spot at RYN. Runway 15/33 is used as a taxi route to Runway End 6R. **Figure 3-7** shows the Hot Spot. According to FAA runway geometry design guidelines, use of runways as a taxiway is to be avoided due to potential for pilot confusion and increased risk of runway incursions. It is recommended that this area be reconfigured to remove the hot spot.

Figure 3-7: RYN Identified Hot Spot

RUNWAY PAVEMENT STRENGTH

FAA pavement design considers wear resulting from use based on the fleet of aircraft expected to frequently use the pavement. No single aircraft is designated for pavement strength because aircraft weight can vary, and a runway that is built to service larger, heavier aircraft can also serve light aircraft. A pavement strength rating does not necessarily prohibit airport use by heavier aircraft; however, if routine use by heavier aircraft is anticipated, then it is recommended that the pavement strength be designed to accommodate the heaviest aircraft that will use it.

In **Table 3-4**, pavement strength ratings are presented for multiple landing gear configurations. Aircraft with more tires distribute their weight differently than aircraft with fewer tires. A section of pavement will have a higher strength rating for aircraft with multiple tires than for aircraft with single tires.

Table 3-4: **Pavement Strength**

By Gear Type and Airfield Pavement Condition Index (PCI)			
Facility Component	**Runway 6R/24L**	**Runway 6L/24R**	**Runway 15/33**
Runway ARC	**B-II**	**B-II**	**B-1 (Small)**
Single Wheel (S)	12,500 pounds	12,500 pounds	12,500 pounds or less
Dual Wheel (DWG)	30,000 pounds	30,000 pounds	NA
PCI Score (2017)	69	88	61

Source: FAA Form 5010 Master Record for RYN, ADOT PCI Database

PAVEMENT CONDITION INDEX

FAA AC 150/5380-6C, *Guidelines and Procedures for Maintenance of Airport Pavements,* provides information on the types of pavement distress that affect airport pavements and typical corrective action during preventive and remedial maintenance. Maintenance includes preventive and any regular or recurring work necessary to preserve existing airport pavements in good condition. Replacing individual parts and mending portions of a pavement are considered minor repair. Typical pavement maintenance includes routine cleaning, filling, or sealing of cracks; patching pavement; seal coating; grading pavement edges; maintaining pavement drainage systems; and restoring pavement markings. Timely maintenance and repair of pavements is essential in maintaining adequate load-carrying capacity, good ride quality necessary for the safe operations, good friction characteristics under all weather conditions, and minimizing the potential for foreign object debris (FOD).

A Pavement Condition Index (PCI) rating is used to determine the condition of a pavement. The PCI is assigned a numerical value on a scale of 0-100, 0 indicating failing pavement, and 100 indicating the pavement is in excellent condition. Any pavement that receives a score of 70 or below requires reconstruction. Based on the most recent pavement inspections in 2017, the following pavements show a score of 70 or below:

- Runway 15/33 (PCI 61)
- Runway 6R/24L (PCI 69)
- Taxiway B west end to Taxiway B5 connector (PCI 67)
- Taxiway E (PCI 66)
- North Apron (PCI 67)

Pavement Strength Recommendations

Evaluate Runway 15/33, Runway 6R/24L, and the associated taxiway pavement conditions for rehabilitation or reconstruction to improve the paved surfaces that are rated below PCI 70.

RUNWAY DESIGN SURFACES

The runway design surfaces include runway safety areas (RSA), object free areas (OFA), runway protection zones (RPZ), and runway setbacks for taxiways and other airport facilities.

Primary Runway 6R/24L

The existing critical aircraft for the primary runway is an ARC B-II design group aircraft and is expected to remain B-II throughout the planning period. However, beyond 20 years it is anticipated the critical aircraft will increase to a more demanding classification. The applicable design standard for Runway 6R/24L of RDC B-II-5000 is presented in **Table 3-5** to show compliance with existing standards.

Table 3-5: Runway 6R/24L Design Standards Compliance

Runway System			
Facility Component	FAA Standards	Runway 6R/24L	
	B-II	Runway End 6R	Runway End 24L
Critical Planning Aircraft	N/A	Cessna Citation	
Runway Width	75'	75'	
Runway Type	N/A	Primary	
Runway Shoulder Width	10'	±10' Asphalt Width Varies	
Runway Blast Pad	95'x150'	None	95' x 200'
RSA Length Beyond Runway End	300'	300'	
RSA Length Prior to Threshold	300'	300'	
RSA Width	150'	150'	
Runway OFA Length Beyond Runway End	300'	300'	
Runway OFA Length Prior to Threshold	300'	300'	
Runway OFA Width	500'	500'	
Runway OFZ Length Beyond Runway End	200’	200'	
Runway OFZ Width	400'	400'	
Runway Separation:			
Parallel Runway Centerline	700'	700'	
Holding Position	200'	150'	
Parallel Taxiway Centerline	240'	300'	
Aircraft Parking Area	250’	818'	
Tan cell = Non-Standard			
Abbreviations RSA, OFA, OFZ are in the Glossary Source: ALP Drawings			

Runway 6R/24L at B-II-5000

Runway 6R/24L is equipped with an Instrument Landing System (ILS) approach with visibility minimums as low as 1 statute mile to Runway 6R. The Runway 6L/24R RDC will remain ARC B-II, and the critical aircraft is not expected to change during the planning period. Runway 6R/24L meets design standards for B-II-5000 except for these items:

- The Runway 6R blast pad is not installed. Blast pads are recommended for runways serving jet aircraft but are not required until serving aircraft of ADG IV and above.
- The aircraft holding position lines at taxiway connectors are 150 feet from the runway centerline. The B-II-5000 standard is 200 feet.

- Separation distance from the Runway centerline to Taxiway B centerline is 300 feet, exceeding the B-II-5000 design standard of 240 feet. However, it is recommended that taxiway separation distance be preserved in the event that RYN sees routine operations by larger aircraft.

Secondary Runway 6L/24R

Runway 6L/24R will remain ARC B-II to support operations by light aircraft up to twin-engine turboprops. The applicable design standards for Runway 6L/24R are presented in **Table 3-6**.

Table 3-6: Existing Runway 6L/24R Design Standards Compliance

Runway System		
Facility Component	FAA Standards B-II-VIS	Runway 6L/24R
Critical Planning Aircraft		King Air 350
Runway Width	75'	75'
Runway Type	N/A	Secondary
Runway Shoulder Width	10'	±10' Asphalt Width Varies
RSA Length Beyond Runway End	300'	300'
RSA Length Prior to Threshold	300'	300'
RSA Width	150'	150'
Runway OFA Length Beyond Runway End	300'	300'
Runway OFA Length Prior to Threshold	300'	300'
Runway OFA Width	500'	500'
Runway OFZ Length Beyond Runway End	200’	200'
Runway OFZ Width	400'	400'
Runway Separation		
Parallel Runway Centerline	700'	700'
Holding Position	200'	200'
Parallel Taxiway Centerline	240'	240'
Aircraft Parking Area	250’	818'
Source: RYN ALP Drawings		

Secondary Runway 6L/24R at B-II-VIS

Runway 6L/24R meets or exceeds standards.

Crosswind Runway 15/33 at B-I (Small) – VIS

Runway 15/33 critical aircraft ARC is classified as B-I (Small) because of the need to provide crosswind component coverage for light aircraft only. Runway 15/33 meets and exceeds design standards for a B-I (Small) critical design code. As seen in **Table 3-7**, the runway width, currently at 60 feet, meets the B-I (Small) standard of at least 60 feet.

Table 3-7: **Crosswind Runway 15/33 Design Standards Compliance**

Runway System			
Facility Component	FAA Standards	Runway 15/33	
	B-I (Small)	Runway End 15	Runway End 33
Critical Planning Aircraft		King Air B100	
Runway Width	60'	75'	
Runway Type		Crosswind	
Runway Shoulder Width	10'	±10' Asphalt Width Varies	
RSA Length Beyond Runway End	240'	240'	240'
RSA Length Prior To Threshold	240’	240'	240'
RSA Width	120'	120'	
Runway OFA Length Beyond Runway End	240'	240'	
Runway OFA Length Prior to Threshold	240'	240'	
Runway OFA Width	250'	250'	
Runway Separation			
Holding Position	125'	125' & 200' (Twy B)	
Parallel Taxiway Centerline	150'	240’ (Twy E) - 450' (Twy D)	
Aircraft Parking Area	125’	540'	

Bold = Exceeds standards
Source: RYN ALP Drawings

Runway Design Recommendation

- Extend or reconfigure the Runway 6R threshold location on Runway 15/33 to eliminate the runway incursion hot spot and decouple the runway threshold.
- Blast pads are recommended for runways used by turbine aircraft to prevent erosion of soils in the safety areas.
- Increase the holding position line separation from Runway 6R/24L centerline from 150 feet to 200 feet to meet the B-II standard.

RUNWAY PROTECTION ZONES

RPZs are trapezoidal areas on the ground at the end of runways intended to enhance safety for aircraft operations and for people and objects on the ground. The FAA recommends that an airport control land uses in the RPZs through fee simple ownership or avigation easement to prevent development of incompatible land use and obstacles that present hazards to aircraft operations. The RPZ for Runway 6L extends beyond the Airport property boundary and is not currently controlled through an avigation easement. The 2012 FAA memo *Interim Guidance on Land Uses Within a Runway Protection Zone* defines land uses that potentially require coordination such as buildings, recreational land uses, roads and railroads, fuel storage, and utility infrastructure.
The RPZ for Runway 33 has a service access road and highway passing through it. These roadways constitute the possibility of incompatible land use and are to be evaluated for means to correct and identify an eventual pathway to compliance.

RPZ dimensions are determined by the RDC and instrument approach visibility minimums. Introduction of certain land uses into an RPZ, either through a change in the RDC, lowering of visibility minimums, or relocation of the runway, may require coordination with the FAA. RPZ dimension standards for RYN are presented in the **Table 3-8**.

Table 3-8: RPZ Dimensions Standards

RUNWAY PROTECTION ZONES			
Facility Component	FAA Standards		
	B-II-5000 Runway 6R/24L	B-II-VIS Runway 6L/24R	B-I-VIS Runway 15/33
RPZ Visibility Minimums	7/8 mile	Visual	Visual
Length	1,700’	1,000’	1,000’
Inner Width	1,000'	500'	250'
Outer Width	1,510'	700'	450'

Note: NM = Nautical Mile

Source: FAA AC 5300-13A

RPZ Recommendations:

- Evaluate alternatives that resolve known incompatible land uses within the RPZs.
- Evaluate Instrument Approach Procedures (IAPs) with reduced visibility minimums and the effect they will have on Runway 6R RPZ dimensions in **Chapter 4 - Improvement Alternatives.**

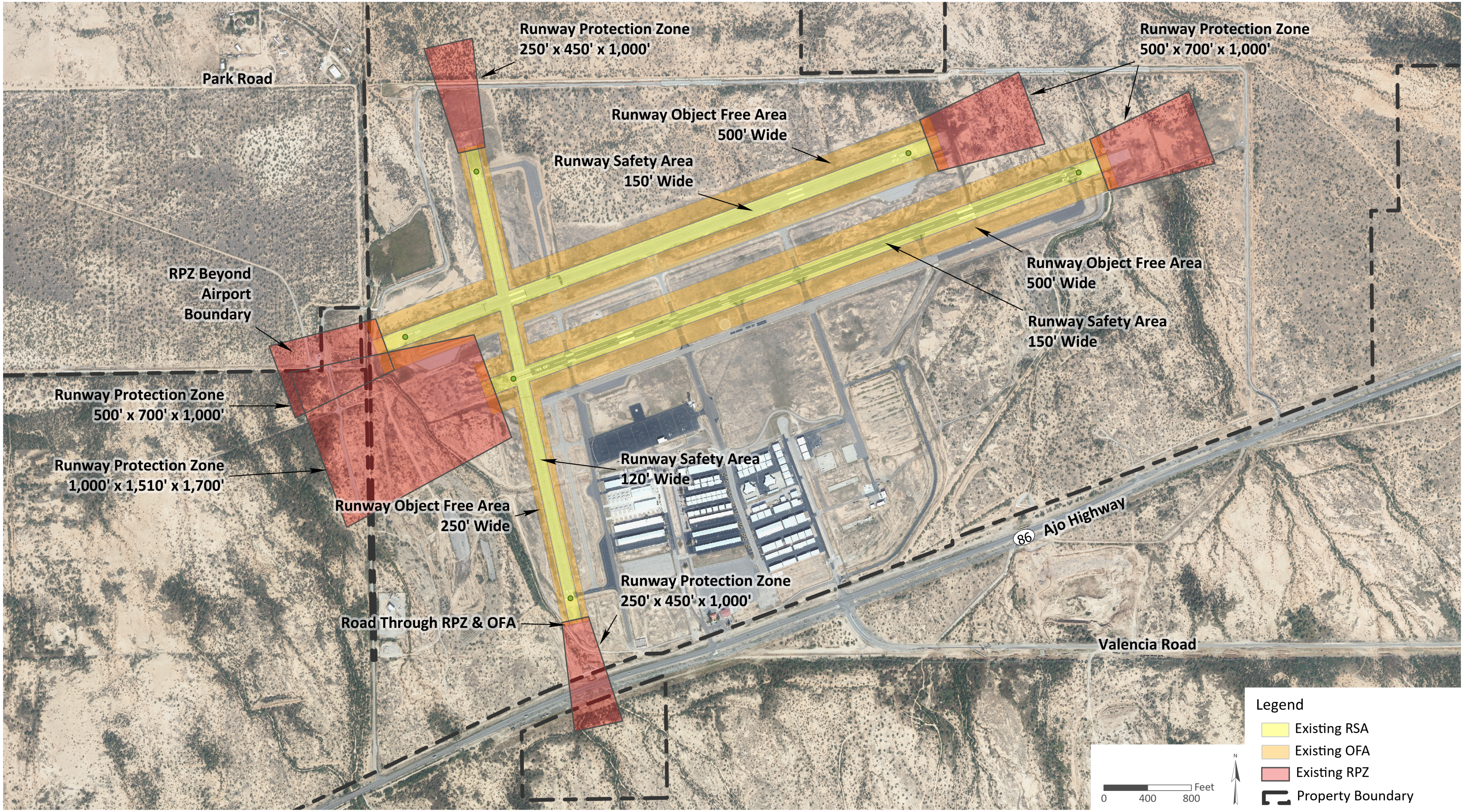
Facility improvements respond to changes in demand and fleet mix rather than being planned for a specific year. **Figure 3-8** shows identified areas of concern about standards compliance and geometry. These areas include runway, taxiway, and safety areas items to be considered further in **Chapter 4 - Improvement Alternatives. Figure 3-9** illustrates the RYN Airfield RPZs.

Mead&Hunt

TUCSON AIRPORT AUTHORITY RYAN AIRFIELD

Airfield Considerations

Figure 3-8



RPZ Considerations

Figure 3-9

TAXIWAY SYSTEM REQUIREMENTS

Taxiway Design Principles

Taxiways are designed for “cockpit over centerline” taxiing with a pavement width that is sufficient to allow a certain amount of wander. Proper taxiway design keeps potential runway incursions to a minimum, especially when choosing simplicity over complexity wherever possible. AC 150/5300-13A provides basic taxiway design concepts and methodologies. Two taxiway design concerns at RYN are minimizing runway crossings with potential for runway incursions and indirect access from aprons to runways.

Limit Runway Crossing

The hazard of runway incursions can be mitigated by limiting the need for runway crossings. Aircraft use Taxiway D and Taxiway B2 to cross Runway 6R/24L to reach Runway 6L/24R and the Runway End 33. It is preferred to have aircraft cross at the runway ends. Crossing Runway 6R/24L in the middle third of a runway at Taxiway B4 is to be avoided. The middle third of the runway is where aircraft are in a high energy state during takeoff or landing and pilots are least able to maneuver to avoid collisions. Limiting runway crossings to the outer thirds of the runway keeps the middle portion of the runway clear and reduces the potential for a high energy collision. The Taxiway B4 connector is located within the middle third of Runway 6R/24L and continues to Runway 6L/24R.

Limit Direct Access

Taxiways that lead directly from an apron to a runway, or a long straight section of taxiway that leads directly onto a runway without requiring a turn, can cause a pilot to lose situational awareness resulting in runway incursions. A pilot typically expects to encounter a parallel taxiway or turn prior to runway entry. Six taxiways at RYN provide direct access from the aprons to runways. Taxiway D1 enters Runway 33 directly from the southwest aircraft apron. Taxiway D2 provides direct access from the north aircraft apron to Runway 15/33. Taxiway B is a long straight section of taxiway that leads directly onto Runway 15/33. The intersection of Taxiway B and Runway 15/33 is identified as an FAA hot spot with a history of runway incursions. Taxiway D is a long straight taxiway with no turns prior to entering Runway 6R and crosses both Runway 6R and 6L to reach Runway End 15. Taxiway connectors B2 and B4 are long straight taxiways from central and east apron areas that also do not have a turn before entering Runway 6R/24L. The direct access taxiways are to be evaluated in **Chapter 4 - Improvement Alternatives**. The following sections outline the specific design standards to address these concerns.

Taxiway Design Group

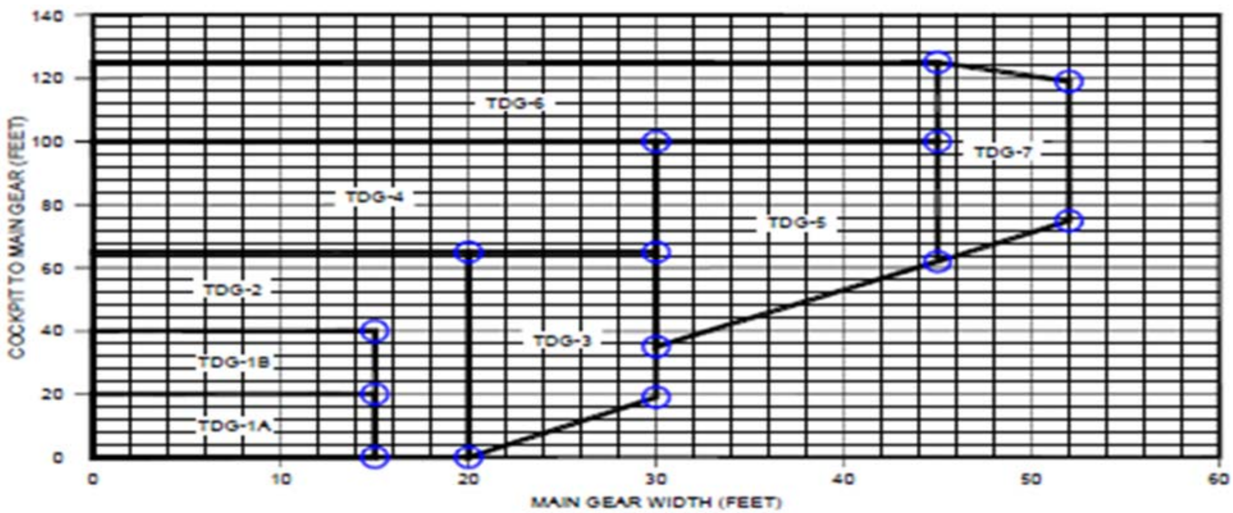
Taxiway and taxilane clearance requirements are based upon wingtip clearance as a function of aircraft wingspan and are determined by the ADG of the critical aircraft. Taxiway and taxilane dimension standards are tied to the TDG, which is based on the Main Gear Width (MGW) and the Cockpit to Main Gear (CMG) distance of the critical aircraft.

The taxiway system design standards to support the existing and future critical aircraft use are:

- Runway 6R/24L Parallel Taxiway System: ADG II, TDG 2 (Cessna Citation)
- Runway 6L/24R Parallel Taxiway System: ADG II, TDG 2 (King Air 350)
- Runway 15/33 Parallel Taxiways E and D: ADG I, TDG IA (King Air B100)

Figure 3-10 shows the aircraft MGW and CMG dimensions for each design group.

Figure 3-10: TDG Dimensions



Source: FAA AC 150/5300-13A *Airport Design*

Taxiway Standards

TDG 2 Width

Taxiway B and the associated Runway 6R/24L connectors B2, B3, B4, B5, and B6 are 50 feet wide and exceed the TDG 2 taxiway width of 35 feet.

TDG I Width

The existing taxiways supporting Runway 15/33 were built to support ADG II - TDG 2 aircraft with taxiway width of 35 feet. With a reduction in design code to ADG I – TDG IA, the standard width is 25 feet.

Taxiway Paved Shoulders

The taxiways at RYN do not have paved shoulders. The design criteria for TDG IA and TDG 2 recommend 10 feet of paved or hardened shoulder.

Runway to Taxiway Separation

The Taxiway E centerline is separated from the Runway 15/33 centerline by 240 feet. The ARC B-I and TDG IA runway centerline to parallel taxiway centerline standard is at least 150 feet, making this an adequate separation.

Table 3-9 shows the FAA design standards compared to the existing conditions for Taxiways A, B, and D. Taxiway D is a parallel for the crosswind Runway 15/33 that serves ARC B-I and TDG I aircraft. Taxiway D also serves as a connection to Runways 6R/24L and 6L/24R that serve B-II and TDG 2 aircraft. To meet the greater demand on the primary and secondary runways, Taxiway D should remain in ADG II and TDG 2 design group standards. **Table 3-10** summarizes the FAA design standards and the existing conditions for Taxiway E.

Table 3-9: Taxiway System ADG II & TDG 2

TAXIWAY SYSTEM ADG II & TDG 2						
Taxiway Segment	**FAA Design Standards**	**TWY A**	**TWY B**	**TWY B2**	**TWY B4**	**TWY D**
Taxiway Width	35'	35'	50’	50'	50’	35’
Paved Shoulder Width	10'	0'	0'	0'	0'	0'
Taxiway Safety Area (TSA)	79'	79'	79'	79'	79'	79'
Taxiway Object Free Area (TOFA)	131'	131'	131'	131'	131'	131'
Runway-Taxiway CL Separation	240'	240'	300'	N/A	N/A	450'
Hold Position Line Separation	200'	200'	125'	155'	155'	155'
Taxiway Segment	**FAA Design Standards**	**TWY A2**	**TWY A4**	**TWY B5**		
Taxiway Width	35'	35'	35'	35'		
Paved Shoulder Width	10'	0'	0'	0'		
Taxiway Safety Area (TSA)	79'	79'	79'	79'		
Taxiway Object Free Area (TOFA)	131'	131'	131'	131'		
Hold Position Line Separation	200'	200'	200'	155’		
Tan cell = Non-Standard						

Source: FAA AC 150/5300-13A Airport Design

Table 3-10: Taxiway System ADG I & TDG IA

Taxiway System ADG I & TDG IA		
Taxiway Segment	**FAA Design Standards**	**TWY E**
Dimension (Width)	25'	35’
Paved Shoulder Width	10'	0'
Taxiway Safety Area (TSA)	49'	49'
Taxiway Object Free Area (TOFA)	89'	89'
Runway-Taxiway CL Separation	150'	240'
Hold Position Line Separation	125'	125'

Bold = Exceeds design standards

Source: FAA AC 150/5300-13A Airport Design

Taxiway Pavement Strength

Taxiway A, B, and D pavement should be maintained to the same pavement load bearing strength as existing Runways 6R/24L and 6L/24R (12,500 pounds for Single wheel and 30,000 pounds Dual Wheel Loading (DWL)). Taxiway E pavement should hold the same pavement load bearing strength of 12,500 pounds for Single wheel main gear as existing Runway 15/33.

Taxiway System Recommendations

Chapter 4 - Improvement Alternatives will evaluate improvements needed to the location and configuration of the following:

- Taxiway B4 crossing Runway 6R/24L in middle third of runway
- Runway 15/33 direct access taxiway connectors at Taxiway D1, D2, and B
- Runway 6R/24L direct access taxiway connectors Taxiway D, B2, and B4
- Taxiway B and connectors width reduced to 35 feet
- Taxiway E width reduced to 25 feet
- Taxiway pavement shoulder widths of 10 feet
- Runway centerline to parallel taxiway centerline separation Taxiway E to be decreased
- Hold Position Line separation distance for Taxiway D, B2, B3, B4, B5, and B6 to 200 feet
- Pavement refurbishment or reconstruction for taxiway pavements with PCI rating of less than 70.

NAVIGATIONAL AIDS (NAVAIDS)

AC 150/5070-6B, *Airport Master Plans*, defines Navigational Aids (NAVAIDs) as "aids to navigation provide pilots with information to assist them in locating the airport and to provide horizontal and/or positional guidance." Many considerations determine the type of NAVAIDs needed at an airport. These include, but are not limited to, the type and volume of aeronautical activity, airspace, meteorological conditions, and capacity. NAVAID requirements are based on guidelines contained in FAA Handbook 7031.2C, *Airway Planning Standard Number One*, and AC 150/5300-13, *Airport Design*.

The FAA is transitioning away from instrument procedures that use ground-based NAVAIDs to procedures that use the satellite-based Global Positioning System (GPS). GPS procedures exist at RYN that have no associated ground-based facilities or equipment. RYN also has approaches with NAVAIDs that are located off-Airport. RYN has a Non-Directional Beacon/Distance Measuring Equipment (NDB/DME) approach that uses the Tucson VHF Omni-Directional Radio Range (VOR) for the DME fixed locations.

The NAVAIDs at RYN are described in the **Airport Facilities Inventory Section** of **Chapter 1 - Inventory**. The existing ILS is expected to remain in service during the planning period, and approach improvements would be made through improved lighting systems. The FAA is gradually phasing out ground-based NAVAID systems as part of the NextGen Airspace program. GPS fixes and approaches do not require the use of Airport-based facilities.

However, for flight training purposes and to maintain access to RYN during inclement weather and low visibility conditions, the ILS in conjunction with improvements to approach lighting systems can serve the Airport during the expected planning period. Having an ILS system will aid in attracting a new flight training facility.

NAVAID Recommendations: It is recommended that RYN retain the existing ILS system to aid in attracting a flight training operator and provide instrument approach guidance during inclement weather for aircraft equipped with ILS receivers. Additional improvements can be made to reduce visibility minimums through approach lighting system improvements discussed in the next section.

Pavement Markings, Lighting, and Signage

Markings

The surface marking schemes used for runways are a direct function of the approach category for each runway end. A precision approach runway has an IAP that provides course and vertical path guidance conforming to ILS minimums. Runway 6R is marked for a precision approach procedure because it has an ILS approach with vertical guidance. Runways 6L/24R, 24L, 15, and 33 are marked for a visual approach and have no instrument procedures associated with them.

Lighting

RYN is equipped with pilot-controlled lighting (PCL). PCL allows pilots to control the intensity of the runway lighting using the radio transmitter in the aircraft. A PCL system turns the airfield lights off or to a lower intensity when not in use. Similar to changing the intensity of the lights, pilots can turn up the lights using the radio transmitter in the aircraft. This system should be maintained through the planning period. The ILS precision approach for Runway 6R is not currently supported by an approach lighting system (ALS) or precision approach path Indicator (PAPI). Runway 6R does have Runway End Identifier Lights (REILs) that only operate during daylight hours. Runway 24L has a 4-box Visual Approach Slope Indicator (VASI) to aid pilots with visual guidance for relative position on the approach path.

An ALS and visual approach aids would contribute to reducing the visibility minimums for the Runway 6R ILS approach. Reduced visibility minimums would improve airport access and utilization during periods of inclement weather or low visibility. Having visual approach slope guidance lights such as a VASI or PAPI system at both ends of the primary runway would assist pilots at night with remaining on the appropriate glide path. A PAPI system provides similar visual guidance as the VASI, but in addition to information about relative position to the glide path, the PAPI can indicate movement trend up and down relative to the glidepath with rate of change information. The REILs assist pilots with identifying the runway end during low visibility.

Markings, Lighting and Signage Recommendations

The **Chapter 4** - **Improvement Alternatives** will evaluate the location and configuration of the following:

- The feasibility for installing an ALS to reduce the ILS visibility minimums to Runway 6R
- Including a Runway 6R PAPI to further supplement the ILS

- Replacement of the VASI to Runway 24L with a PAPI
- Modification of the existing Runway 6R REILs to function during night-time hours as part of the PCL system circuits.

Instrument Approach Procedures (IAP)

There are two IAPs at RYN, both into Runway 6R. The lowest visibility minimums for the ILS is 1 statute mile and a minimum decision altitude of 250 feet AGL for civil pilots and 300 feet AGL for non-civil pilots. The second IAP that is assigned to Runway 6R is an RNAV (GPS) procedure that has a minimum visibility of 7/8 statute mile and a minimum decision altitude of 273 feet AGL for civil pilots and 300 feet AGL for non-civil pilots. Visibility minimums can be lowered to improve access to the Airport during inclement weather through obstruction removal and additional approach lighting systems. The FAA is the agency that evaluates and sets the approach minimums. Other factors such as terrain can prevent minimums from being reduced. Runway 6R is the only runway at RYN with a precision approach and is the only runway with a Glideslope Qualification Surface (GQS). The GQS is used to evaluate approaches providing vertical guidance. When objects that cannot be mitigated exceed the height of the GQS, approaches with vertical guidance cannot be authorized.

IAP Recommendations:

Chapter 4 - Improvement Alternatives is to include evaluation for the GQS to Runway 6R for the preferred alternative to maintain the ILS approach. Include feasibility evaluation of an ALS and PAPI to improve Runway 6R approach minimums. Conduct instrument approach procedures feasibility study to validate ultimate approach procedures and visibility minimums for all runways.

Weather Reporting Equipment

RYN is equipped with an AWOS. The AWOS provides automated weather observations 24 hours per day. The system updates weather observations every minute, continuously reporting significant weather changes as they occur. The AWOS reports cloud ceiling, visibility, temperature, dew point, wind direction, wind speed, altimeter setting (barometric pressure), thunderstorm activity, and density altitude (airfield elevation corrected for temperature).

Weather Reporting Equipment Recommendation

It is recommended that future improvements should consider AWOS siting criteria.

Communications Equipment

RYN is currently equipped with a remote transmitter receiver (RTR). An RTR provides pilots with a direct communication link to the Albuquerque Air Route Traffic Control Center. This communication link facilitates the opening and closing of flight plans.

Communications Equipment Recommendation

The RTR is anticipated to be needed and maintained through the planning period.

Airfield Vehicle Access Route

An airport operator should limit vehicle operations on the movement areas of the airport to only those vehicles necessary to support the operational activity of the airport. Service roads are typically used to segregate vehicles from the aircraft operational areas. RYN tenants, once inside the operational fence to access hangars and aprons, also have access to the airfield operations surfaces. Vehicle control lines, also known as apron edge boundary markings, can help differentiate where vehicle access is restricted.

Airfield Vehicle Access Recommendation

The alternatives analysis will examine options for interior access roads to serve hangar facilities as well as a service road extending around the runway and airport perimeter for airport maintenance vehicles.

Airspace Surfaces

FAA airport design standards (identified in AC 150/5300-13A) are created for safe aircraft operations. These standards include threshold siting surfaces (TSS). The Code of Federal Aviation Regulations (FAR) Part 77 determines the airspace around RYN that is to be protected from obstructions and includes the approach, primary, transitional, conical, and horizontal surfaces.

The TSS are trapezoidal shaped and extend away from the runway along the centerline at a specific slope expressed in horizontal feet by vertical feet (e.g., a 20:1 slope rises one unit vertically for every 20 units horizontally). The specific size, slope, and starting point of the surfaces depend on the visibility minimums and aircraft type associated with the runway end.

Thresholds are located to provide landing aircraft the proper clearance over obstacles when they are on approach to a runway end. When an object obstructs the airspace required for aircraft to land, and it is beyond an airport owner's ability to remove, relocate, or lower, the landing threshold may require a relocation or a displaced threshold.

Departure Runway End Analysis

Departure ends of runways normally mark the end of the runway pavement that is full-strength, available, and suitable for departures. Departure surfaces, when clear of obstacles, allow pilots to follow standard departure procedures. If obstacles penetrate the departure surface, then the obstacles must be evaluated through the Obstruction Evaluation/Airport Airspace Analysis (OE/AAA) process. After the OE/AAA process, departure procedure amendments such as non-standard climb rates, non-standard (higher) departure minimums, or a reduction in the length of takeoff distance available may be required. RYN has one instrument departure procedure for use on Runway 6R/24L. Runway 24L has standard takeoff minimums while Runway 6R requires a minimum climb gradient of 309' per nautical mile to 4,400' as identified in the Almon One departure. There are obstacles noted at either end of the runways to include:

- Runway 6R
  - Bushes beginning 331' from Departure End of Runway, 293' right of centerline, up to 28' AGL/2,428' MSL
  - Bush 166' from Departure End of Runway, 366' left of centerline, 8' AGL/2,408' MSL
- Runway 24L
  - Bush 282' from Departure End of Runway, 462' left of centerline, 10' AGL/2,410' MSL
  - Windsock 280' from Departure End of Runway, 248' right of centerline, 18' AGL/2,408' MSL
  - Tree 1,401' from Departure End of Runway, 724' right of centerline, 44' AGL/2,434' MSL

The size, shape, slope, and criteria for RYN are presented in **Table 3-11.**

Table 3-11: Departure Surface Dimensions

Departure Surface	Distance from Runway End	Inner Width	Length	Outer Width	Slope
Existing					
Runway 6R/24L	0	1,000'	10,200'	6,466'	40:1
Standards					
Departure Surface	0	1,000'	10,200'	6,466'	40:1
Source: FAA AC 150/5300-13A, *Airport Design*.					

FAR PART 77 ANALYSIS - GENERAL

Safe and efficient landing operations at an airport require that certain areas on and near an airport are clear of objects or restricted to objects with certain functions, composition, and height.

The primary surface is centered on the runway and extends 200 feet beyond each end of the runway. The primary surface width varies based on the existing instrument approach visibility minimums of the runway.

The transitional surface is a 7:1 sloped surface that extends upward and outward at right angles to the runway centerline and begins at the edges of the primary surface. Above the horizontal surface, the 7:1 transitional surface for the instrument approach extends outwards 5,000 feet on either side of the approach slope.

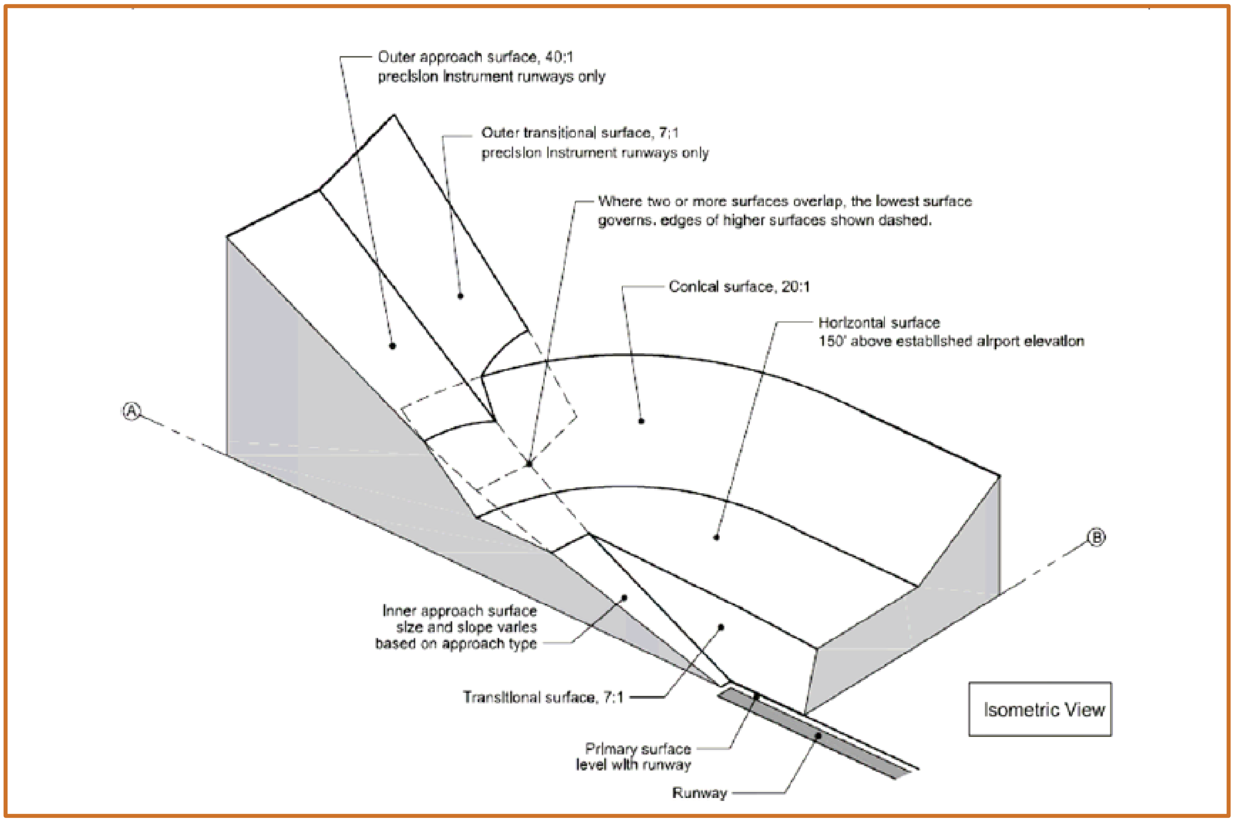
The approach surface is centered on the extended runway centerline and slopes outward and upward from each end of the primary surface. An approach surface is applied to each end of the runway based on the type of approach available or planned for that runway end. The inner width of the approach surface is the same as the primary surface and expands uniformly to the outer width. **Table 3-12** summarizes the dimensions standards for the primary surface.

Table 3-12: Primary Surface Dimensions

Primary Surface - Centered on Runway			
Runway	**Approach Type**	**Extends Past Runway End**	**Width**
Runway 6R/24L	Precision	200'	1,000'
Runway 6L/24R	Visual	200'	500'
Runway 15/33	Visual	200'	250'
Source: FAA AC 150/5300-13A, *Airport Design*.			

Figure 3-11 shows the profile and layout of Part 77 surfaces for an example runway with an instrument approach.

Figure 3-11: Part 77 Surfaces Isometric View



Source: FAR Part 77 Object Affecting Navigable Airspace

FAR Part 77 Recommendations

Evaluate penetrations to future Part 77 surfaces for the preferred runway alternative in **Chapter 4 - Improvement Alternatives**.

LANDSIDE FACILITIES

AIR TRAFFIC CONTROL TOWER (ATCT)

The ATCT at RYN is run by a contracted company, Serco. The ATCT is located just south of the middle of Runway 6R/24L. With the ATCT's current location and the presence of numerous hangars to the southwest of the ATCT, seeing all of Taxiway D is not possible without making a taller ATCT or changing the ATCT location.

While signage of existing blind spots is adequate, if the GA and potential flight school activity increases, a new ATCT may need to be considered. The ATCT continues to operate under the existing hours of 6:00 a.m. and 8:00 p.m., but if activity continues to increase, extended hours may need to be implemented. **Figure 3-12** shows the location of the blind spot created by the low height of the ATCT and the presence of hangars to the southwest of the ATCT.

ATCT Recommendation

It is recommended that a new ATCT location or a taller ATCT be evaluated in **Chapter 4 - Improvement Alternatives**.

ATCT Blind Spots

Figure 3-12

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AIRCRAFT HANGARS

Hangars are generally the most desired option for both short- and long-term aircraft storage. Due to the high investment cost of owning and operating aircraft, hangars provide suitable protection for the aircraft and are, therefore, more desired. Aircraft hangars at RYN consist of T-hangars, multi-aircraft box hangars, and executive hangars with offices. The based aircraft forecast presented in **Chapter 2 - Aviation Activity Forecast** projected an increase of 40 based single-engine aircraft, an increase of one jet aircraft, a decrease of six based multi-engine piston aircraft, and an increase of 36 of the smaller experimental and light sport aircraft. RYN Operations reports that no hangar wait list is maintained by the airport.

Hangar floor space required for a single-engine aircraft will vary based on the aircraft dimensions, but for planning purposes, 1,250 square feet is typical. Twin-engine aircraft need 1,600 square feet. Hangar floor space for the smaller "other" types of aircraft require on average 900 square feet. The hangars at RYN average 560 square feet for T-Hangars (shade cover only), 2,500 square feet for conventional hangars, and 3,600 square feet for the executive hangars. Depending upon the aircraft type being housed, hangars can often accommodate more than one aircraft.

Existing and Future Hangar Square Feet Demand

The increase needed in the total hangar area to accommodate 100 percent of the forecasted growth in based aircraft by 2035 is 72,800 square feet. The total for based aircraft is projected to increase by 71 by the year 2035, bringing the total based fleet to 327 aircraft. There are currently more aircraft than available hangars at RYN. RYN employees and the TAA have expressed that they will not be building additional hangars, but if a future tenant would like one, they may build their own hangar. **Table 3-13** outlines RYN hangar development based on forecasted growth.

TIE DOWNS

There are aircraft owners that choose to use tie downs and shade shelters rather than hangar their aircraft. RYN currently has 123 tie down spaces available between the north apron, south apron, and west hangar areas. The available tie down spaces can accommodate the expected growth as new aircraft are based at RYN until such time as new hangar facilities are developed.

Table 3-13: **Forecast Hangar Demand**

GA Hangar Facilities	2018	2020	2025	2030	2035	Change from 2018 to 2035
TOTAL AIRCRAFT	256	271	289	306	327	71
TOTAL HANGARED AIRCRAFT	251	266	284	301	321	70
HANGAR SURPLUS / SHORTAGE	4	5	5	5	6	2
Single-Piston	189	198	208	218	229	40
Twin-Piston	10	8	7	5	4	-6
JET	1	2	2	2	2	1
Rotorcraft	0	0	0	0	0	0
Other Aircraft	56	63	72	81	92	36
HANGAR DEMAND - SQUARE FEET	302,650	317,000	336,000	353,400	375,450	72,800
Single-Piston	236,250	247,500	260,000	272,500	286,250	50,000
Twin-Piston	16,000	12,800	11,200	8,000	6,400	-9,600
Other Aircraft	50,400	56,700	64,800	72,900	82,800	32,400
Note: “Other” aircraft not counted as FAA official based aircraft, but still may necessitate hangar storage.						

Aircraft hangars at RYN can be developed as private use or as commercial properties to be leased. **Table 3-14** outlines RYN minimum requirements for a commercial hangar owner at RYN.

Table 3-14: **Minimum Requirements for Aircraft Storage Operator**

Aircraft Storage Operator		
Infrastructure	**Group I Aircraft**	**Group II Aircraft**
Land – Square Feet	8,280	16,100
Hangar – Square Feet	3,600	6,400
Hangar Door Height – Feet	16	18
Source: RYN Minimum Standards, December 2013		

AIRCRAFT FUEL STORAGE AND DISPENSING SYSTEM

The TAA provides fueling facilities for the aircraft self-fueling station located next to the Airport Administration offices at the transient ramp at the south end of Taxiway B2. There are two 12,000-gallon FiberSteel underground fuel storage tanks that serve the self-fueling facility. The Airport’s FBO, Velocity Air, owns a 1,000-gallon capacity 100 low-lead (LL) Aviation Gas (AvGas) truck for delivery of fuel to aircraft on the Airport. For aircraft that require Jet A fuel, Velocity Air also has two fuel trucks with a capacity for 5,500 gallons.

Velocity Air also provides additional fueling capacity, with mobile fueling trucks available to provide fueling services on demand. For the existing and forecasted traffic at RYN, these fuel facilities meet the expected demands.

Fuel Storage Recommendation

Should the Airport attract a large flight school operator, additional fueling capacity may be needed and should be further evaluated upon initiation of development.

JOINT USE FIRE STATION

As stated in **Chapter 1 - Inventory**, RYN is not an FAA commercially-certified airport under 14 CFR Part 139; therefore, RYN is not required to have aircraft rescue and firefighting (ARFF) equipment. It was also stated that, although it is not required, the TAA does maintain an emergency vehicle capable of extinguishing a fire with chemical flame retardants. In case of an emergency, RYN also has the help of the Drexel Heights Fire Department in the general area. Two Drexel Heights Fire Department locations are within a 6-mile radius of RYN, making them both about a 10-minute drive away. Although having an ARFF is not required at RYN by the FAA, with expected increase in activity and the potential addition of a flight school, positioning a joint use fire department on airport property could help increase the safety of people utilizing the airfield.

In the effort to reduce the mutual aid support response time, a joint use fire station could be located at RYN near the entrance off the Ajo Highway. The fire station would primarily be a structural fire facility, responding to fires and medical emergencies within the neighboring residential areas; however, those same firefighters could also be responders to Airport-related incidents.

Joint Use Fire Station Recommendation

It is recommended that RYN continue the mutual aid agreement with Drexel Heights Fire Department and develop an on-Airport joint use fire station to better emergency response times.

AIRPORT MAINTENANCE MATERIALS STORAGE

The TAA Maintenance facilities include a 2,400-square-foot maintenance shop, an 1,800-square-foot storage room, and an 1,800-square-foot shade parking structure. The TAA's emergency response vehicle is stored in the maintenance facility. The vehicles and equipment used by the TAA maintenance personnel listed in the **Chapter 1 - Inventory** are kept at the maintenance facility.

Airport Maintenance Materials Storage Recommendation

It is determined that RYN has sufficient building space given the existing levels of operational activity; however, if operational activities increase due to additional tenants or flight schools, TAA will need to evaluate the necessary materials storage space to meet future storage needs.

FENCING

The airport perimeter is equipped with an 8-foot high chain-link fencing with three-strand barbed wire on top. Automated gates are located at various locations in the terminal area, which are either padlocked or secured by remote control. There are several manual access gates around the perimeter of the airport.

Fencing Recommendation

The existing perimeter fence is adequate and should be maintained through the planning period.

TAA OFFICE AND PILOTS' LOUNGE

The TAA's RYN office in the airport administration building is 2,500 square feet. The office space is adjacent to the self-fueling island and is open for pilots to use for flight planning equipment, vending machines, and restrooms. The TAA maintains a conference room and a pilots' lounge within this space.

TAA Office Recommendation

The RYN pilot lounge and terminal facilities meet existing demand. However, should long-term development bring increased transient traffic to RYN, a larger facility may be required to adequately meet the needs for passenger waiting areas, restrooms, flight planning, and vehicle parking.

AERONAUTICAL USE FACILITIES

This section references the RYN minimum standards established for facilities supporting aeronautical activity. The minimum standards are intended to encourage, promote, and ensure the delivery of quality general aviation products, services, and facilities to Airport users. The minimum standards also guide the development of general aviation facilities to provide consistency for safety, security, and economic health of airport businesses. In this section, and as defined in the Airport's minimum standards, aircraft are grouped by ADG. Each of the following operator facilities are to include space for vehicle parking and street side frontage.

FLIGHT TRAINING OPERATOR

A Flight Training Operator is a commercial operator engaged in providing flight instruction to the public, or the operator of a flight training school operating according to FAR Part 141 or as a FAR Part 61 Flight School. Under FAR Part 141, a flight school must seek and maintain FAA approval for its training curriculum, syllabus, and lesson plans, creating a more structured flight training environment. A FAR Part 61 training curriculum is less prescriptive in its regulatory requirements and leaves an instructor with more flexibility to change the training program as they see fit. **Table 3-15** outlines RYN minimum requirements for a flight school.

The total space and facility requirements will depend upon the scope and scale of a commercial flight school operation. According to the RYN Minimum Standards: "Apron or paved tiedowns – shall be adequate to accommodate five (5) aircraft having a minimum wingspan of 40 feet." If the operator utilizes a hangar for the storage of operator's entire fleet at the airport, paved tie downs are not required. The addition of a flight school would increase the demand for flight school hangar space on the property. **Table 3-16** identifies the square footage needed for hangars based on the forecasted growth associated with the addition of a flight school between the years of 2018 and 2035.

Table 3-15: Flight Training Operator

Flight Training Operator	
Infrastructure	**Group I Aircraft**
Contiguous Land – Square Feet	21,780
Apron and Paved Tiedowns	5 (aircraft) - 40' Wingspan
Customer & Administrative Area – Square Feet	1,000
Hangar Area – Square Feet	Not less than 3,000
Maintenance Area – Square Feet	500
Source: RYN Minimum Standards, December 2013	

Table 3-16: Flight School Hangar Space

Flight School Hangar Facilities	2018	2020	2025	2030	2035	Change from 2018 to 2035
HANGAR DEMAND - SQUARE FEET	N/A	102,500	118,750	131,250	143,750	143,750
Part 61 Single-Piston 22 fixed wing	N/A	27,500	37,500	43,750	50,000	50,000
Part 141 60 fixed wing, 3 helicopter	N/A	75,000	81,250	87,500	93,750	93,750
Total Hangar Area Square Feet	302,650	419,500	454,750	484,650	519,200	216,550
Total Hangar Area Acres	7	10	10	11	12	5

FIXED BASE OPERATOR (FBO)

An FBO is a business that provides aircraft services such as fuel sales, aircraft maintenance, flight training, and aircraft storage, primarily serving GA aircraft owners and pilots. RYN has one FBO that provides fuel, aircraft storage, flight instruction, and maintenance services. New construction of underground fuel storage is not allowed. Any additional fuel storage capacity must use above ground tanks. **Table 3-17** outlines minimum requirements for an FBO at RYN.

Table 3-17: Fixed Based Operator

Fixed Based Operator	
Infrastructure	**Group I Aircraft**
Land – Square Feet	43,560
Hangar – Square Feet	10,000
Customer and Administrative – Square Feet	2,500
Source: RYN Minimum Standards, December 2013	

SPECIALIZED AVIATION SERVICE OPERATION (SASO)

A SASO is a commercial operator engaged in providing aircraft maintenance for aircraft other than those owned, leased, and run by the operator. This category includes the sale of aircraft parts and accessories. According to the RYN Minimum Standards: "An Aircraft Maintenance Operator at RYN shall be able to provide minor aircraft maintenance, and major repair on the airframe, powerplants, and associated systems of general aviation aircraft up to 12,500 pounds MTOW." **Table 3-18** outlines the minimum requirements for an FBO at RYN.

Table 3-18: **Aircraft Maintenance Operator**

Aircraft Maintenance Operator		
Infrastructure	**Group I Aircraft**	**Group II Aircraft**
Contiguous Land – Square Feet	21,780	35,000
Customer Area – Square Feet	200	300
Administrative Area – Square Feet	200	300
Maintenance Area – Square Feet	400	1,250
Maintenance Hangar – Square Feet	3,500	8,000
Hangar Door Height – Feet	16	18
Source: RYN Minimum Standards, December 2013		

APRON AND AIRCRAFT SERVICING AREAS

Flight School Need for Hangars and Tiedown Apron Space

In the event a commercial flight training operator or institute resumes operations at RYN, the facility requirement for hangars and apron will depend on the number of aircraft being used. Using estimates for fleet size from **Chapter 2 - Aviation Activity Forecasts**, a FAR Part 61 school with 22 aircraft would require an estimated 27,000 square feet of hangar space and 67,500 square feet of apron. This equals 1.5 acres of hangars and apron space. A larger FAR Part 141 flight school with 60 fixed wing aircraft requires 75,000 square feet of hangar space and 187,500 square feet of apron. This equals 4.3 acres for hangars and apron. Additional space would be needed for the flight school buildings, any student dormitories, and support facilities such as cafeterias, laundry, and retail shops.

MAINTENANCE REPAIR AND OVERHAUL (MRO) FACILITIES

Space for a large MRO operator is available on the north quadrant of the Airport. Large open spaces are available for aircraft storage, parts salvage, and repair. The site is isolated from the rest of the Airport operations area, minimizing interference with regular operations that large parked aircraft may induce. The area also has ease of access to the runway facilities making construction and development costs lower.

AERONAUTICAL USE FACILITIES RECOMMENDATION

- Identify 72,800 square feet, or 1.67 acres, for future GA hangar space development.
- Identify 182,000 square feet, or 4.17 acres, of apron associated with the new hangar areas.
- Identify 4.5 acres for commercial flight school, hangars, and apron. Include additional space for student housing and other facilities to support student population.

The development of future hangars may require improvements to vehicular access and parking, as well as aircraft access and circulation via taxiways and taxi lanes. The actual number, size, and location of future hangars will depend on user needs and financial feasibility at the time demand occurs.

NON-AERONAUTICAL USE FACILITIES

This subsection summarizes the non-aeronautical facility requirements for RYN. Through the analysis of existing and projected demand for the next 20 years, the facility requirements identified are for non-aviation businesses that complement the airport operations and are appropriate for the Tucson market. A summary of recommended non-aeronautical development target industries to help facilitate local revenue development and the recommended infrastructure upgrades to support these uses are described in the following paragraphs.

The facility development recommendations are based on a comparison of the existing aeronautical uses and facilities, and the corresponding demands and requirements of the target uses and industries. **Figure 3-13** depicts the four preliminary subareas or quadrants that are the focus of this section. In all quadrants, critical infrastructure, such as sewer, water, drainage, and dry utilities, need to be extended from nearby existing infrastructure with designated drainage corridors and storm water management facilities needed in support of on-site development within each quadrant. In addition, existing site information indicates remnants of an old landfill site that may need remediation. A brief overview the infrastructure needs is described for the overall development area. Vehicular access and parking elements also need to be planned along with upgrades and enhancements to aviation perimeter fencing to accommodate secured separation between aeronautical and non-aeronautical uses.

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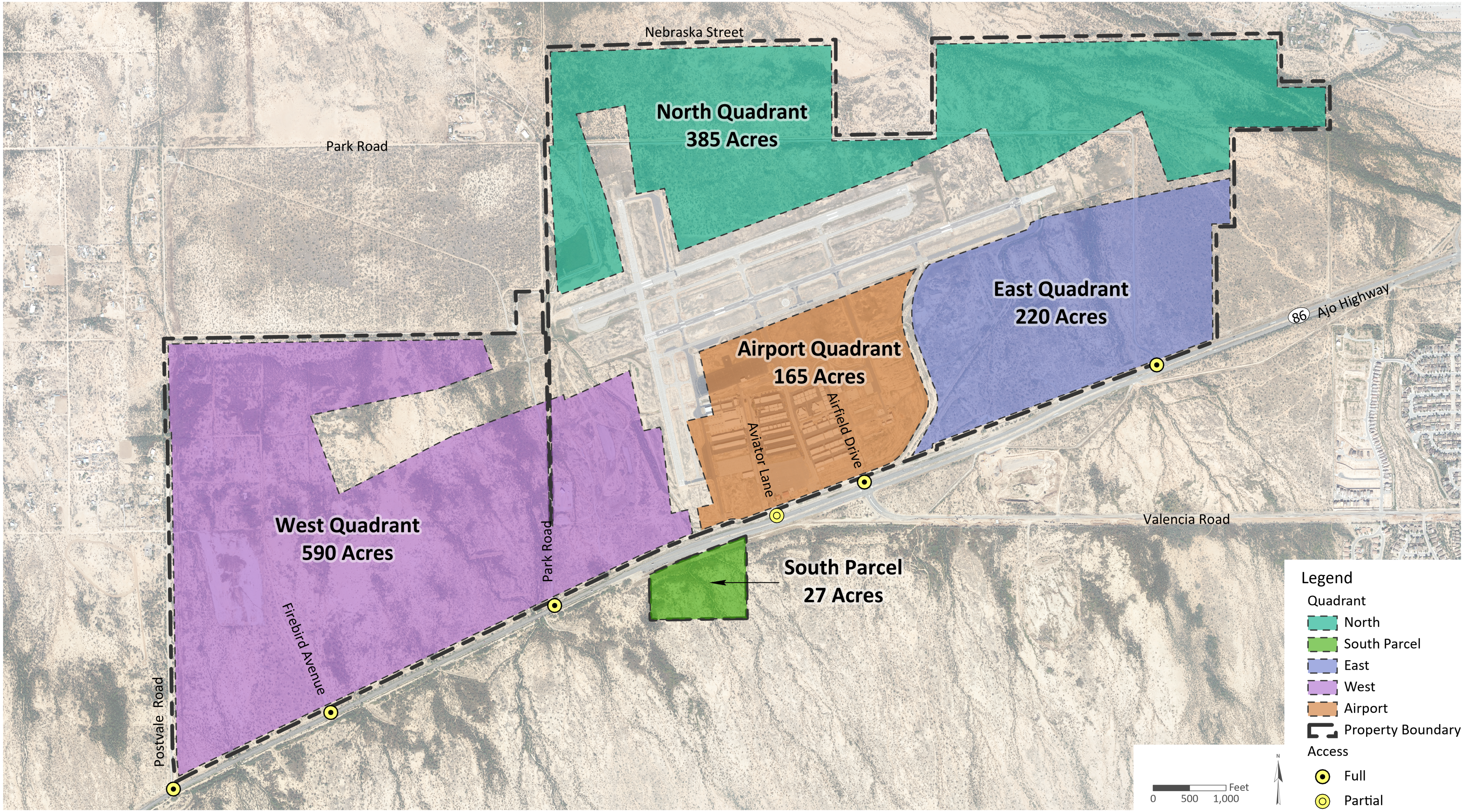

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Quadrant Delineation

Figure 3-13

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TARGET INDUSTRY SELECTION FACTORS

The analysis of the Tucson economy and stakeholder feedback revealed several market sectors and uses as target industries for the identified quadrants. The factors listed below influenced selection of the target industries.

Existing Employment Sectors

According to the Economic and Business Research Center at the University of Arizona, Eller College of Management, Tucson experienced a 2.9 percent growth in real Gross Regional Product (GRP) and added nearly 9,000 net jobs from the third quarter of 2017 to the same quarter of 2018. Tucson is forecast to gain 19,000 net new jobs over the next two years. The biggest gains are anticipated to be in healthcare, tourism, services, and construction, but all sectors are expected to gain.

Growth Outlook

The socioeconomic analysis further identified industries and subsectors likely to experience strong growth over the next 10 years. Interstate 11 is in the environmental impact review phase and is planned to begin construction in several years. The proposed alignment of Interstate 11 is adjacent to the Airport and will provide a high-priority, access controlled, north-south transportation corridor. Additionally, future industry and other non-aeronautical users will have access to RYN.

Suitability of Site and Land Inventory

This assessment considered the suitability of available land among airport area properties to accommodate potential uses and users.

Stakeholder Feedback

The proposed land use determinations considered the economic development goals and objectives of the Airfield and input from stakeholders.

QUADRANT UTILITIES

Sewer

Currently, the wastewater system consists of multiple 8-inch Polyvinyl chloride (PVC) lines connected to nine septic tanks and leach fields located in various areas of the Airport quadrants. Pima County Wastewater Reclamation Department is the provider for wastewater collection and treatment for the incorporated areas of the city, including at RYN.

The main Avra Valley interceptor, a 21-inch Vitrified Clay Pipe sewer line located approximately 1 mile away from RYN, will serve as the future connection for a sub-regional gravity sewer outfall system. An agreement is in place with the upstream private development community to jointly design and construct a public outfall sewer to replace the current septic system infrastructure.

Water

Tucson Water is the designated municipal water service provider for the Airport and has a distribution system able to support development within each quadrant. There are three existing water production wells surrounding the Airport. One is located on the northwestern portion of the property with a 12-inch PVC water line that traverses the site north to south and connects to a 42-inch Corp Cock thread water main line running along Valencia Road. Two of them are located inside the southwest property corner and serve the Airport through a 12-inch PVC main water line running east to west, then along the property boundary, then north to the easternmost taxiway access road. There are five 8-inch PVC lines for water distribution around the Airport quadrant's developed area that provide looped connections to the 12-inch main line. Service to each of the quadrants will be served from the nearest extent of this existing loop system.

Electric

Trico Electric Cooperative (TEC) and Tucson Electric Power (TEP) provide electrical service to the Airport. TEP serves the main Airport quadrant and power is transmitted via two main connections from the TEP distribution lines located at the Valencia Road and Ajo Highway intersection. The onsite power is conducted through underground lines around the main facilities and an overhead line between Airfield Drive and the easternmost taxiway access road. Although portions of the Western quadrant and portions of the Northern quadrant are contained within the territory served by TEC, with the nearest TEC powerline located along Park Road to the northwest side of the property, the preference is to utilize TEP for all future electrical needs at RYN. Service to each of the quadrants will be from the nearest extents of the existing systems.

Telecommunication

The Airport is served by CenturyLink, a local telecommunications and fiber optic provider. Although no fiber has been placed by the City of Tucson, private companies such as CenturyLink purchase conduits and deploy fiber optic connectivity for commercial needs. Service to each of the quadrants will be from the nearest extent of the existing loop system.

Gas

Southwest Gas is the natural gas provider for the Airport. A 6-inch, high-pressure main line runs along Ajo Highway and distributes to a 2-inch lateral connection than runs along Airfield Drive to serve the Airport facilities. Service to each of the quadrants will be from the nearest extent of the existing gas line system.

Drainage

The Airport is located within the FEMA mapped Black Wash floodplain limits. According to the *Tucson Airport Authority Ryan Airfield Drainage Improvements Project Environmental Determination*, dated October 2017, the existing drainage conveyance on the eastern portion of Airport uses an earthen berm, natural channels, and drainage culverts located near the approach end of Runway 24L to deliver runoff to a drainage swale located on the north side of the airfield.

In addition, the *Ryan Airfield Airport-Wide Basin Study Update* was intended to address future developments associated with the storm-water runoff on and across the Airport. The designated culvert improvements upstream from the Arizona Department of Transportation's recently completed Ajo Highway roadway improvements will serve to establish the anticipated drainage corridors through the quadrants.

DEVELOPMENT QUADRANTS

East Quadrant

The east quadrant is approximately 220 acres of currently vacant land. This quadrant has the most access to existing site infrastructure and would be suitable for the first development. In addition to access to infrastructure, this quadrant will have access to taxiways and other flight facilities. A flight school or similar educational use, in conjunction with the University of Arizona or community college for a satellite campus, would be the primary uses for this quadrant. The use of this area for education will create a campus atmosphere and a community anchor for the Airport. Academic use will also serve as a transitional use between future residential development and the Airport. The identified uses would be beneficial to the surrounding community by creating job and educational opportunities and would boost the area's economy. The supporting uses for education, including dining, entertainment, and retail, are similar to the supporting uses needed for the existing and planned adjacent residential areas.

East Quadrant Transportation

The east quadrant has limited existing transportation infrastructure and access from Ajo Highway. There are full access points at Airfield Drive via West Valencia Road through the Airport Quadrant and approximately 4,300 feet east of Airfield Drive along Ajo Highway. An additional full access point is recommended approximately halfway between the two intersections to support the uses for this quadrant. Internal vehicular circulation will be required within the quadrant. A public collector road in conjunction with non-residential local roads will need to be constructed to City of Tucson standards to provide access within this quadrant.

Parking requirements for educational uses would be calculated using current City of Tucson standards, but a possible reduction could be made if the school has a boarding element. Parking reductions could also be warranted if a ride share or shuttle system is implemented to transport students to and from Tucson. **Figure 3-14** presents the conceptual overview of the critical peripheral infrastructure described above to serve the East Quadrant.

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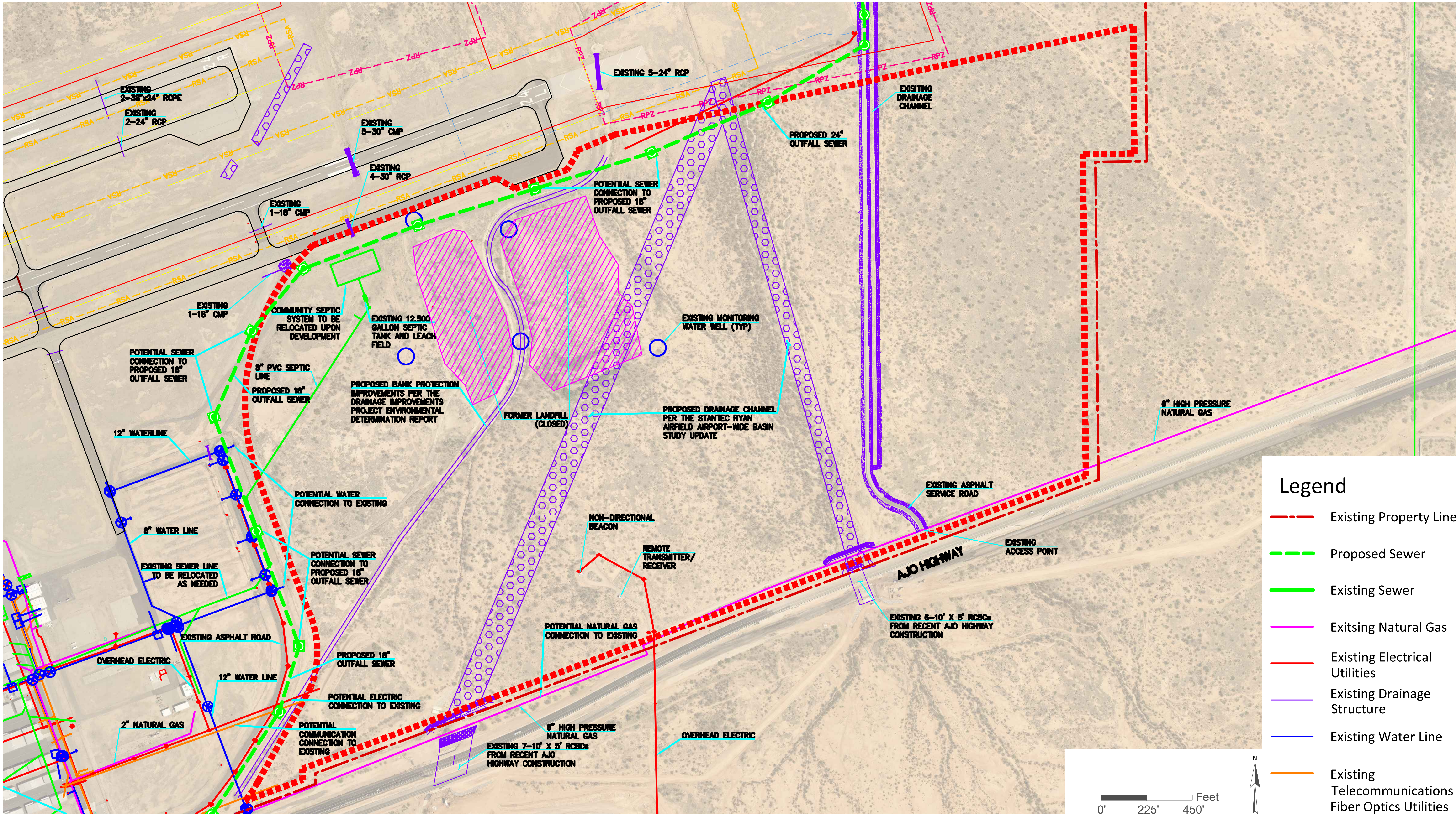

EAST QUADRANT INFRASTRUCTURE

Figure 3-14

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West Quadrant

The west quadrant is approximately 547 acres of vacant land. This quadrant is the closest to the future Interstate 11 corridor and has approximately 1.5 miles of frontage along Ajo Highway. Based on the size, transportation corridors, and access to the runway, this quadrant is best suited for Employment and Industrial uses. Some potential end users could include a large corporate campus, manufacturing, tech users, an incubator space, energy producers, and/or alternative energy production. Supporting or secondary uses should align with the planned residential and/or educational uses. There is a waste transfer facility within this quadrant located at the northeast corner of Continental Road and Aviator Lane. This waste transfer site will be removed. If the facility is still needed within the airpark, it is recommended to be relocated to the northeast corner of the north quadrant along the Sunset View Trail road to prevent impacts to the ability of the other quadrants to be developed.

West Quadrant Transportation

The west quadrant currently has two full access points from Ajo Highway at Firebird Avenue and South Continental Road. Additionally, the western boundary of the quadrant is South Postvale Road, a likely future arterial. The future alignment of Interstate 11 will be close to the quadrant, and designated access roads to both Ajo Highway and S. Postvale Road will be required. Internal collectors and local streets will need to be constructed to City of Tucson standards.

Uses for this quadrant will have limited direct access to Ajo Highway, and internal vehicular circulation will be required to service the uses within the quadrant.

Parking requirements for employment and industrial uses would mainly be calculated by referencing City of Tucson standards. Parking requirements for such development would have to remain flexible until an end-user can be identified and established at the time of zoning. **Figure 3-15** presents the conceptual overview of the critical peripheral infrastructure described above to serve the West Quadrant.

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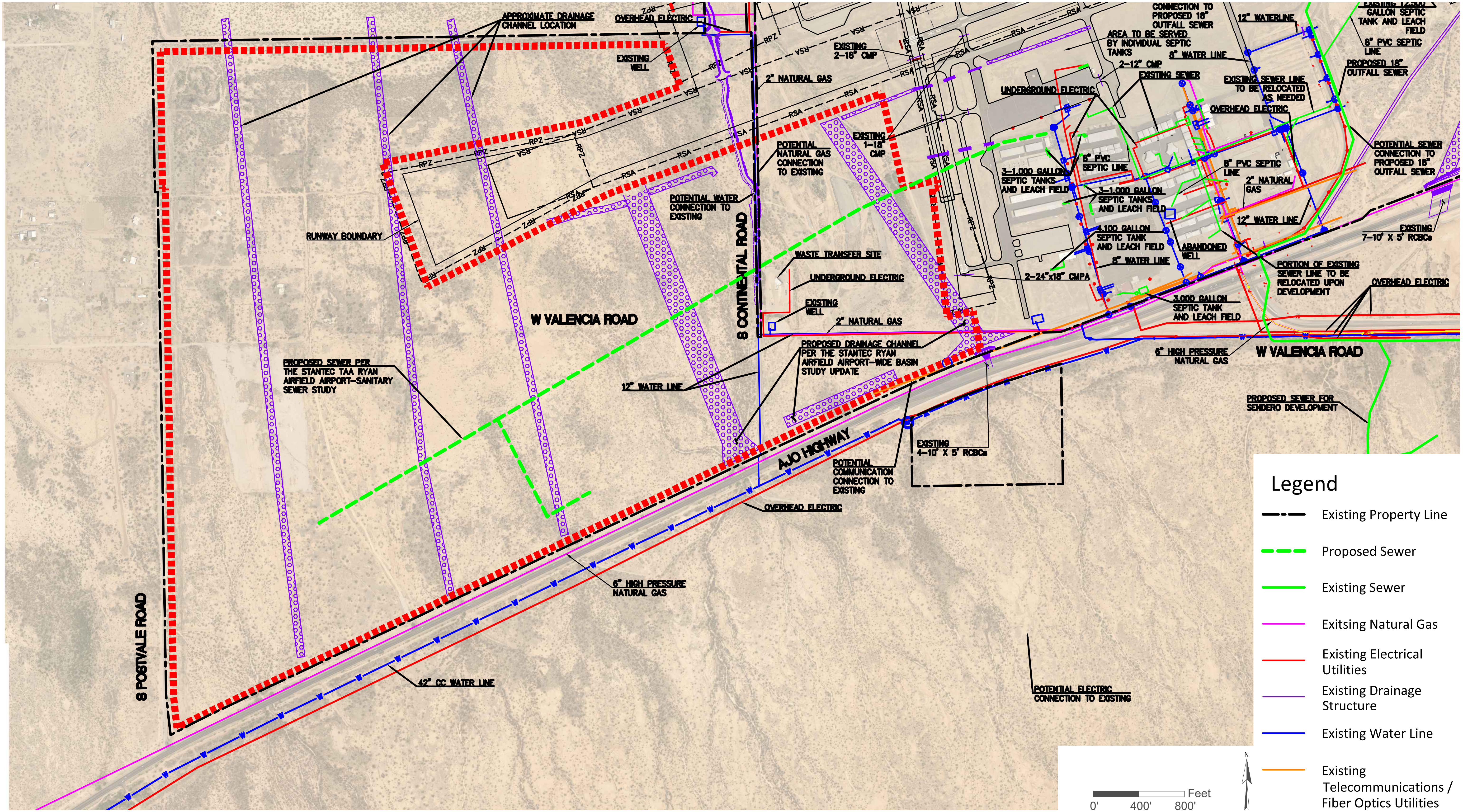

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WEST QUADRANT INFRASTRUCTURE

Figure 3-15

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North Quadrant

The North Quadrant is approximately 316 acres of vacant land and is adjacent to the future Millstone Industrial District to the north. Due to its limited surface street access and proximity to the runways, this quadrant has been identified to expand some aeronautical uses, including a “boneyard” storage area for aircraft or additional hangars for storage. An additional aeronautical support use could be an MRO operation. A non-aeronautical use may include alternative energy production. This quadrant has an advantage of potential runway access and is isolated from other more intense Airport uses.

North Quadrant Transportation

The quadrant currently has limited to no transportation infrastructure and can only be accessed by an un-improved service road. Additional access would need to be constructed by connecting to South Continental Road and West Park Road along the west boundary of this quadrant and through a minor collector road from the east quadrant.

Parking requirements for aeronautical support uses and aeronautical storage will not be the same as typical employment or commercial standards. Aeronautical storage such as a boneyard would not have any required parking. Other aeronautical support uses should follow the current City of Tucson standards, but planning options remain flexible until an end-user can be identified. **Figure 3-16** presents the conceptual overview of the infrastructure described above to serve the North Quadrant.

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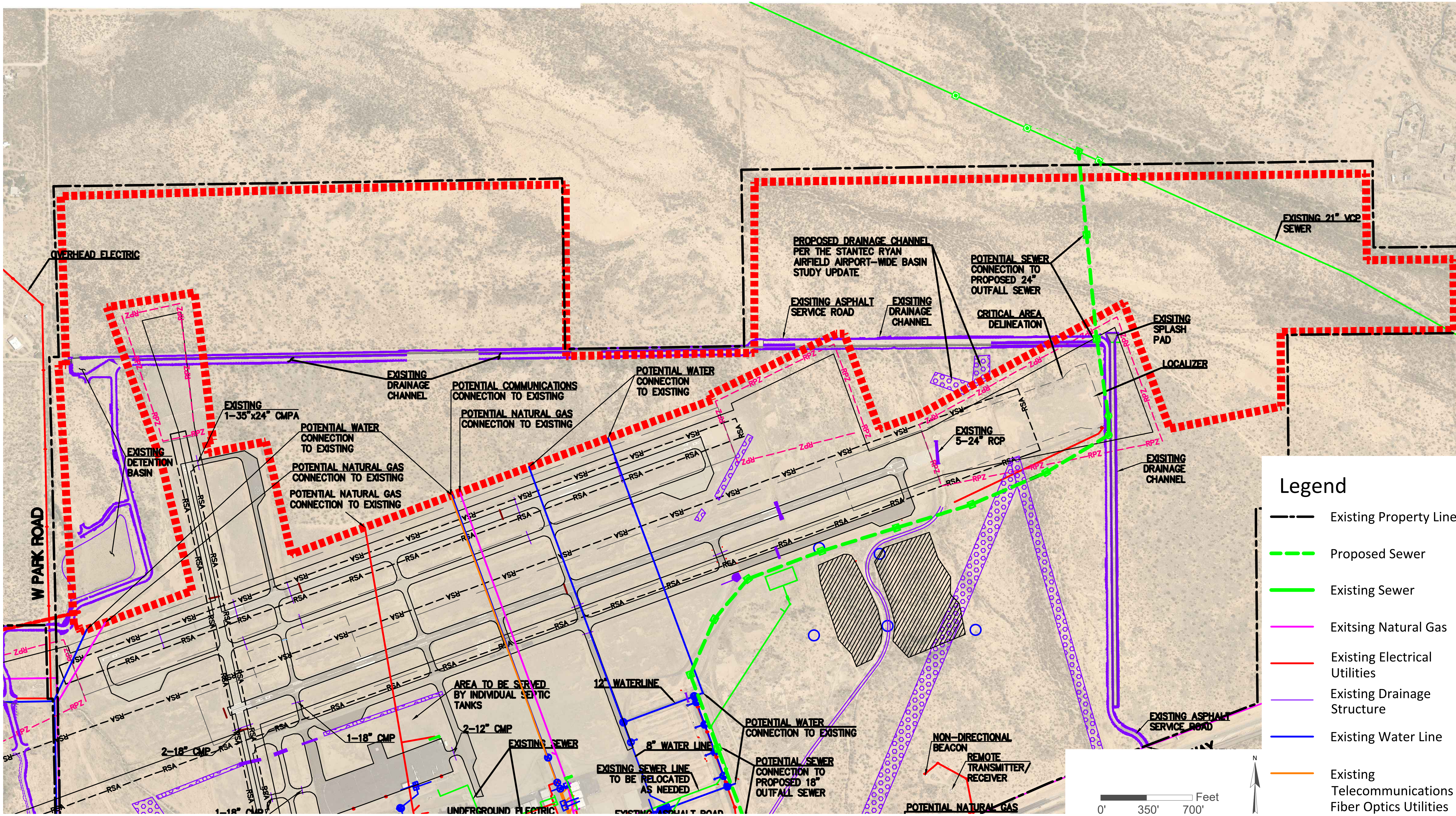

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NORTH QUADRANT INFRASTRUCTURE

Figure 3-16

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South Quadrant

The South Quadrant is located to the south of the Airfield on the south side of Ajo Hwy. The 26-acre parcel is bordered to the east, west, and south by residential zoned land. This area was originally located in the RPZ of the crosswind runway, but with the proposed modification to this runway, the area will no longer fall within the RPZ area. Care must be given to the uses allowed with in this parcel. The south quadrant has been identified as a good candidate for uses that will support the primary users in the other quadrants and future residential developments. Such uses include commercial retail, recreation, and/or entertainment. This quadrant could also be a good candidate for sale to an adjacent landowner. Any uses that require the storage of hazardous, toxic, or flammable materials should be prohibited as well as uses that require tall structures or lighting standards over 30 feet high.

South Quadrant Transportation

The South Parcel has no current access point from Ajo Highway. A full access point onto Ajo Highway is required for this parcel to be developable. Currently there are access points from the north to the highway at South Continental Road and South Aviator Lane. These access points are approximately 3,000 feet apart and do not intersect with the South Parcel. A full access point into the South Parcel at least 1,320 feet from either existing intersection is needed. At least one additional right in or out will also be need if the site is developed with commercial uses with a second one desired. Parking requirements for Commercial uses would mainly be calculated by referencing City of Tucson standards.

Figure 3-17 presents the conceptual overview of the critical peripheral infrastructure described above to serve the South Quadrant.

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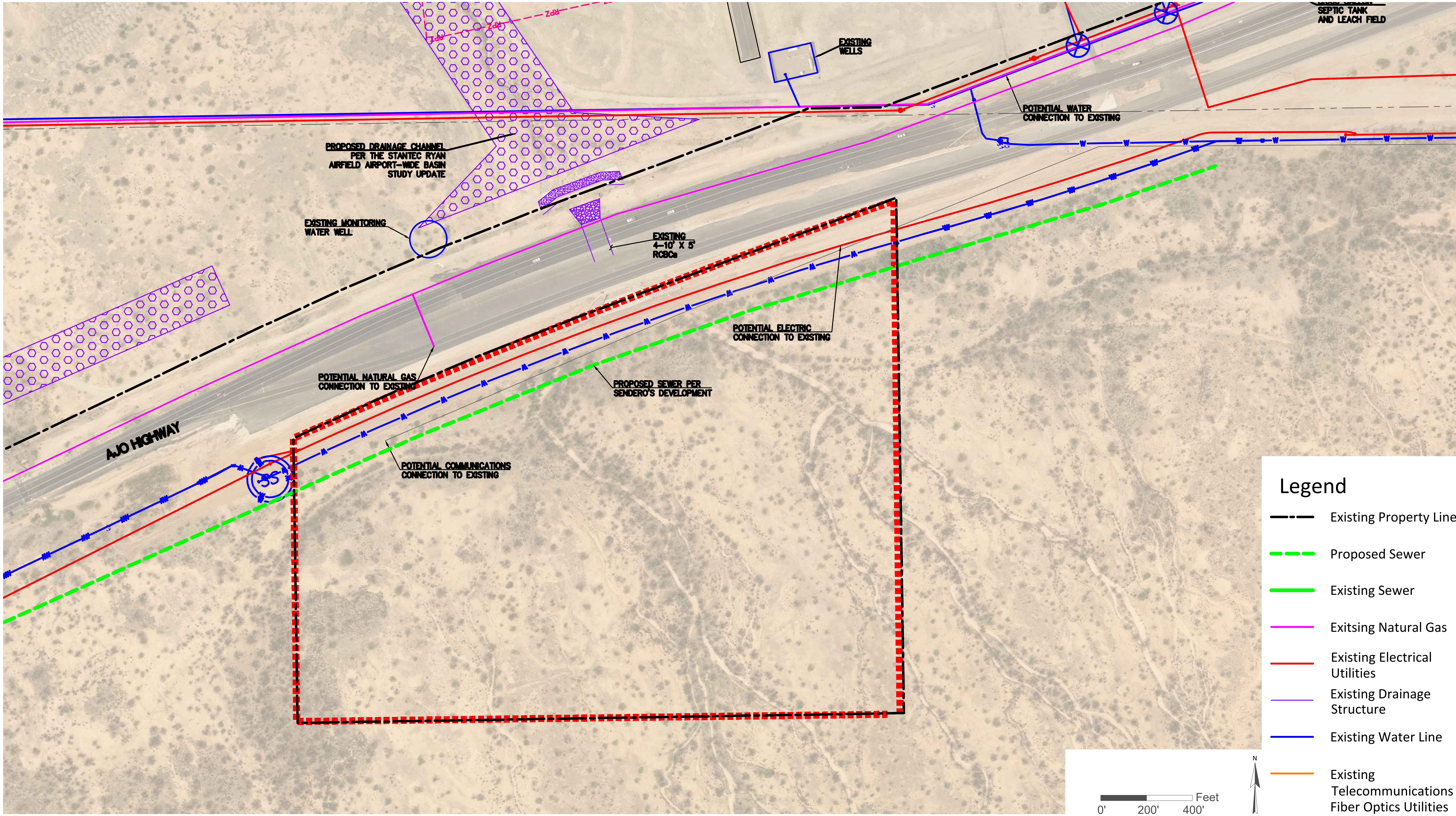

SOUTH QUADRANT INFRASTRUCTURE

Figure 3-17

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Airport Quadrant

The Airport Quadrant is located to the south of the runway facilities on the north side of Ajo Hwy. This quadrant consists of 170 acres and includes the aprons, taxi lanes, hangars, and services on the Airport. Space exists for additional in-fill development for aprons, hangars, and services focused on aeronautical uses. Access to the Airport from the Ajo highway is at Airfield Drive with a newly constructed interchange allowing for east and west directions. Additional access to the Airport can be made at the intersection of Ajo Highway and South Aviator Lane. When departing the Airport from South Aviator Lane, drivers cannot turn to the east on Ajo Highway. Airfield Drive provides direct access to the existing eastern hangar areas and future development areas. Valencia Road acts as a frontage road to Ajo Highway and provides access to Aviator Lane and the hangars in the west and central areas. The TAA Administrative office, south apron, and restaurant are at the west end of Aviator Lane. Property development for commercial and industrial purposes is available along the frontage area.

A joint use fire station that requires ease of access to both the airside and off-airport residential areas could be located on Airfield Drive near the Airport connector with Ajo Highway.

SUMMARY

Consistent with the Tucson region, RYN is projected to experience sustained growth, as evidenced by forecasted aircraft operations and based aircraft. To accommodate the corporate aircraft operational requirements, RYN will need to increase the runway length to mitigate effects of high ambient temperatures that impact jet aircraft useful loads. The primary Runway 6R/24L is forecasted to continue serving small to medium cabin corporate jet aircraft. The secondary Runway 6L/24R accommodates turboprop and light aircraft and meets the anticipated needs for these aircraft. The crosswind Runway 15/33 will remain the same length and width to serve the needs of light aircraft when wind alignment is not provided by the primary and secondary runways. The Airport has land available to accommodate new aircraft hangars, aeronautical tenants, and growth in flight training within the terminal area.

The following summary of recommended Airport improvements and tasks from the facility requirements assessment are listed here and are to be evaluated in **Chapter 4 - Improvement Alternatives**.

AIRSIDE FACILITIES

Runway Design Recommendations

- Runway 6R/24L remain in RDC B-II
  - ✓ Blast pads recommended for runways used by turbine aircraft to prevent erosion of soils in safety areas
  - ✓ Holding position line separation from Runway 6R/24L centerline increase from 150 feet to 200 feet to meet B-II standard
- Extend Runway End 6R to eliminate runway incursion hot spot and decouple the runway threshold

- Runway 15/33 RDC to remain at B-I (Small)
  - √ Runway width meets B-I (Small) standards of at least 60 feet and is to remain at existing length
  - √ Separation distance between Runway 15/33 and partial parallel Taxiway E to remain at 240 feet
- RPZs
  - √ Realignment of maintenance access roadway within RPZ to Runway 33 to remove possibility of incompatible land uses
  - √ Avigation easement or property acquisition of land outside Airport perimeter within Runway 6L RPZ
- Runway crossing in middle third of runway
  - √ Evaluate removal of Taxiway B4 crossing Runway 6R/24L to reach Runway 6L/24R

Taxiway Design Recommendations

- Direct access from aprons to runways at the following locations:
  - √ Runway 15/33 connectors for Taxiways D1, D2, B (hot spot)
  - √ Runway 6R/24L connectors for Taxiways D, B2, B4
- Taxiway Design Group
  - √ Taxiway B connectors to Runway 6R/24L are to remain at 50 feet wide, which meets the TDG width of at least 35 feet.
  - √ Taxiway E width is to remain at 35 feet, which meets the TDG standard of at least 25 feet
  - √ Recommend paved shoulders width of 10 feet

Runway Length Recommendations

- Runway 6R/24L length increased from 5,503 feet to an ultimate length of 8,300 feet
- Runway 6L/24R length remain at 4,900 feet
- Runway 15/33 length to remain at 4,000 feet

Airfield Lighting Recommendations

- Install approach lighting system to Runway 6R to reduce ILS visibility minimums
- Install PAPI for Runway 6R/24L
- Replace Runway 24R VASI with PAPI
- Modify Runway 6R REILs to function at night as part of pilot-controlled lighting system

Instrument Approach Recommendations

- Include GQS to Runway 6 preferred alternative to maintain the ILS.
- Conduct instrument approach procedures feasibility study for all runways.

LANDSIDE AERONAUTICAL USE FACILITIES

ATCT Recommendations

- RYN ATCT siting location or height increase to mitigate existing blind spots

Flight School, FBO, SASO, and Joint Use Fire Station Recommendations

- Identify site(s) for future FBO
- Identify site for development of large flight training operator
  - ✓ Land for aprons, hangars, flight instruction, aircraft maintenance, fuel storage
- Identify site for development of new Airport administrative office and pilot lounge
- Identify site for future SASO and aircraft maintenance operator
- Identify site for joint use emergency response facility

LANDSIDE NON-AERONAUTICAL USE FACILITIES

- Identify and reserve property for commercial and industrial development along Ajo Highway frontage road
- Identify and reserve property for commercial and industrial development purposes in quadrants to north, east, south, and west of existing Airport quadrant and runway system
- Identify, upgrade, and develop utility services and roadways for development within identified quadrants to enable infrastructure development when land use demand warrants

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