RYAN AIRFIELD

AIRPORT MASTER PLAN

TAA #20105254

AIRPORT MASTER PLAN

for

RYAN AIRFIELD
Tucson, Arizona

TAA Project Number 20105254

Prepared for the

TUCSON AIRPORT AUTHORITY

by

COFFMAN ASSOCIATES, INC.

In Association with

STANTEC INC.

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Tucson, Arizona

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RYAN AIRFIELD
TUCSON AIRPORT AUTHORITY

INTRODUCTION

Introduction

This update of the Ryan Airfield (RYN) Master Plan has been undertaken to evaluate the airport's capabilities and role, to review forecasts of future aviation demand, and to plan for the timely development of new or expanded facilities that may be required to meet that demand. The ultimate goal of the master plan is to provide systematic guidelines for the airport's overall development, maintenance, and operation.

The master plan is intended to be a proactive document which identifies and then plans for future facility needs well in advance of the actual need for the facilities. This is done to ensure that the Tucson Airport Authority (TAA), Arizona Department of Transportation (ADOT), and the Federal Aviation Administration (FAA) can coordinate project approvals, design, financing, and construction to avoid experiencing detrimental effects due to inadequate facilities.

An important result of the master plan is reserving sufficient areas for future facility needs. This protects development areas and ensures they will be readily available when required to meet future demand. The intended result is a development concept which outlines the proposed uses for all areas of airport property.

The preparation of this master plan is evidence that the TAA recognizes the importance of air transportation to the Tucson community and the associated challenges inherent in providing for its unique operating and improvement needs. The cost of maintaining an airport is an investment which yields impressive benefits to the community and the region. With a sound and realistic master plan, Ryan Airfield can

maintain its role as an important link to the national air transportation system for the community and maintain the existing public and private investments in its facilities.

MASTER PLAN GOALS AND OBJECTIVES

The primary objective of the master plan is to provide the community and public officials with proper guidance for future development which will address aviation demands and be wholly compatible with the environment. The accomplishment of this objective requires the evaluation of the existing airport and determination of what actions should be taken to maintain an adequate, safe, and reliable airport facility in support of those long term goals. This master plan will provide an outline of necessary development and give those responsible an advance notice of future airport funding needs so that appropriate steps can be taken to ensure that adequate funds are budgeted and planned.

Specific goals for the airport are:

- To preserve and protect public and private investments in existing airport facilities;
- To enhance the safety of aircraft operations;
- To be reflective of community and regional goals, needs, and plans;
- To ensure that future development is environmentally compatible;
- To establish a schedule of development priorities and a program to meet the needs of the proposed improvements in the master plan;
- To develop a plan that is responsive to air transportation demands;
- To develop an orderly plan for use of the airport;
- To coordinate this master plan with local, regional, state, and federal agencies, and;
- To develop active and productive public involvement throughout the planning process.

Specific objectives of this master plan designed to help in attaining these goals include:

- Research and evaluate socioeconomic factors likely to affect the air transportation demand in the region.
- Determine projected needs of airport users through the year 2030 in support of airport development alternatives.
- Recommend improvements that will enhance the airport's safety capabilities to the maximum extent possible within affordability parameters established jointly with ADOT.
- Establish general aviation requirements and evaluate general aviation facility alternatives.

- Conduct an evaluation of the facility needs for approved aviation fuels for General Aviation at the airport.
- Update future facility development plans, including utilities.
- Incorporate the findings and recommendations of the 2005 Drainage Study.
- Produce current and accurate base maps and Airport Layout Plan drawings.
- Investigate the proper horizontal and vertical position for the future extension of Runway 6R-24L.
- Establish a schedule of priorities and an affordable program for the improvements proposed in the Master Plan.
- Prioritize the airport capital improvement program and develop a detailed financial plan.
- Assess the continued validity of Ryan Airfield's Noise Compatibility Program and suggest changes where necessary.
- Develop ways to encourage greater use of Ryan Airfield as a reliever to Tucson International Airport.
- Develop active and productive public involvement throughout the planning process.

The Master Plan will provide recommendations from which the TAA may take action to improve the airport and all associated services important to public needs, convenience, and economic growth. The plan will benefit all residents of the area by providing a single, comprehensive plan which supports and balances the continued growth of aviation activity with the preservation of the surrounding environs.

BASELINE ASSUMPTIONS

A study such as this typically requires several baseline assumptions that will be used throughout the analysis. The baseline assumptions for this study are as follows:

- Ryan Airfield will remain as a general aviation reliever airport through the planning period.
- The City of Tucson and Pima County population, employment, and economy will continue to grow positively through the 20-year period of this Master Plan as forecast by the Pima County Association of Governments (PAG).
- The general aviation industry will continue to grow positively through the planning period as forecast by the Federal Aviation Administration (FAA) in its annual Aerospace Forecasts.
- Civil aviation activity will continue to share the Arizona airspace with the military air installations and its training operations.
- Both a federal program and state program will be in place through

the planning period to assist in funding future capital development needs.

MASTER PLAN ELEMENTS AND PROCESS

The Ryan Airfield Master Plan is being prepared in a systematic fashion following FAA guidelines and industry-accepted principles and practices. The master plan has six chapters that are intended to assist in the discovery of future facility needs and provide the supporting rationale for their implementation.

Chapter One - Inventory summarizes the inventory efforts. The inventory efforts are focused on collecting and assembling relevant data pertaining to the airport and the area it serves. Information is collected on existing airport facilities and operations. Local economic and demographic data is collected to define the local growth trends. Planning studies which may have relevance to the master plan are also collected.

Chapter Two - Forecasts examines the potential aviation demand for aviation activity at the airport. This analysis reviews and updates the Ryan Airfield demand forecasts previously prepared for the TAA in the 1999 *Ryan Airfield Airport Master Plan*. The forecast effort takes into account local socioeconomic information, as well as national air transportation trends to quantify the levels of aviation activity which can reasonably be expected to occur at Ryan Airfield through the year 2027. The results of this effort are used to determine the types and sizes of facilities which will be required to meet the projected aviation demands on the airport through the planning period.

Chapter Three - Facility Requirements comprises the demand/capacity and facility requirements analyses. The intent of these analyses is to compare the existing facility capacities to forecast aviation demand and determine where deficiencies in capacities (as well as excess capacities) may exist. Where deficiencies are identified, the size and type of new facilities to accommodate the demand are identified. The airfield analysis focuses on improvements needed to serve the type of aircraft expected to operate at the airport in the future, as well as navigational aids to increase the safety and efficiency of operations. This element also examines the terminal area facilities, general aviation facilities, and support needs.

Chapter Four - Alternatives considers a variety of solutions to accommodate the projected facility needs. This element proposes various facility and site plan configurations which can meet the projected facility needs. An analysis is completed to identify the strengths and weaknesses of each proposed development alternative, with the intention of determining a conceptual direction for development.

Chapter Five – Recommended Master Plan Concept provides both a graphic and narrative description of the recommended plan for the use, development, and operation of the airport. An environmental overview is also provided. The master plan also supports the official Airport Layout Plan (ALP) and detailed technical drawings depicting airspace, land use, and property data. These drawings are used by the FAA in determining grant eligibility and funding.

Chapter Six - Financial Plan establishes the capital needs program, which defines the schedules and costs for the recommended development projects. The plan then evaluates the potential funding sources to analyze financial strategies for successful implementation of the plan.

Appendices – Appendices are included in the final Master Plan report. These include a glossary of aviation terms used in the study, and an F.A.R. Part 150 Review analyzes existing and future airport noise contours and determine land use impacts. The Part 150 Review also analyzes impacts on the local population, the status of the 1990 Noise Compatibility Plan (NCP), noise abatement issues, and land use compatibility planning issues.

COORDINATION

The Ryan Airfield Master Plan is of interest to many within the local community. This includes local citizens, community organizations, airport users, airport tenants, local and state planning agencies, and aviation organizations. As the airport is a strategic component of the state and national aviation systems, the Ryan Airfield Master Plan is of importance to both state and federal agencies responsible for overseeing air transportation.

To assist in the development of the master plan, the TAA has identified a group of community members and aviation interest groups to act in an advisory role in the development of the master plan. Members of the Planning Advisory Committee (PAC) reviewed phase reports and provided comments throughout the study to help ensure that a realistic, viable plan was developed.

To assist in the review process, draft working papers were prepared at the various milestones in the planning process. The working paper process allows for timely input and review during each step within the master plan to ensure that all master plan issues are fully addressed as the recommended program develops.

A series of public information workshops were also held as part of the plan coordination. The public information workshops are designed to allow any and all interested persons to become informed and provide input concerning the master plan. Notices of meeting times and locations were advertised through the media as well as local neighborhood associations.

SUMMARY AND RECOMMENDATIONS

The proper planning of a facility of any type must consider the demand that may occur in the future. For Ryan Airfield, this involved updating forecasts to identify potential future aviation demand. Because of the cyclical nature of the economy, it is virtually impossible to predict with certainty year-to-year fluctuations in activity when looking five, ten, and twenty years into the future.

Recognizing this reality, the Master Plan is keyed more towards potential demand "horizon" levels than future dates in time. These "planning horizons" were established as levels of activity that will call for consideration of the implementation of the next step in the Master Plan program. By developing the airport to meet the aviation demand levels instead of specific points in time, the airport will serve as a safe and efficient aviation facility, which will meet the operational demands of its users while being developed in a cost efficient manner. This program allows the TAA to adjust specific development in response to unanticipated needs or demand.

The forecast approach recognizes the current economic climate and anticipates a gradual recovery through the planning period of this master plan. The forecast planning horizons are summarized in **Table A**.

TABLE A
Aviation Demand Planning Horizons
Ryan Airfield

	2007	2008	Short Term	Intermediate Term	Long Term
ANNUAL OPERATIONS					
Military	2,978	3,760	3,500	3,500	3,500
General Aviation					
Itinerant	75,037	59,930	61,000	70,500	100,000
Local	171,410	104,262	107,000	119,500	150,000
Total Operations	249,425	167,952	171,000	193,500	253,500
Based Aircraft	301	242	266	296	369

The Airport Layout Plan set has also been updated to act as a blueprint for everyday use by management, planners, programmers, and designers. These plans were prepared on computer to help ensure their continued use as an everyday working tool for airport management.

This Master Plan is an update of the previous Ryan Airfield Master Plan completed in 1999. Since the completion of that plan the TAA has constructed new taxiways and resurfaced others to improve taxiway circulation. Adjacent lands have been acquired to protect runway approaches and to allow for future airport development opportunities. Several new hangar facilities have been constructed and the north apron has been expanded to provide additional aircraft parking positions. The updated Master Plan carries many of the previous concepts forward with revisions made to accommodate changes in the industry and in the market area. **Exhibit IA** depicts the updated plan.

With three runways, the longest measuring 5,500 feet, the airport currently operates as a general aviation reliever airport to Tucson International Airport. In order to serve growing business jet aircraft operations the plan recommends an ultimate length of 8,300 feet and width of 100 feet for the primary runway (Runway 6R-24L). The parallel runway (Runway 6L-24R) is planned to be extended to 5,005 feet improving airfield capacity and redundancy. Crosswind Runway 15-33 is planned for an ultimate length of 4,800 feet. At this length Runway 15-33 will better serve small aircraft.

Airfield drainage issues are of primary importance to the airport and will need to be addressed prior to any improvements of the primary runway. Proposed airfield drainage improvements involve raising the primary runway and portions of the crosswind runway and various taxiways to allow for the installation of box culverts.

Additional airfield improvements recommended include the construction of a helicopter training touchdown and lift-off (TLOF) area and a heliport. These facilities will segregate rotorcraft operations from fixed-wing operations improving airfield capacity and enhancing safety.

The development of additional aircraft storage hangars, parking aprons, fuel storage facilities, a new airport traffic control tower, and other aviation services at the airport have been planned to provide adequate facilities for existing and forecast users of the airport.

SHORT TERM PLANNING HORIZON IMPROVEMENTS

- Construct perimeter service road and security fencing
- Upgrade airfield drainage system
- Construct additional hangar facilities
- Rehab and preservation of existing airfield pavements

INTERMEDIATE TERM PLANNING HORIZON IMPROVEMENTS

- Extend Runway 6L-24R to 5,005 feet
- Renovate airport traffic control tower and add office space
- Acquire 119.3 acres for future airport development and runway approach protection
- Construction of additional hangar facilities
- Pavement preservation
- Expand apron capacity by 88,200 square yards
- Extend Runway 15-33 to a full length of 4,800 feet
- Construct heliport

LONG TERM PLANNING HORIZON IMPROVEMENTS

- Construct dual parallel Taxiway C
- Construct high-speed exit taxiways
- Raise Runway 6R-24L
- Relocate Taxiway B

- Construction of additional hangar facilities
- Pavement preservation
- Extend Runway 6R by 800 feet for a full length of 6,300 feet
- Construct helicopter training TLOF area
- Install approach lighting systems on Runways 6R and 24L
- Construct a new airport traffic control tower
- Widen Runway 6R-24L to 100 feet

Detailed costs were prepared for each development item included in the capital improvement program. As shown in **Table B**, implementation of the total program will require a total financial commitment of approximately $80.3 million dollars over the long-term planning horizon. Nearly 96 percent of the recommended program funding could be funded through state or federal grant-in-aid programs. The source for federal monies is through the Airport Improvement Program (AIP), administered by the Federal Aviation Administration (FAA), which was established to maintain the integrity of the air transportation system. Federal monies could come from the Aviation Trust Fund which is the depository for federal aviation taxes such as those from airline tickets, aviation fuel, aircraft registrations, and other aviation-related fees. Federal AIP funding of 95 percent can be received from the FAA for eligible projects.

The Arizona Department of Transportation (ADOT) also provides a separate state funding mechanism which receives annual funding appropriation from collection of statewide aviation related taxes. Eligible projects can receive up to 90 percent funding from ADOT for non-federally funded projects, and one-half (2.5 percent) of the local share for projects receiving federal AIP funding. The following table depicts the breakdown of federal, state, and local funding for the implementation of the short term capital improvement program.

TABLE B
Development Funding Summary
Ryan Airfield

PLANNING HORIZON	Total Costs	FAA Share	ADOT Share	Local Share
Short Term Program	$14,072,163	$7,368,391	$5,295,974	$1,407,801
Intermediate Term Program	$22,470,668	$19,797,791	$1,765,453	$907,424
Long Term Program	$43,840,416	$41,648,395	$1,096,010	$1,096,010
TOTAL PROGRAM COST	$80,383,247	$68,814,577	$8,157,437	$3,411,235

With the airport master plan completed, the most important challenge is implementation. The cost of developing and maintaining aviation facilities is an investment which yields impressive benefits for the community. This plan and associated development program provides the tools the TAA will require to meet the challenges of the future. By providing a safe and efficient facility, Ryan Airfield will continue to be a valuable asset to the City of Tucson and the surrounding region.

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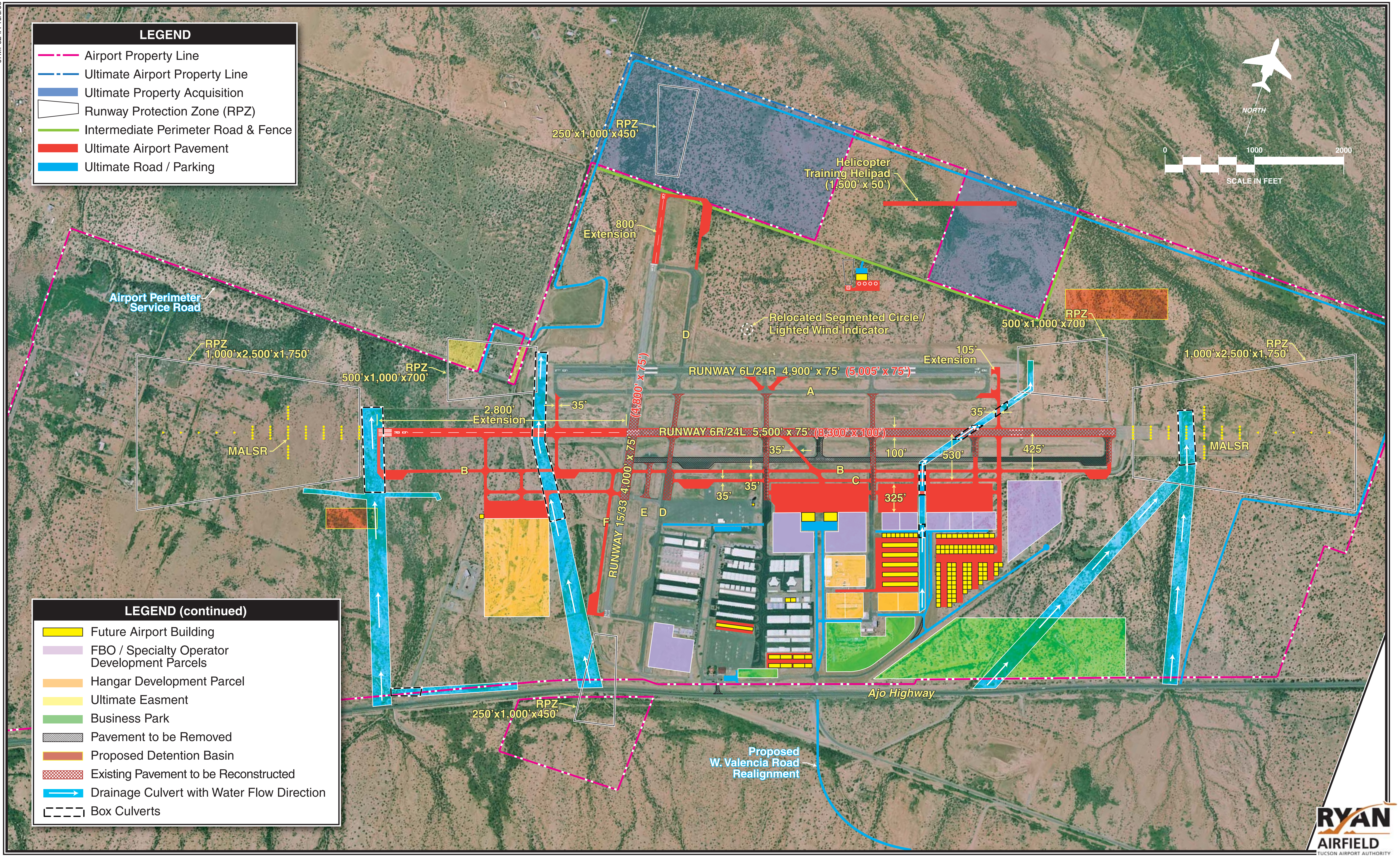

Exhibit IA
AIRFIELD DEVELOPMENT CONCEPT

RYAN AIRFIELD
TUCSON AIRPORT AUTHORITY

Chapter 1

INVENTORY

Chapter One

Inventory

The initial step in the preparation of the airport master plan for Ryan Airfield (RYN) is the collection of information pertaining to the airport and the area it serves. The information summarized in this chapter will be used in subsequent analyses in this study. It includes:

- Physical inventories and descriptions of the facilities and services currently provided at the airport, including the regional airspace, air traffic control, and aircraft operating procedures.
- Background information pertaining to Pima County and the Tucson metropolitan area, including descriptions of the regional climate, surface transportation systems, Ryan Airfield's role in the regional, state, and national aviation systems, and development that has taken place recently at the airport.
- Population and other significant socioeconomic data which can provide an indication of future trends that could influence aviation activity at the airport.
- A review of existing local and regional plans and studies to determine their potential influence on the development and implementation of the airport master plan.

The information in this chapter was obtained from several sources, including on-site inspections, interviews with the Tucson Airport Authority (TAA) staff and airport tenants, airport records, related studies, the Arizona Department of Transportation (ADOT), the Federal Aviation Admini-

stration (FAA), and a number of internet sites. A complete listing of the data sources is provided at the end of this chapter.

AIRPORT SETTING

Ryan Airfield is located approximately ten miles southwest of the City of Tucson at the intersection of Ajo Highway (State Route 86) and West Valencia Road, as shown on **Exhibit 1A**. Ryan Airfield is situated on 1,754 acres at 2,417 feet above mean sea level (MSL) and serves as a general aviation reliever to Tucson International Airport. Tucson International Airport as well as Ryan Airfield are owned by the City of Tucson and operated by the TAA. Ryan Airfield is one of five public-use general aviation airport facilities in Pima County.

Pima County encompasses approximately 9,189 square miles of south central Arizona. Tucson, the state's second largest city at 543,959 residents, made up approximately 54 percent of the total County population of 1,014,023 in 2008. Tucson is also the county seat for Pima County. Pima County is home to the Tohono O'odham Nation Native American Reservation, as well as Saguaro National Park which showcases the Sonoran Desert and the plants and animals that inhabit the desert.

OWNERSHIP AND MANAGEMENT

Ryan Airfield is owned by the City of Tucson and is operated and maintained by the TAA. The Tucson Airport Authority is a non-profit organization that was created by state charter in 1948 to promote air transportation and commerce in the state, to maintain the Tucson International Airport and Ryan Airfield facilities, and to encourage economic growth in Tucson and southern Arizona. The TAA is made up of 115 community volunteers and a nine-person board which oversees policy decisions. The TAA also has a staff of approximately 330 employees who handle daily operations at Tucson International Airport and Ryan Airfield.

AIRPORT DEVELOPMENT HISTORY

Ryan Airfield was developed during World War II as the Federal government began to realize a need for a large number of trained pilots. The San Diego-based Ryan School of Aeronautics was one of several civilian flight schools contracted to train Army fliers. With the fear of coastal attack spurred by Pearl Harbor, inland training sites were preferred, and Arizona's clear weather was ideal.

From a June 15, 1942 groundbreaking, the open desert southwest of Tucson was transformed into an Army airfield in just three months. The Ryan School of Aeronautics came complete with paved runways, apron, hangars, barracks, mess hall, maintenance shop, classrooms, offices, a PX, and recreational facilities. A full four month course of flight instruction was compressed to nine weeks as Ryan graduated 6,000 pilots in two years of operation before the school was closed on September 5, 1944.

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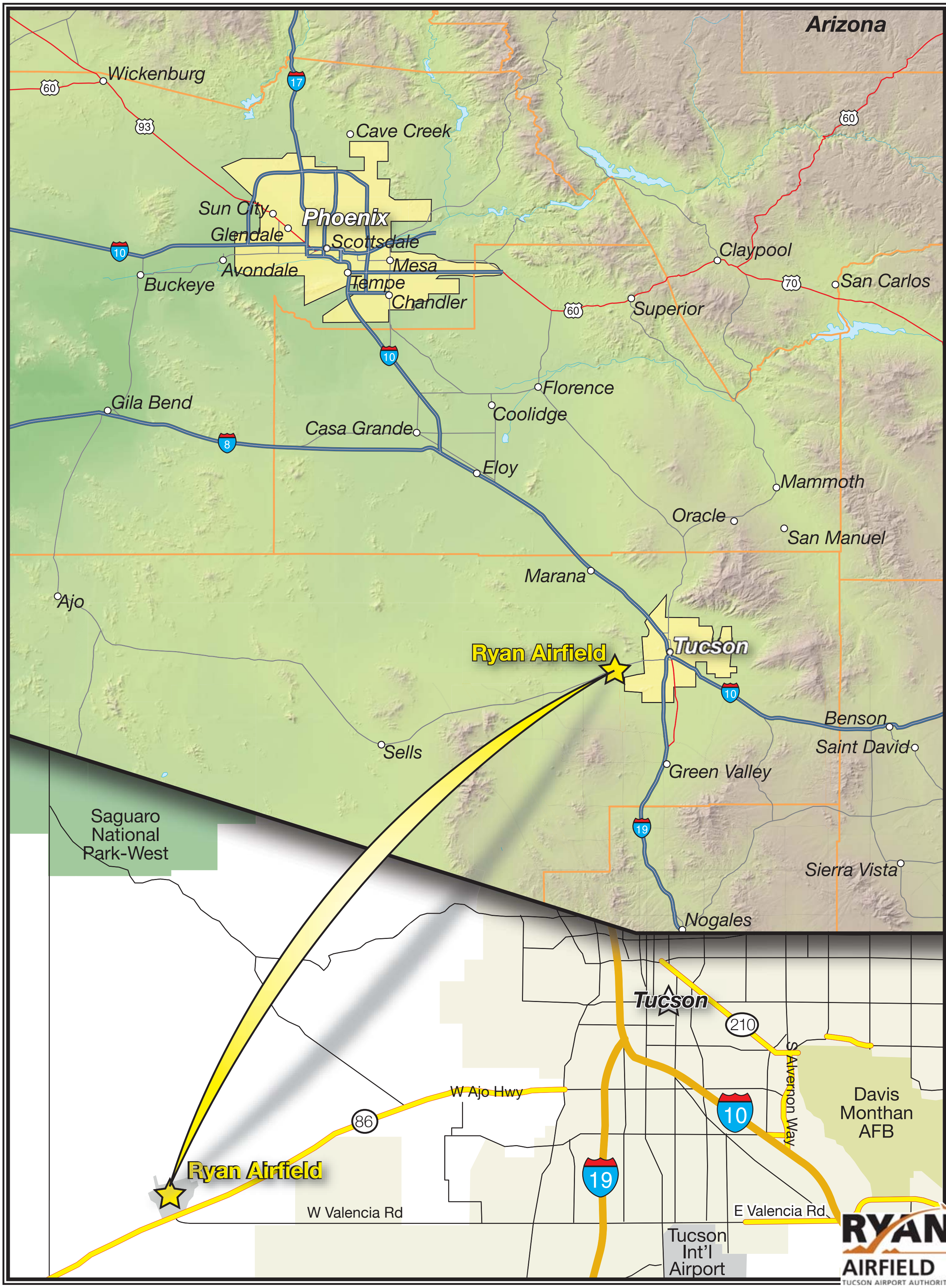

Exhibit 1A
LOCATION MAP

At the end of World War II, the United States government was left with numerous surplus airports which were transferred to state and local jurisdictions under the War Surplus Property Act of 1944. Ryan Airfield, including all improvements, was transferred to the state of Arizona on October 4, 1948.

On August 1, 1951, the State executed a 10-year lease agreement with the TAA for the 906-acre airport, ending a six-year period of dormancy. Within three weeks of operation, five buildings were leased to two tenants. The original agreement, however, proved to be a barrier to development because prospective tenants would not finance any improvements based upon the short term of the lease. In 1954, a new 99-year lease was executed. The State ultimately transferred ownership of the airport by quit claim deed to the City of Tucson on December 16, 1960. The lease with the TAA remained in effect.

Since that time, Ryan Airfield has experienced a significant expansion of general aviation facilities. This has included the extension of the primary runway from 4,000 feet to 5,500 feet in 1982-83; the construction of the maintenance facility in 1987, the installation of a permanent airport traffic control tower (ATCT) in 1993; the construction of a 4,900-foot-long parallel runway in 1993; the paving of the 4,000-foot crosswind runway in 1999; and the construction of an airport administration building in 2004.

The FAA has provided funding assistance to Ryan Airfield through the Airport Improvement Program (AIP). The AIP is funded through the Aviation Trust Fund, which was established in 1970 to provide funding for aviation capital investment programs (aviation development, facilities and equipment, and research and development). The Trust Fund also finances a portion of the operation of the FAA. It is funded by user fees, taxes on airline tickets, aviation fuel, and various aircraft parts.

Table 1A summarizes FAA AIP grants received by Ryan Airfield since 1997. The FAA has provided more than $5.2 million for airport improvements at Ryan Airfield over the past ten years.

TABLE 1A
AIP Grants Offered to TAA for Ryan Airfield Projects

Fiscal Year	AIP Grant Number	Project Description	Total Grant Funds
1997	3-04-0044-10	Land Acquisition	$1,000,000
2001	3-04-0044-11	Taxiway/Apron Reconstruction	$1,062,939
2002	3-04-0044-12	Taxiway B Lighting, Airfield Drainage	$859,697
2003	3-04-0044-13	GA Development Area Design	$150,000
2004	3-04-0044-14	GA Development Area Construction, Emergency Generator, Update Airport Wide Basin Study	$1,667,131
2005	3-04-0044-15	Airfield Security Fencing	$107,585
2007	3-04-0044-17	Ryan Tower Equipment & Cab Glass	$395,879
Total Grant Funds			**$5,243,231**

Source: TAA Records

From 1994 through 2008, ADOT has invested more than $12.1 million in improvements at Ryan Airfield. **Table 1B** summarizes these projects and their total expenditures over this period.

TABLE 1B
State Grants Offered to TAA for Ryan Airfield Projects

Fiscal Year	ADOT Grant Number	Project Description	Total Grant Funds
1994	N557	Land Acquisition/Relocation	$49,090
1994	N517	Pave Crosswind Runway, Land Acquisition, Taxiway Reconstruction	$450,910
1995	N617	Land Acquisition	$500,000
1996	N719	Land Acquisition	$965,000
1997	N851	Pave Crosswind Runway, Fire Protection, Storm Water Improvements, Service Road	$911,000
1998	N857	Master Plan Update	$150,000
1998	N873	Overlay Runway 6R/24L, Realign Twy B2	$131,150
1998	E9030	Pave Crosswind Runway	$994,000
1999	E0124	Overlay Rwy 6R/24L, Realign Twy B2	$1,077,000
2000	E0170	Install Twy D Apron Ramp Parking	$110,000
2000	E1124	AWOS, Land Acquisition, Fencing	$936,000
2001	E2S21	Land Acquisition	$555,300
2001	E1147	Taxiway/Apron Reconstruction	$52,178
2002	E3S19	Apron Construction	$550,000
2003	E3F40	Taxiway B Lighting, Airfield Drainage	$42,201
2004	E4F10	GA Development Area Design	$7,363
2004	E5F47	GA Development Area Construction, Emergency Generator	$41,247
2004	E5F48	Update Airport Wide Basin Study	$2,625
2005	E5S07	GA Development Area Utilities	$246,000
2005	E5S08	Install MIRL Rwy 6R/24L	$848,788
2006	E6S27	Taxiway & Entrance Road Improvements	$855,000
2006	E6S39	Master Plan Update	$315,000
2006	AMPM 06	AMPM	$79,936
2006	E6F53	Airfield Security Fencing	$2,831
2007	E7S72	GA Development Area Utilities, Fire Protection	$716,603
2007	E7S73	Lighting Detection AWOS, Electrical Vault	$169,466
2008	Pending	Ryan Tower Equipment	$10,418
2008	E8S30	Lighting Improvements	$1,350,442
Total State Grant Funds			**$12,119,548**

Source: TAA Records

THE AIRPORT'S SYSTEM ROLE

Airport planning exists on many levels: local, regional, and national. Each level has a different emphasis and purpose. This master plan is the primary local airport planning document.

At the regional level, Ryan Airfield is included in the Pima Association of Governments' (PAG) *2002 Regional Aviation System Plan* (RASP). The RASP provides an overview for airport planning in the region, reflecting the overall plans for each airport in the region and assessing proposed project costs and the proper phasing of each project. Ryan Airfield is one of six public-use airports included in the RASP. The RASP classifies public-use airports as either Level I or Level II. Level I airports are those that are essential to meeting the region's transportation and economic needs, whereas Level II airports are thought of as support facilities. Ryan Airfield is classified as a Level I airport in the PAG RASP.

At the state level, Ryan Airfield is included in the Arizona *State Airports System Plan* (SASP). The purpose of the SASP is to ensure that the State has an adequate and efficient system of airports to serve its aviation needs. The SASP defines the specific role of each airport in the State's aviation system and establishes funding needs. In 2009, ADOT updated the SASP to reflect current conditions. Through the State's continuous aviation system planning process, the SASP is updated every five years. The 2000 SASP update concluded with the State Aviation Needs Study (SANS). The SANS provides policy guidelines that promote and maintain a safe aviation system in the State, assess the State's airports' capital improvement needs, and identifies resources and strategies to implement the plan. Ryan Airfield is one of 112 airports included in the 2000 SANS, which includes all airports and heliports in Arizona that are open to the public, including American Indian and recreational airports. The SANS classifies Ryan Airfield as a reliever airport.

At the national level, Ryan Airfield is designated within the FAA's *National Plan of Integrated Airport Systems* (NPIAS). Inclusion within the NPIAS allows the airport to be eligible for Federal Airport Improvement Program (AIP) funding. Ryan Airfield is classified as a reliever airport in the NPIAS. A total of 3,489 airports across the country are included in the NPIAS. This number includes existing and proposed airports. Ryan Airfield is one of 59 airports in the State of Arizona that are included in the NPIAS and one of seven airports in Arizona classified as a reliever airport.

AIRPORT FACILITIES

Airport facilities can be functionally classified into two broad categories: airside and landside. The airside category includes those facilities directly associated with aircraft operations. The landside category includes those facilities necessary to provide a safe transition from surface to air transportation and support aircraft servicing, storage, maintenance, and operational safety.

AIRSIDE FACILITIES

Airside facilities include runways, taxiways, airfield lighting, and navigational aids. Airside facilities are identified on **Exhibit 1B**. **Table 1C** summarizes airside facility data.

TABLE 1C Airside Facility Data Ryan Airfield						
	Runway 6R-24L		Runway 6L-24R		Runway 15-33	
Length (ft.)	5,500		4,900		4,000	
Width (ft.)	75		75		75	
Surface Material	Asphalt		Asphalt		Asphalt	
Load Bearing Strength (pounds) Single Wheel Loading (SWL) Dual Wheel Loading (DWL)	 12,500 30,000		 12,500 30,000		 12,500 N/A	
Instrument Approach Procedures	ILS/DME/GPS		None		None	
Runway Edge Lighting	MIRL		None		None	
Pavement Markings	Precision (6R) Basic (24L)		Basic		Basic	
Taxiway Edge Lighting	None		None		None	
Approach Aids	6R	24L	6L	24R	15	33
Global Positioning System	Yes	No	No	No	No	No
Visual Approach Slope Indicators	No	Yes	No	No	No	No
Runway End Identifier Lights	Yes	No	No	No	No	No
Runway High/Low Point Elevation (ft.)	2,403/2,398		2,396/2,393		2,417/2,385	
Fixed Wing Aircraft Traffic Pattern	Left		Left		Left	
Weather or Navigational Aids	AWOS-III; Segmented Circle Lighted Wind Cone; Rotating Beacon; NDB; GPS					

Source: *FAA Airport/Facility Directory*, Southwest U.S., October 25, 2007 Edition
AWOS – Automated Weather Observing System
DME – Distance Measuring Equipment
GPS – Global Positioning System
ILS – Instrument Landing System
MIRL – Medium Intensity Runway Lighting
NDB – Non-Directional Beacon

Runway

Ryan Airfield is served by a three-runway system including parallel Runways 6R-24L and 6L-24R and crosswind runway 15-33. Runways 6R-24L and 6L-24R are both asphalt and oriented in a northeast to south-west manner with 6R-24L measuring 5,500 feet in length and 75 feet wide, and 6L-24R measuring 4,900 feet in length and 75 feet wide. The load bearing strength for both parallel runways are equal at 12,500 pounds single wheel loading (SWL) and 30,000 pounds dual wheel loading (DWL). SWL refers to the design of certain aircraft landing gears having a single wheel on each main landing gear, while DWL refers to landing gears having dual wheels on each main landing gear. The parallel runways both slope upward from the southwest to the northeast. The Runway 24L end elevation is 3.3 feet higher than the Runway 6R end, equating to a runway gradient (difference in runway elevations divided by the length of the runway) of 0.07 percent. The Runway 24R end elevation is 4.6 feet higher

Exhibit 1B
AIRFIELD FACILITIES

than the Runway 6L end, equating to a runway gradient of 0.08 percent.

The crosswind runway (Runway 15-33) is oriented in a northwest south-east manner and has a length of 4,000 feet and a width of 75 feet. This runway is also asphalt with a load bearing strength of 12,500 pounds SWL. Runway 15-33 slopes downward from south to the north. The Runway 33 end elevation is 32 feet higher than the Runway 15 end, resulting in an effective runway gradient of 0.8 percent.

Taxiways

The existing taxiway system at Ryan Airfield is shown on **Exhibit 1B**. Each runway has an associated parallel taxiway and entrance/exit (connector) taxiways. The parallel taxiways include Taxiways A, B, and D serving Runways 6L-24R, 6R-24L, and 15-33 respectively. Taxiway E is a 35 foot wide partial parallel taxiway serving the southwest end of Runway 15-33. The 35-foot wide Taxiway A has three connector taxiways with the same width. Taxiway B is 50 feet wide and has five connector taxiways with the same width. Taxiway D is 40 feet wide southwest of the intersection with the Runway 6R end. Northeast of this intersection Taxiway D is 35 feet wide. Taxiway D has three connector taxiways each 35 feet wide.

Pavement Condition

As a condition of receiving federal funds for the development of the airport, the Federal Aviation Administration requires the airport sponsor receiving and/or requesting federal funds for pavement improvement projects implement a pavement maintenance management program.

Part of the pavement maintenance management program is to develop a Pavement Condition Index (PCI) rating. The rating is based on the guidelines contained in FAA Advisory Circular 150/5380-6, *Guidelines and Procedures for Maintenance of Airport Pavements*.

The PCI procedure was developed to collect data that would provide engineers and managers with a numerical value indicating overall pavement conditions and that would reflect both pavement structural integrity and operational surface condition. A PCI survey is performed by measuring the amount and severity of certain distresses (defects) observed within a pavement sample unit.

In March 2006, a pavement inspection was conducted at Ryan Airfield by the Arizona Department of Transportation. The parallel runways 6R-24L and 6L-24R were found to have PCI ratings of 84 and 77 respectively. Both runways were found to have longitudinal and transverse cracking of low to high severity. Runway 15-33 had a PCI rating of 86 with low to moderate longitudinal and transverse cracking and patching. The south parking apron adjacent the terminal building has a PCI rating of 74 and 79 (two sections). The north apron between Taxiway D and B2 had a PCI rating of 100. The apron used by the

International Airline Training Academy had a PCI rating of 37 with low to high severity cracking, patching, and weathering.

Airfield Lighting

Airfield lighting systems extend an airport's usefulness into periods of darkness and/or poor visibility. A variety of lighting systems are installed at the airport for this purpose. These lighting systems, categorized by function, are summarized as follows.

Identification Lighting: The location of an airport at night is universally identified by a rotating beacon. A rotating beacon projects two beams of light, one white and one green, 180 degrees apart. The rotating beacon at Ryan Airfield is located atop the airport traffic control tower (ATCT) as shown on **Exhibit 1B**.

Pavement Edge Lighting: Pavement edge lighting utilizes light fixtures placed near the edge of the pavement to define the lateral limits of the pavement. This lighting is essential for safe operations during night and/or times of low visibility in order to maintain safe and efficient access to and from the runway and aircraft parking areas. Runway 6R-24L is equipped with medium intensity runway lighting (MIRL). Runways 6L-24R and 15-33 are not currently equipped with a lighting system. Most of the taxiway system is equipped with taxiway retro reflective edge markers, which resemble taxiway lighting. These reflective markers serve the same purpose as taxiway lights, but are illuminated by the landing lights of the aircraft. Medium intensity taxiway lighting (MITL) is installed along entrance/exit taxiways B2, B3, B4, B5, and B6.

Pilot-Controlled Lighting: Airfield lighting systems can be controlled through a pilot-controlled lighting system (PCL). A PCL allows pilots to turn on or increase the intensity of the airfield lighting systems from the aircraft with the use of the aircraft's radio transmitter. The Runway 6R-24L MIRL is connected to the PCL system at Ryan Airfield.

Visual Approach Lighting: A visual approach slope indicator (VASI-4) is available for Runway 24. The VASIs provide approach path guidance with a series of light units. The four-unit VASIs give the pilot an indication of whether their approach is above, below, or on-path through a pattern of red and white light visible from the light units.

Airfield Signs: Airfield identification signs assist pilots in identifying their location on the airfield and directing them to their desired location. Current airfield signage includes lighted and unlighted signs installed at all taxiway and runway intersections.

Runway Threshold Lighting: Runway threshold lights identify the runway end. Runway threshold lights have specially designed lights that are green on one side and red on the other. The green side is oriented towards the landing aircraft. Runway 6R is equipped with runway threshold lighting.

Runway End Identification Lighting: Runway end identifier lights (REILs) provide rapid and positive identification of the approach end of a runway. REILs are typically used on runways without more sophisticated approach lighting systems. The REIL system consists of two synchronized flashing lights located laterally on each side of the runway facing the approaching aircraft. REILs are installed at the end of Runway 6R and are only operational during daylight hours.

Pavement Markings

Pavement markings aid in the movement of aircraft along airport surfaces and identify closed or hazardous areas on the airport. Ryan Airfield provides and maintains marking systems in accordance with Part 139.311(a) and Advisory Circular 150/5340-1, *Standards for Airport Marking*.

Runway 6R has precision instrument runway (PIR) markings that identify the runway centerline, threshold, designation, touchdown point, and aircraft holding positions. Runways 24L, 6L-24R, and 15-33 are equipped with basic runway markings, which identify the runway centerline, designation, and aircraft holding positions. Runway 6L-24R is also equipped with aiming points 1,000 feet from the 6L threshold and 850 feet from the 24R threshold. Runway 24L is marked with an aiming point 1,000 feet from the threshold.

Taxiway and apron taxilane centerline markings are provided to assist aircraft using these airport surfaces. Centerline markings assist pilots in maintaining proper clearance from pavement edges and objects near the taxilane/taxiway edges. Pavement markings also identify aircraft parking positions.

Weather Reporting

Ryan Airfield is equipped with an Automated Weather Observing System (AWOS). The AWOS-III provides automated aviation 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). The AWOS is located adjacent to the ILS glide slope antenna.

Ryan Airfield is equipped with lighted wind cone and a segmented circle. The wind cone provides wind direction and speed information to pilots, while the segmented circle provides aircraft traffic pattern information. This equipment is located northeast of the airport traffic control tower between Taxiway B and Runway 6R-24L. Four additional unlit wind cones are located at the ends of Runways 6R/6L, 15, 33, and 24L.

Area Airspace and Air Traffic Control

The *Federal Aviation Administration (FAA) Act of 1958* established the FAA as the responsible agency for the control and use of navigable airspace within the United States. The FAA has established the National Airspace System (NAS) to protect persons and property on the ground and to establish a safe and efficient airspace environment for civil, commercial, and military aviation. The NAS covers the common network of U.S. airspace, including air navigation facilities; airports and landing areas; aeronautical charts; associated rules, regulations, and procedures; technical information; and personnel and material. The system also includes components shared jointly with the military.

Airspace Structure

Airspace within the United States is broadly classified as either "controlled" or "uncontrolled." The difference between controlled and uncontrolled airspace relates primarily to requirements for pilot qualifications, ground-to-air communications, navigation and air traffic services, and weather conditions. Six classes of airspace have been designated in the United States, as shown on **Exhibit 1C**. Airspace designated as Class A, B, C, D, or E is considered controlled airspace. Aircraft operating within controlled airspace are subject to varying requirements for positive air traffic control. Airspace in the vicinity of Ryan Airfield is depicted on **Exhibit 1D**.

Class A Airspace: Class A airspace includes all airspace from 18,000 feet mean sea level (MSL) to flight level (FL) 600 (approximately 60,000 feet MSL). This airspace is designated in Federal Aviation Regulation (F.A.R.) Part 71.193 for positive control of aircraft. The Positive Control Area (PCA) allows flights governed only under instrument flight rule (IFR) operations. The aircraft must have special radio and navigation equipment, and the pilot must obtain clearance from an air traffic control (ATC) facility to enter Class A airspace. In addition, the pilot must possess an instrument rating.

Class B Airspace: Class B airspace has been designated around some of the country's major airports to separate arriving and departing aircraft. Class B airspace is designed to regulate the flow of uncontrolled traffic above, around, and below the arrival and departure airspace required for high-performance, passenger-carrying aircraft at major airports. This airspace is the most restrictive controlled airspace routinely encountered by pilots operating under visual flight rules (VFR) in an uncontrolled environment. The nearest Class B airspace to Ryan Airfield is located at Phoenix Sky Harbor International Airport.

Class C Airspace: The FAA has established Class C airspace at 120 airports around the country as a means of regulating air traffic in these areas. Class C airspace is designed to regulate the flow of uncontrolled traffic above, around, and below the arrival and departure airspace required for high-performance, passenger-carrying

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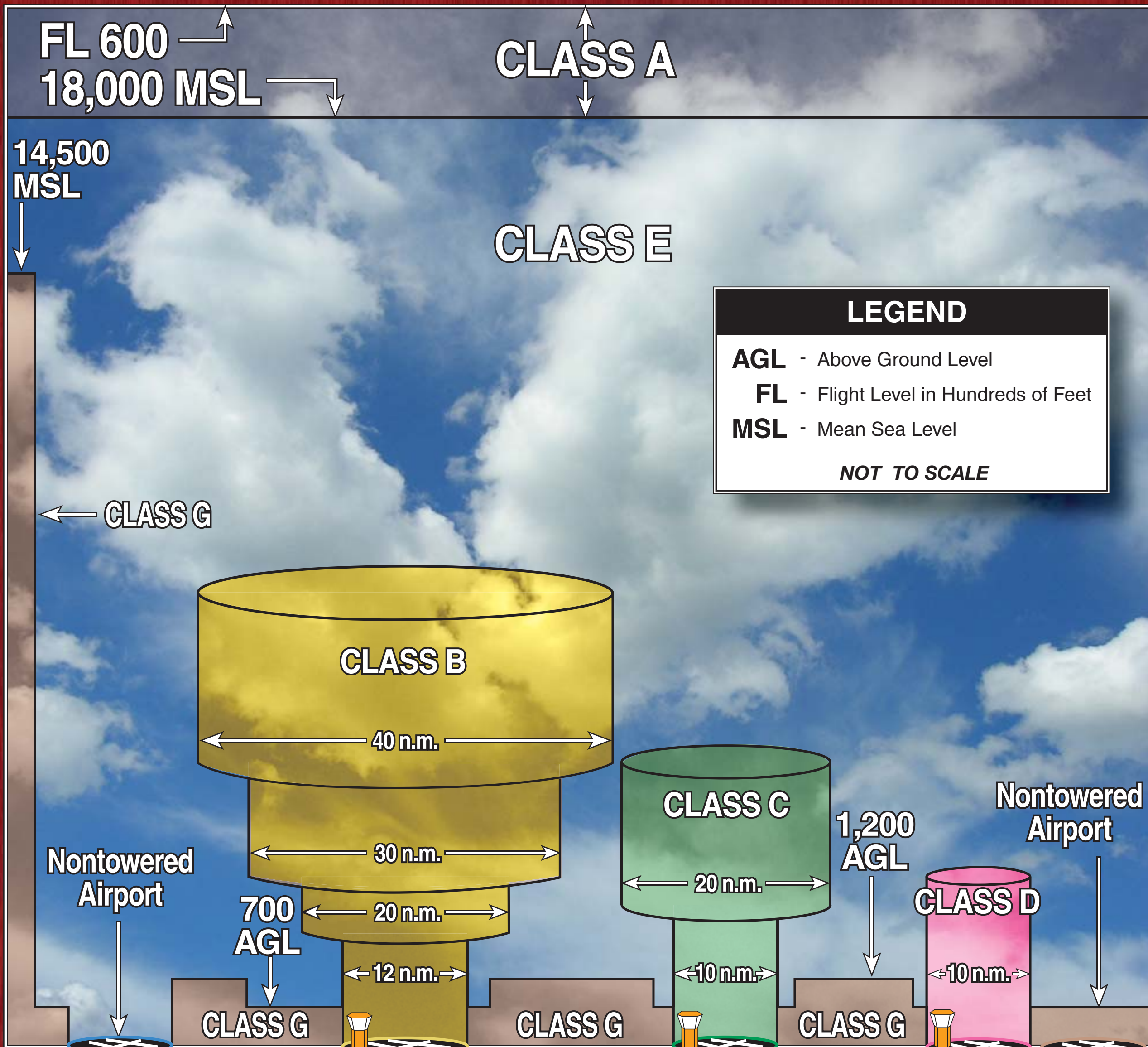
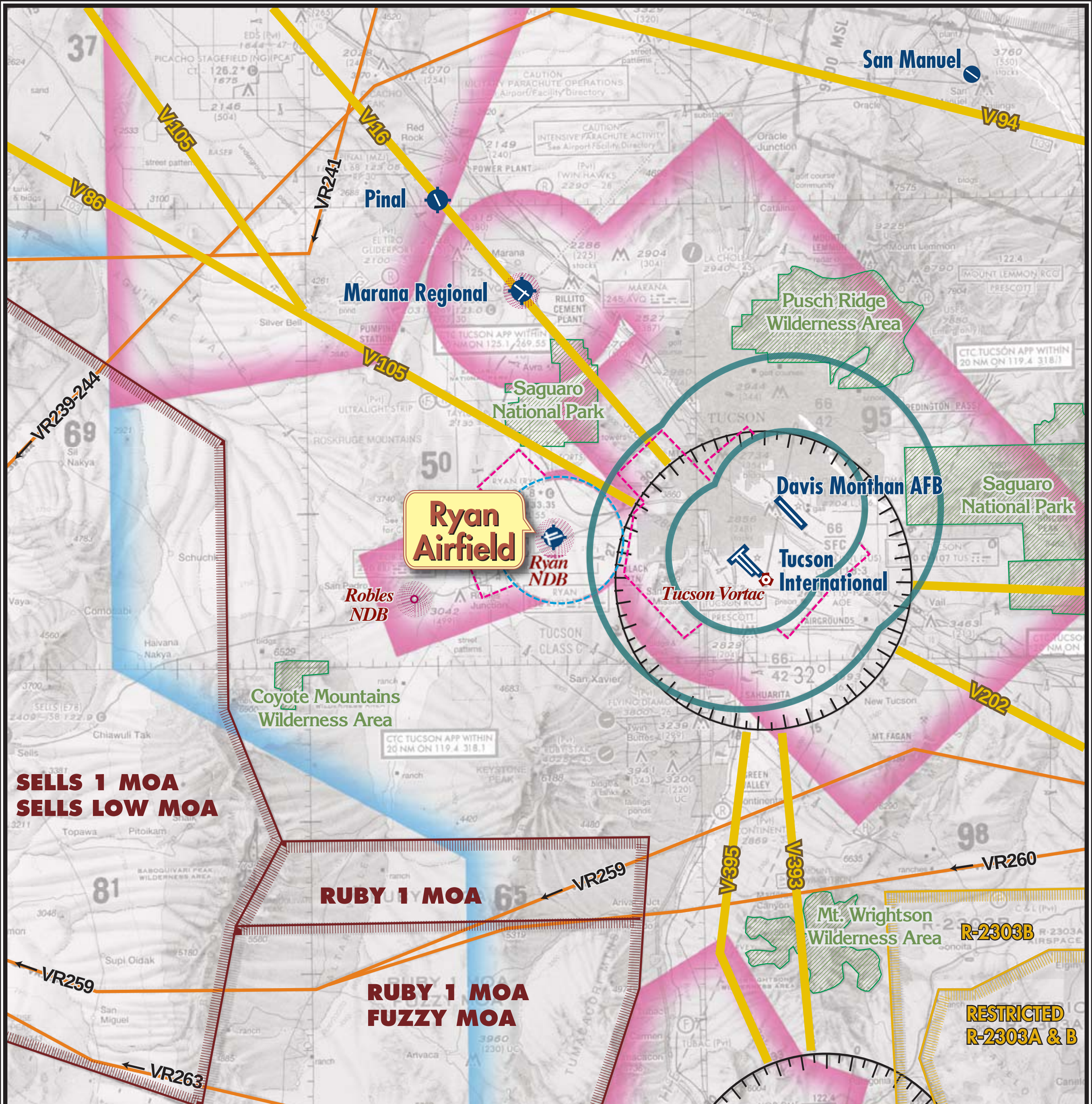


CLASSIFICATION	*DEFINITION*
CLASS A	Generally airspace above 18,000 feet MSL up to and including FL 600.
CLASS B	Generally multi-layered airspace from the surface up to 10,000 feet MSL surrounding the nation's busiest airports.
CLASS C	Generally airspace from the surface to 4,000 feet AGL surrounding towered airports with service by radar approach control.
CLASS D	Generally airspace from the surface to 2,500 feet AGL surrounding towered airports.
CLASS E	Generally controlled airspace that is not Class A, Class B, Class C, or Class D.
CLASS G	Generally uncontrolled airspace that is not Class A, Class B, Class C, Class D, or Class E.

Source: "Airspace Reclassification and Charting Changes for VFR Products," National Oceanic and Atmospheric Administration, National Ocean Service. Chart adapted by Coffman Associates from AOPA Pilot, January 1993.

RYAN AIRFIELD
TUCSON AIRPORT AUTHORITY

Exhibit 1C
AIRSPACE CLASSIFICATION



LEGEND

- Airport with hard-surfaced runways 1,500' to 8,069' in length
- Airports with hard-surfaced runways greater than 8,069' or some multiple runways less than 8,069'
- Non-Directional Radiobeacon (NDB)
- VORTAC
- Compass Rose
- Victor Airways
- Class C Airspace (Mode C)
- Class D Airspace
- Class E Airspace
- Class E Airspace with floor 700 ft. above surface
- Class E Airspace with floor 1200 ft. or greater above surface that abuts Class G Airspace
- Military Training Routes
- MOA - Military Operations Area
- Prohibited, Restricted, Warning and Alert Areas

NORTH

NOT TO SCALE

Source: South Phoenix Sectional Charts, US Department of Commerce, National Oceanic and Atmospheric Administration 08/02/07

RYAN AIRFIELD
TUCSON AIRPORT AUTHORITY

Exhibit 1D
VICINITY AIRSPACE

aircraft at major airports. In order to fly inside Class C airspace, the aircraft must have a two-way radio, an encoding transponder, and have established communication with ATC. Aircraft may fly below the floor of the Class C airspace or above the Class C airspace ceiling without establishing communication with ATC. Tucson International Airport and Davis Monthan Air Force Base are both located within Class C airspace.

Exhibit 1D shows the Tucson International Airport and Davis Monthan Air Force Base Class C airspace. The Class C airspace consists of controlled airspace extending upward from the surface to 6,600 feet above ground level (AGL), within which all aircraft are subject to the operating rules and pilot equipment requirements specified in FAR Part 91. The Class C airspace for both airports converge to form an oval shape. The airspace for each airport is made up of two cylinders, an inner and outer, which are centered on each airport. The inner cylinder of each airport has a radius of five nautical miles and extends from the surface of the airport up to 6,600 feet AGL. The outer cylinders have a radius of ten nautical miles that extend from 4,200 AGL to 6,600 feet AGL.

Class D Airspace: Class D airspace is controlled airspace surrounding airports with an ATCT. The Class D airspace typically constitutes a cylinder with a horizontal radius of four or five nautical miles (NM) from the airport, extending from the surface up to a designated vertical limit, typically set at approximately 2,500 feet above the airport elevation. If an airport has an instrument approach or departure, the Class D airspace sometimes extends along the approach or departure path.

Ryan Airfield has its own Class D airspace. It extends for approximately four nautical miles around the airport, from the surface to 4,199 feet MSL. The Ryan Airfield Class D airspace is effective only during the ATCT operational hours, which is from 6:00 a.m. to 8:00 p.m., daily. At all other times, the airport is in Class E airspace.

Class E Airspace: Class E airspace consists of controlled airspace designed to contain IFR operations near an airport and while aircraft are transitioning between the airport and enroute environments. Unless otherwise specified, Class E airspace terminates at the base of the overlying airspace. Only aircraft operating under IFR are required to be in contact with air traffic control when operating in Class E airspace. While aircraft conducting visual flights in Class E airspace are not required to be in radio communications with air traffic control facilities, visual flight can only be conducted if minimum visibility and cloud ceilings exist.

Ryan Airfield is in Class E airspace when the ATCT is closed between 8:00 p.m. and 6:00 a.m. This area of controlled airspace has a floor of 700 feet AGL and extends to Class A airspace. This transition area is intended to provide protection for aircraft transitioning from enroute flights to the airport for landing.

Class G Airspace: Airspace not designated as Class A, B, C, D, or E is considered uncontrolled, or Class G, airspace. Air traffic control does not have the authority or responsibility to exercise control over air traffic within this airspace. Class G airspace lies between the surface and the overlaying Class E airspace (700 to 1,200 feet AGL). Class G airspace extends below the floor of the Class E airspace transition area in the Ryan Airfield area.

While aircraft may technically operate within Class G airspace without any contact with ATC, it is unlikely that many aircraft will operate this low to the ground. Furthermore, federal regulations specify minimum altitudes for flight. F.A.R. Part 91.119*, Minimum Safe Altitudes*, generally states that except when necessary for takeoff or landing, pilots must not operate an aircraft over any congested area of a city, town, or settlement, or over any open air assembly of persons, at an altitude of less than 1,000 feet above the highest obstacle within a horizontal radius of 2,000 feet of the aircraft. Over less congested areas, pilots must maintain an altitude of 500 feet above the surface, except over open water or sparsely populated areas. In those cases, the aircraft may not be operated closer than 500 feet to any person, vessel, vehicle, or structure. Finally, this section states that helicopters may be operated at less than the minimums prescribed above if the operation is conducted without hazard to persons or property on the surface. In addition, each person operating a helicopter shall comply with any routes or altitudes specifically prescribed for helicopters by the FAA.

Special Use Airspace

Special use airspace is defined as airspace where activities must be confined because of their nature or where limitations are imposed on aircraft not taking part in those activities. These areas are depicted on **Exhibit 1D** by brown and yellow-hatched lines, as well as with the use of green shading.

Military Operating Areas: Military Operations Areas (MOAs) are depicted in **Exhibit 1D** with the brown-hatched lines. The MOAs in the vicinity of Ryan Airfield are all controlled by the Albuquerque Air Route Traffic Control Center (ARTCC) and include the Ruby 1 MOA, Fuzzy MOA, Sells 1 MOA, and the Sells Low MOA, all of which are located southwest of the airfield. The Ruby 1 MOA is used at 10,000 feet MSL from 6:00 a.m. to 7:00 p.m., Monday through Friday. The Fuzzy MOA is used from 100 feet AGL up to 9,999 feet MSL from 7:00 a.m. to 7:00 p.m. daily. The Sells 1 MOA is used at 10,000 feet MSL from 6:00 a.m. to 7:00 p.m., Monday through Friday. The Sells Low MOA is used from 3,000 feet AGL up to 9,999 feet MSL Monday through Friday from 6:00 a.m. to 7:00 p.m.

Military Training Routes: Military training routes near Ryan Airfield are identified with the letters VR and a four digit number, or with IR and a three digit number. The arrows on the route show the direction of travel. Military aircraft travel on these routes below 10,000 feet MSL and at speeds in excess of 250 knots.

Wilderness Areas: As depicted on **Exhibit 1D**, a number of wilderness areas are located in the Tucson area. These wilderness areas include Saguaro National Park (five nautical miles [nm] north), Coyote Mountains Wilderness Area (16 nm southwest), Pusch Ridge Wilderness Area (16 nm northeast), and the Mt. Wrightson Wilderness Area (27 nm southeast). Aircraft are requested to maintain a minimum altitude of 2,000 feet above the surface of designated National Park areas, which includes wilderness areas and designated breeding grounds. FAA Advisory Circular 91-36C defines the "surface" as the highest terrain within 2,000 feet laterally of the route of flight or the uppermost rim of a canyon or valley.

Victor Airways: For aircraft arriving or departing the regional area using very high frequency omnidirectional range (VOR) facilities, a system of Federal Airways, referred to as Victor Airways, has been established. Victor Airways are corridors of airspace eight miles wide that extend upward from 1,200 feet AGL to 18,000 feet MSL and extend between VOR navigational facilities. Victor Airways are shown with solid yellow lines on **Exhibit 1D**.

Restricted Areas: Restricted areas are depicted on **Exhibit 1D** with yellow-hatched lines. There are two restricted areas to the southeast of Ryan Airfield. Restricted airspace is off-limits for public use unless granted permission from the controlling agency. These restricted areas are bomb and gunnery ranges used by the military for training purposes.

Restricted area R-2303A includes altitudes from the surface to 15,000 feet MSL and is operational Monday through Friday from 7:00 a.m. to 5:00 p.m. Restricted area R-2303B includes altitudes from 8,000 feet to 30,000 feet MSL and is operational Monday through Friday from 7:00 a.m. to 5:00 p.m. The controlling agency for these restricted areas is the Albuquerque ARTCC.

Airspace Control

The FAA is responsible for the control of aircraft within the Class A, Class C, Class D, and Class E airspace described above. The Albuquerque ARTCC controls aircraft operating in Class A airspace. The Albuquerque ARTCC located in Albuquerque, New Mexico, controls IFR aircraft entering or leaving the Ryan Airfield area. The area of jurisdiction for the Albuquerque center includes most of the states of New Mexico and Arizona, and portions of Texas, Colorado, and Oklahoma.

The Ryan Airfield ATCT controls aircraft approaches and departures from Ryan Airfield airspace. The Ryan ATCT located at the northeast corner of the north parking apron is a contract tower operated by SERCO from 6:00 a.m. to 8:00 p.m. daily. The tower cab is 65 feet high, with offices and a break area below. Controllers gain access to the facility via a staircase from the ground leading to the lower offices and break area. The airport's rotating beacon is located on top of the ATCT cab.

Navigational Aids

Navigational aids are electronic devices that transmit radio frequencies which pilots of properly equipped aircraft translate into point-to-point guidance and position information. The types of electronic navigational aids available for aircraft flying to or from Ryan Airfield include the VOR, the nondirectional beacon (NDB), global positioning system (GPS), and Loran-C.

The VOR provides azimuth readings to pilots of properly equipped aircraft by transmitting a radio signal at every degree to provide 360 individual navigational courses. Frequently, distance measuring equipment (DME) is combined with a VOR facility to provide distance as well as direction information to the pilot. Military tactical air navigation aids (TACANs) and civil VORs are commonly combined to form a VORTAC. A VORTAC provides distance and direction information to civil and military pilots.

The Tucson VOR/DME, located at Tucson International Airport, is approximately 13.5 nautical miles east of the Ryan Airfield area. This facility is identified on **Exhibit 1D**.

The nondirectional beacon (NDB) transmits nondirectional radio signals, whereby the pilot of a properly equipped aircraft can determine the bearing to or from the NDB facility and then "home" or track to or from the station. Ryan Airfield is equipped with NDB equipment on the airfield. The Robles NDB is located approximately 12 miles southwest of Ryan Airfield and provides an initial approach fix to the airport.

Loran-C is a ground-based enroute navigational aid which utilizes a system of transmitters located in various locations across the continental United States. Loran-C allows pilots to navigate without using a specific facility. With a properly equipped aircraft, pilots can navigate to any airport in the United States using Loran-C.

GPS was initially developed by the United States Department of Defense for military navigation around the world. However, GPS is now used extensively for a wide variety of civilian uses, including civil aircraft navigation.

GPS uses satellites placed in orbit around the globe to transmit electronic signals, which pilots of properly equipped aircraft use to determine altitude, speed, and navigational information. This provides more freedom in flight planning and allows for more direct routing to the final destination.

Instrument Approach Procedures

Instrument approach procedures are a series of predetermined maneuvers established by the FAA, using electronic navigational aids that assist pilots in locating and landing at an airport, especially during instrument flight conditions. Ryan Airfield has a published precision and non-precision instrument approach. Precision instrument approaches provide course and vertical guidance, while nonprecision instrument approaches provide only course guidance.

The capability of an instrument is defined by the visibility and cloud ceiling minimums associated with the approach. Visibility minimums define the horizontal distance the pilot must be able to see in order to complete the approach. Cloud ceilings define the lowest level a cloud layer (defined in feet above the ground) can be situated for the pilot to complete the approach. If the observed visibility or cloud ceilings are below the minimums prescribed for the approach, the pilot cannot complete the instrument approach. **Table 1D** summarizes instrument approach minima for Ryan Airfield.

TABLE 1D
Instrument Approach Data

	WEATHER MINIMUMS BY AIRCRAFT TYPE							
	Category A		Category B		Category C		Category D	
	CH	VIS	CH	VIS	CH	VIS	CH	VIS
ILS or LOC RWY 6R								
S-ILS	250	1.0	250	1.0	250	1.0	250	1.0
S-LOC	500	1.0	500	1.0	500	1.25	500	1.5
Circling	500	1.0	500	1.0	500	1.5	580	2.0
NDB/DME or GPS RWY 6R								
Straight-In	900	1.25	900	1.25	900	2.75	900	3.0
Circling	900	1.25	900	1.25	900	2.75	900	3.0

Aircraft categories are based on the approach speed of aircraft, which is determined by 1.3 times the stall speed in landing configuration. The approach categories are as follows:
Category A 0-90 knots (Cessna 172)
Category B 91-120 knots (Beechcraft KingAir)
Category C 121-140 knots (Canadair Challenger)
Category D 141-165 knots (Gulfstream IV)

Abbreviations:
CH: Cloud Height (in feet above ground level)
DME: Distance Measuring Equipment
GPS: Global Positioning System
ILS: Instrument Landing System
LOC: Localizer
NDB: Nondirectional Beacon
VIS: Visibility (in statute miles)

Source: U.S. Terminal Procedures Southwest Volume 4 of 4, March 12, 2009

Visual Flight Procedures

The majority of flights into and out of Ryan Airfield are conducted under visual flight rules (VFR). Under VFR flight, the pilot is responsible for collision avoidance. Typically, the pilot will make radio calls announcing his/her intentions and the position of the aircraft relative to the airport.

In most situations, under VFR and basic radar services, the pilot is responsible for navigation and choosing the arrival and departure flight paths to and from the airport. The results of individual pilot navigation for sequencing and collision avoidance are that aircraft do not fly a precise flight path to and from the airport. Therefore, aircraft can be found flying over a wide area around the airport for sequencing and safety reasons.

While aircraft can be expected to operate over most areas of the airport, the density of aircraft operations is higher near the airport. This is the result of aircraft following the established traffic patterns for the airport. The traffic pattern is the traffic flow that is prescribed for aircraft landing or taking off from an airport. The components of a typical traffic pattern are upwind leg, crosswind leg, downwind leg, base leg, and final approach.

a. Upwind Leg - A flight path parallel to the landing runway in the direction of landing.

b. Crosswind Leg - A flight path at right angles to the landing runway off its upwind end.

c. Downwind Leg - A flight path parallel to the landing runway in the direction opposite to landing. The downwind leg normally extends between the crosswind leg and the base leg.

d. Base Leg - A flight path at right angles to the landing runway off its approach end. The base leg normally extends from the downwind leg to the intersection of the extended runway centerline.

e. Final Approach - A flight path in the direction of landing along the extended runway centerline. The final approach normally extends from the base leg to the runway.

Essentially, the traffic pattern defines the side of the runway on which aircraft will operate. At Ryan Airfield, all runways have established left-hand traffic pattern resulting in aircraft making left turns from base leg to final for landing.

While the traffic pattern defines the direction of turns that an aircraft will follow on landing or departure, it does not define how far from the runway an aircraft will operate. The distance laterally from the runway centerline an aircraft operates or the distance from the end of the runway is at the discretion of the pilot, based on the operating characteristics of the aircraft, number of aircraft in the traffic pattern, and meteorological conditions. The actual ground location of each leg of the traffic pattern varies from operation to operation for the reasons of safety, navigation, and sequencing, as described above. The distance that the downwind leg is located laterally from the runway will vary based mostly on the speed of the aircraft. Slower aircraft can operate closer to the runway as their turn radius is smaller.

The established traffic pattern altitude (TPA) for aircraft operating in the traffic pattern is 800 feet above the ground (or 3,217 feet MSL) when on the downwind leg. The traffic pattern altitude is established so that aircraft have a predictable descent profile on base leg to final for landing.

Area Airports

A review of public-use airports within the vicinity of Ryan Airfield has been made to identify and distinguish the type of air service provided in the area surrounding the airport. Information pertaining to each airport was obtained from FAA records.

Tucson International Airport is located approximately 12 miles east of Ryan Airfield. Tucson International Airport is owned by the City of Tucson and operated by the TAA. There are three runways available for use: Runway 11L-29R is 10,996 feet long and 150 feet wide; Runway 11R-29L is 8,408 feet long and 75 feet wide; and Runway 3-21 is 7,000 feet long and 150 feet wide. The ATCT at Tucson International Airport is operated continuously. There is one published ILS instrument approach, eight RNAV instrument approaches (6 GPS, 2 RNP), one LOC/DME instrument approach, and two VOR instrument approaches into Tucson International Airport. Tucson International Airport has approximately 400 based aircraft, and 270,348 operations were conducted in 2006. A full range of commercial service as well as general aviation services are available at the airport.

Davis Monthan Air Force Base is located approximately 15 nautical miles east of Ryan Airfield. Davis Monthan AFB is a military base with a single runway. Runway 12-30 has a length of 13,643 feet and a width of 200 feet. The base has its own military ATCT.

Marana Regional Airport is located approximately 16 nautical miles north of Ryan Airfield and is owned and operated by the Town of Marana. The airport is equipped with a dual runway system. The primary runway, Runway 12-30, has a length of 6,901 feet and a width of 100 feet. Marana Regional Airport has five published non-precision instrument approaches. A full range of general aviation services are available at the airport. The airport has approximately 295 based aircraft and annual operations are estimated at more than 100,000. The airport does not currently have a tower, but has begun the approval process to establish a federal contract tower similar to that at Ryan Airfield.

La Cholla Airpark is located approximately 20 nautical miles northeast of Ryan Airfield and is privately owned and operated by La Cholla Airpark Inc. The airport is equipped with a single asphalt runway, which measures 4,500 feet long and 44 feet wide. La Cholla Airpark has limited general aviation services available, including 100LL Avgas. There are a total of 93 based aircraft, and annual operations are estimated at 4,000.

Pinal Airpark is located approximately 23 nautical miles northwest of Ryan Airfield. It is owned by Pinal County and leased to Evergreen Air Center, Inc. A single runway 6,849 feet long by 150 feet wide is available for use. Pinal Airpark does not have an operating ATCT. There are approximately 58 based aircraft at Pinal Airpark. A full range of general aviation services are available at Pinal Airpark. A major function on this airport is the storage of commercial service aircraft.

San Manuel Airport is located approximately 40 nautical miles northeast of Ryan Airfield. San Manuel Airport is on property owned by Magma Copper Co. and leased to Pinal County. There is a single runway available for use, Runway 11-29, which measures 4,200 feet in length and 75 feet in width. There is no operating ATCT and there are no published instrument approaches into San Manuel Airport. There are approximately 27 based aircraft at San Manuel Airport. General aviation services at San Manuel Airport are limited.

Sells Airport, located 39 miles southwest of Ryan Airfield, has a single asphalt runway that measures 5,830 feet long and 60 feet wide. Sells Airport is owned and operated by the Tohono O'odham Indian Nation. There are no general aviation services provided at the airport. There are currently no based aircraft, and annual operations are estimated at 1,210.

Eric Marcus Municipal Airport, located 88 miles west of Ryan Airfield in the City of Ajo, Arizona, has a single asphalt runway available for public use. The runway has a length of 3,800 feet and a width of 60 feet. The airport is owned and operated by Pima County. Limited general aviation services are available at the airport. There are currently five based aircraft, and annual operations are estimated at 300.

LANDSIDE FACILITIES

Landside facilities are the ground-based facilities that support the aircraft and pilot/passenger handling functions. These facilities typically include aircraft storage/maintenance hangars, aircraft parking aprons, and support facilities such as fuel storage, automobile parking, and roadway access. Landside facilities are identified on **Exhibit 1E**.

Administration Building

The administration building was built in 2004 and is located on the southeast side of the airport, north of the intersection of West Ajo Highway (Highway 86) and West Valencia Road. The administration building encompasses approximately 2,500 square feet and includes administrative offices, a pilot's lounge and briefing room, a conference room, supply closets, and restrooms. An adjacent parking lot provides a total of 13 parking spaces, including a handicapped parking space.

Aircraft Hangar Facilities

There are currently 251 individual aircraft storage units at Ryan Airfield totaling 434,830 square feet. This hangar space is made up of 30 T-hangar units and 157 conventional hangar units of varying size and shape. There are also two 18,900 square-foot shade hangar facilities on the airport with a total of 64 aircraft storage spaces. All hangar facilities are located south of Runway 6R-24L and east of Runway 15-33. There is currently a hangar waiting list as each hangar unit is currently occupied.

07MP02-1E-4/2/09

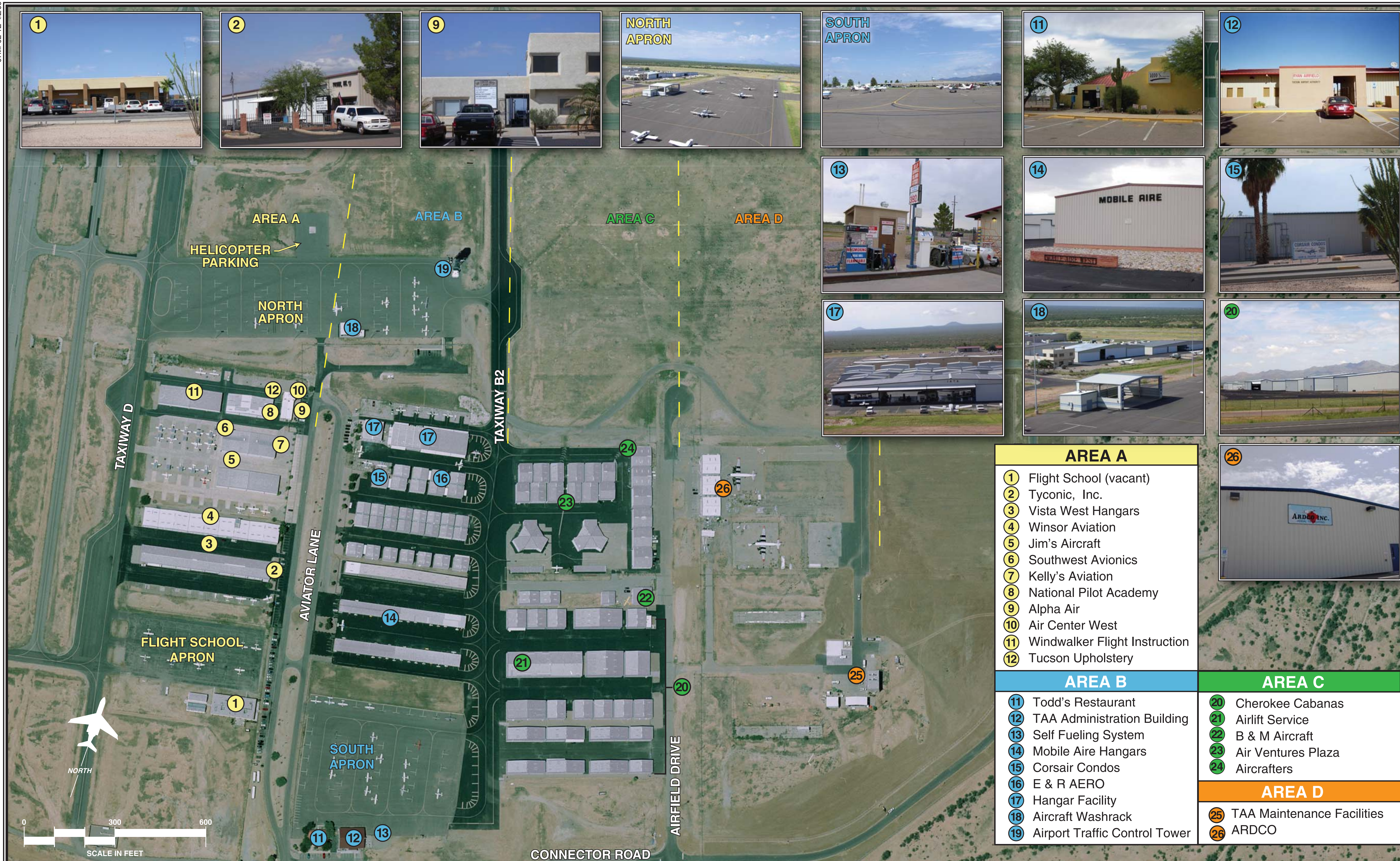


Exhibit 1E
LANDSIDE FACILITIES

Fixed Base Operator (FBO)

Ryan Airfield does not currently have a full service FBO, but provides similar services through a combination of the Airport Authority and specialty operators on the airport. General aviation services that the TAA provides include 100LL Avgas fuel, aircraft ramp or tiedown parking, flight planning equipment, vending machines, and restrooms. The TAA maintains office space, a conference room, and a pilot's lounge in the airport administration building.

Apron and Aircraft Parking

There are five separate aircraft parking aprons at Ryan Airfield encompassing approximately 70,499 square yards and providing 160 total aircraft tiedown spaces.

The TAA controls two of the three aircraft parking aprons. The first is located adjacent to the administration building and the restaurant and is called the south apron. The south apron encompasses approximately 24,000 square yards and has 50 aircraft tiedown spots used mainly for short-term and overnight aircraft parking. The self-service fuel island operated by the TAA is located on the south end of the south apron east of the administration building. The north apron, the closest apron to the airfield, is located between Taxiways D and B2. The north apron encompasses approximately 28,900 square yards and has 51 aircraft tiedown spots not including a helicopter parking pad north of the central part of the apron. The north apron is used primarily as long-term parking. The ATCT is located at the northeast corner, and an aircraft wash rack is located on the south side of this apron.

The third aircraft parking apron, which is located east of the Runway 33 end was formerly used by the airport's flight training school. This apron encompasses approximately 10,500 square yards and has 20 aircraft tiedown spaces. The flight training facilities are located at the southeast corner of the apron. An additional five aircraft tiedown positions are available north of the flight school's hangar facilities on 1,044 square yards of apron area.

A 6,055 square yard apron area north of the Vista West hangars includes 16 tiedown positions and 15 nose shades for locally based aircraft.

Fueling Facilities

Fuel storage at Ryan Airfield consists of underground fuel storage tanks and fueling trucks. Two 12,000 gallon FiberSteel underground 100LL Avgas fuel storage tanks owned by the TAA are located adjacent the administration building. These storage tanks were installed in 1989 and are in excellent condition. The fuel in these storage tanks is dispensed by a self-service fuel island that allows customers to pay at the pump and fuel their own aircraft. The TAA also owns one 100LL Avgas fuel truck with a capacity of 1,000 gallons, two Jet A fuel trucks with a combined capacity of 5,500 gallons, and two 2,000-gallon tanks used to store diesel fuel and unleaded gasoline. The diesel and unleaded gasoline storage tanks were installed adjacent to the maintenance facilities in 1999 and are used for fueling fleet vehicles. The TAA has plans to construct a fuel farm consisting of one 12,000-gallon storage tank for Jet A fuel. This fuel farm would be located adjacent the maintenance facilities.

Maintenance/ARFF Facilities

Maintenance at Ryan Airfield is performed by the TAA. The maintenance facilities are located on the east side of the airport and are made up of a 2,400 square-foot maintenance shop, an 1,800 square-foot shade parking structure, a 1,200 square-foot storage room, a pesticide shed, a paved vehicle movement area, and fuel storage facilities. The maintenance area is accessible through a security gate entrance off of Airfield Road and a service road stemming from Taxiway B4.

Ryan Airfield is not an F.A.R. Part 139 certificated airport; therefore, it is not required to have aircraft rescue and firefighting (ARFF) equipment onsite. However, the TAA maintains an ARFF vehicle at the airport which has the capability of applying aqueous foam and dry chemical flame retardants. This ARFF equipment is stored in the maintenance facilities. A listing of maintenance and ARFF equipment is included in **Table 1E**.

Utilities

The availability of utilities at the airport is an important factor in determining the development potential of the airport property. Of primary concern in the inventory investigation is the availability of water, sanitary sewer, electricity, telecommunications, and natural gas. Some, if not all, of these utilities will be necessary for any future development. Water is provided by the City of Tucson via a 12-inch main water line which runs along Ajo Highway and on-site water mains for domestic and fire protection. Sanitary sewer service is provided by individual septic tank systems, and a TAA maintained "community" septic tank system. Electrical power is supplied to the airport by two sources: Tri Co. Electric Company serving the west side of the airport and Tucson Electric Power serving the east side. Telecommunication services are provided by Qwest. Natural gas is provided by Southwest Gas.

Security Fencing and Gates

The airport perimeter is equipped with six-foot chain-link fencing with three strands of barbed wire. Hangars and operating areas in the terminal area are separated from public areas by chain-link security fencing. Automated access gates are located in several locations throughout the terminal area, all of which are padlocked or remote security controlled.

TABLE 1E
TAA Maintenance and ARFF Equipment
Ryan Airfield

ASSET NUMBER	YEAR	TYPE	DESCRIPTION
227	1970	Dump Truck	International 2 1/2 ton 2wd
268	1977	Jet A Refueler	International 2,500-gallon capacity
85	1978	Crack Sealer	Crafco Ez-pour 200-gallon capacity
210	1990	GPU	28vdc, 10kw, military surplus
289	1991	Jet A Refueler	3,000-gallon capacity
170	1993	Sweeper	International-Elgin
226	1994	Welder/Generator	Miller 8kw
231	1996	Forklift	Ingersol Rand 8,000 lbs. off-road 2wd
230	1999	Trailer	Carson 3,500 lbs. single-axle
252	1999	Pressure Washer	Landa 3,000 psi.
89	2000	Avgas Refueler	Isuzu/Bosserman - 1,000-gallon capacity
323	2002	Utility Tractor	John Deere 72 4wd, 90 hp
324	2002	Mower Deck	John Deere 15' width
--	2004	Riding Mower	John Deere
369	2005	Fuel Bowser	200-gallon capacity
--	2005	Pesticide Sprayer	Single axle trailer, 200-gallon capacity
365	2006	Service Truck	Ford F-250 crew cab, 4wd, long bed, winch
373	2006	ARFF	Ford F-550 4wd - aqueous foam/dry chemical
383	2006	Service Truck	Ford F-250 extended cab, 4wd, long bed
395	2006	Skid-Steer	John Deere 317
126	UNKNOWN	Crack Router	Crafco
--	UNKNOWN	Spill Response Trailer	Military surplus, single axle

Source: TAA Records

Specialty Operators/ Other Tenants

Several businesses are located on the airport providing a wide variety of aviation and non-aviation related services. The following is a brief description of each of the businesses currently located on airport property. Each business is identified on **Exhibit 1E**.

Air Center West, located in area A of the terminal area on **Exhibit 1E**, leases hangar space, aircraft tiedowns, shadeports, and office space at Ryan Airfield. Their facility includes a pilot's lounge and office space.

AirCrafters, located in area C of the terminal area, provides heavy maintenance for light aircraft.

Airlift Service, located in area C of the terminal area, provides maintenance for light aircraft.

Air Ventures Plaza, located in area C of the terminal area, develops, leases, and sells hangar space.

Alpha Air, located in area A of the terminal area, is a flight school and flying club, which also sells basic pilot supplies.

ARDCO, located in area D of the terminal area, contracts with the U.S. Forest Service for aerial firefighting services.

B&M Aircraft, located in area C of the terminal area, provides heavy maintenance on light aircraft.

Cherokee Cabanas, located in area C of the terminal area, develops, rents, and sells hangar space on the airport.

Corsair Condos, located in area B of the terminal area, provides executive hangar space for rent.

E & R AERO, located in area B of the terminal area, provides maintenance for light aircraft.

Jim's Aircraft, located in area A of the terminal area, provides maintenance on light aircraft, aircraft part sales, and hangar and tiedown rentals.

Kelly's Aviation, located in area A of the terminal area, provides flight instruction and aircraft rental services.

Mobile Aire, located in area B of the terminal area, provides aircraft parking, tiedowns, and hangar rentals.

National Pilot Academy, located in area A of the terminal area, provides flight training services.

Southwest Avionics, located in area A of the terminal area, sells avionics equipment.

Todd's Restaurant, located in area B of the terminal area, is a 2,400 square-foot facility located adjacent to the airport administration building, providing restaurant services. The restaurant has a parking lot which provides 30 automobile parking spaces.

Tucson Upholstery, located in area A of the terminal area, provides full service upholstery services.

Tyconic, Inc., located in area A of the terminal area, provides flight training, aircraft rental, light maintenance on light aircraft, and limited pilot supplies.

VistaWest Hangars, located in area A of the terminal area, provides aircraft storage services.

Windwalker Flight Instruction, located in area A of the terminal area, provides flight instruction services.

Winsor Aviation, located in area A of the terminal area, provides flight instruction services and pilot supplies.

ACCESS & CIRCULATION

The airport is located approximately ten miles southwest of the City of Tucson at the intersection of Ajo Highway (State Route 86) and West Valencia Road. Ajo Highway is a two-lane paved roadway that extends from Interstate 19 in Tucson to Ajo.

Interstate 19, which runs north to south, extends from Tucson 66 statute miles to Nogales at the Mexican border. Interstate 10, which runs east to west, traverses Tucson and extends 116 statute miles to Phoenix in the northwest, and 318 statute miles to El Paso, Texas to the east.

Access to the airport is provided by Airfield Drive at the intersection of Ajo Highway and West Valencia Road. Airfield Road is a paved two-lane road which provides access to several on-airport specialty operators and hangar facilities. South Aviator Lane is a divided two-lane paved road that provides access from Ajo Highway to the ATCT, as well as several other specialty operators and hangar facilities. South Aviator Lane and Airfield Drive are connected by a paved roadway that runs parallel to Ajo Highway. Each of these roadways is identified on **Exhibit 1E**.

A total of 199 automobile parking spaces are provided along both Aviator Lane (146 parking spaces) and Airfield Drive (53 parking spaces) for public use. An additional 10 parking spaces are provided adjacent to the gate entrance to the north apron.

SOCIOECONOMIC PROFILE

The socioeconomic profile provides a general look at the socioeconomic makeup of the community that utilizes Ryan Airfield. It also provides an understanding of the dynamics for growth and the potential changes that may affect aviation demand. Aviation demand forecasts are often directly related to the population base, economic strength of the region, and the ability of the region to sustain a strong economic base over an extended period of time. Current demographic and economic information was collected from the Pima Association of Governments (PAG), Arizona Department of Economic Security, and the United States Department of Commerce.

POPULATION

Population is a basic demographic element to consider when planning for future needs of the airport. The State of Arizona has been one of the fastest growing states in the country. **Table 1F** shows the total population growth since 1960 for the State of Arizona, Pima County, and the City of Tucson. The State, County, and City experienced its greatest amount of growth between 1970 and 1980. Recently, Arizona has grown at a faster annual average rate (3.3 percent) since 2000 than Pima County and the City of Tucson (2.3 and 1.4 percent respectively).

TABLE 1F
Tucson Area Population Trends

Year	State of Arizona	Avg. Annual % Change	Pima County	Avg. Annual% Change	City of Tucson	Avg. Annual % Change
1960	1,302,161	--	265,660	--	212,892	--
1970	1,770,900	3.1%	351,666	2.8%	262,933	2.1%
1980	2,718,215	4.4%	531,433	4.2%	330,537	2.3%
1990	3,665,228	3.0%	666,880	2.3%	405,390	2.1%
2000	5,130,632	3.4%	843,746	2.4%	486,699	1.8%
2008	6,629,455	3.3%	1,014,023	2.3%	543,959	1.4%

Sources: U.S. Census Bureau (1960-2000)
Arizona Department of Commerce (2008)

EMPLOYMENT

Employment opportunities affect migration to the area and population growth. As shown in **Table 1G**, the Tucson metropolitan statistical area (MSA) unemployment rate has been consistently below state and national levels over the last seven years. This indicates a strong job market and a healthy local economy which promotes population growth.

TABLE 1G
Historical Unemployment Rate
United States, State of Arizona, Tucson Metropolitan Statistical Area

Year	United States	State of Arizona	Tucson MSA
2000	4.0%	4.0%	3.7%
2001	4.7%	4.7%	4.3%
2002	5.8%	6.0%	5.7%
2003	6.0%	5.7%	5.3%
2004	5.5%	4.9%	4.6%
2005	5.1%	4.6%	4.4%
2006	4.6%	4.1%	4.0%
2007	4.6%	3.7%	3.6%

Source: Arizona Department of Economic Security

Table 1H summarizes total employment by sector for Pima County from 1970 to 2008. As shown in the table, total employment in the county has experienced steady growth over this timeframe with an average annual growth rate of 3.4 percent. The sectors that experienced the greatest growth were the "Services" sector (5.2 percent), "Finance, Ins. & Real Estate" sector (4.4 percent), and "Transportation, Communication, and Utility" sector (3.4 percent).

TABLE 1H
Pima County Employment by Sector

Sector	1970	1980	1990	1995	2000	2008	Annual % Growth
Farm Employment	1,090	930	1,040	1,070	990	1,155	0.2%
Agricultural Services, Other	970	1,880	3,330	4,260	4,940	294	-3.1%
Mining	6,970	6,920	2,740	2,790	2,480	2,320	-2.9%
Construction	11,060	16,710	18,830	24,300	27,710	36,069	3.2%
Manufacturing	9,300	22,080	28,260	29,870	34,930	30,589	3.2%
Trans., Comm., Util.	5,870	8,960	10,120	15,220	14,580	21,245	3.4%
Wholesale Trade	3,510	6,130	8,840	11,360	12,620	11,702	3.2%
Retail Trade	25,340	40,840	60,490	68,210	73,940	57,334	2.2%
Finance, Ins. & Real Estate	10,950	21,000	24,780	26,850	36,220	55,655	4.4%
Services	32,450	59,960	103,820	126,550	155,830	219,970	5.2%
Government	36,750	49,340	59,450	74,130	80,130	85,431	2.2%
Total	144,260	234,750	321,700	384,610	444,370	521,764	3.4%

Source: Woods & Poole CEDDS 2007

PER CAPITA PERSONAL INCOME

Per capita personal income (PCPI) for the United States, the State of Arizona, and the Tucson MSA is summarized in **Table 1J**. PCPI is determined by dividing total income by population. For PCPI to grow significantly, income growth must outpace population growth. As shown in the table, PCPI average annual growth in the Tucson MSA (1.2 percent) has been outpaced by PCPI growth in the state (1.3 percent) and the country (1.5 percent) since 1970. Historic PCPI levels for the Tucson MSA have also been consistently lower than the state and national levels.

TABLE 1J
Historical Per Capita Personal Income (2004 $)
United States, State of Arizona, Tucson MSA

Year	United States	Arizona	Tucson MSA
1970	$19,810	$18,505	$18,539
1980	$23,038	$21,384	$20,559
1990	$28,150	$24,577	$23,128
1995	$28,603	$24,702	$23,891
2000	$32,737	$28,144	$26,517
2005	$33,341	$29,035	$27,923
Avg. Annual Growth Rate	1.5%	1.3%	1.2%

Source: United States Department of Commerce, Bureau of Economic Analysis

CLIMATE

Weather plays an important role in the operational capabilities of an airport. Temperature is an important factor in determining runway length required for aircraft operations. The percentage of time that visibility is impaired due to cloud coverage is a major factor in determining the use of instrument approach aids.

Temperatures typically range from 68 to 99 degrees Fahrenheit (F) during the summer months. The hottest month is typically July with an average high of 99.6 degrees. July is the wettest month averaging 2.29 inches of precipitation. January is the coldest month with average minimum temperatures around 38 degrees. There are only 82 cloudy days a year in Tucson, with the majority occurring during the winter months. **Table 1K** summarizes typical temperature and precipitation data for the region.

TABLE 1K Temperature and Precipitation Data Tucson, Arizona				
	Temperature (Fahrenheit)			
	Mean Maximum	Mean Minimum	Precipitation (Inches)	Cloudy Days
January	64.8	38.7	0.87	10
February	68.2	41.0	0.72	9
March	73.2	44.9	0.71	9
April	81.5	50.9	0.31	6
May	90.4	58.7	0.18	4
June	99.6	68.1	0.24	3
July	99.3	73.9	2.29	9
August	97.0	72.4	2.28	7
September	94.2	67.8	1.35	4
October	84.7	57.0	0.91	5
November	73.1	45.4	0.59	6
December	65.3	39.0	0.94	10
Annual	82.6	54.8	11.37	82
Source: Western Regional Climate Center				

ENVIRONMENTAL INVENTORY

Available information about the existing environmental conditions at Ryan Airfield has been derived from the 1990 Environmental Assessment, internet resources, agency maps, and existing literature. The intent of this task is to inventory potential environmental sensitivities that might affect future improvements at the airport.

Air Quality

The U.S. Environmental Protection Agency (EPA) has adopted air quality standards that specify the maximum permissible short-term and long-term concentrations of various air contaminants. The National Ambient Air Quality Standards (NAAQS) consist of primary and secondary standards for six criteria pollutants which include: Ozone (O_3), Carbon Monoxide (CO), Sulfur Dioxide (SO_2), Nitrogen Oxide (NO), Particulate matter (PM_{10} and $PM_{2.5}$), and Lead (Pb). Various levels of review apply within both NEPA and permitting requirements. Potentially significant air quality impacts, associated with an FAA project or action, would be demonstrated by the project or action exceeding one or more of the NAAQS for any of the time periods analyzed.

The airport is located in Pima County, which is in attainment for Carbon Monoxide (CO), Particulate Matter (PM10), and Sulfur Dioxide (SO2).

Fish, Wildlife, and Plants

The Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS) are charged with overseeing the requirements contained within Section 7 of the *Endangered Species Act*. This Act was put into place to protect animal or plant species whose populations are threatened by human activities. Along with the FAA, the FWS and the NMFS review projects to determine if a significant impact to these protected species will result with implementation of a proposed project. Significant impacts occur when the proposed action could jeopardize the continued existence of a protected species or would result in the destruction or adverse modification of federally designated critical habitat in the area.

In a similar manner, states are allowed to prepare statewide wildlife conservation plans through authorizations contained within the *Sikes Act*. Airport improvement projects should be checked for consistency with the State or Department of Defense (DOD) Wildlife Conservation Plans where such plans exist. The Arizona Department of Game and Fish oversees State Natural Heritage Programs in Arizona.

Vegetation on the airport is mostly characterized by a sparse Mesquite-Creosote bush. The airport lies in the Avra Valley and is adjacent to the east forks of Brawley Wash, the main drainage way of the valley. A major branch of the wash runs from southwest to northwest past the extreme northeastern corner of the airport. This area consists of riparian habitat to the north and east of the airport containing dense stands of mesquite forests and provides high density nesting habitat for migratory birds and functions as a movement corridor for a variety of wildlife.

Table 1L depicts federally listed species in Pima County. In addition, the Arizona Game and Fish Department has numerous species listed as wildlife species of concern. A search of the Arizona Heritage Data Management System on-line environmental review tool indicates that the Pima Pineapple Cactus, a federally listed species, has a recorded occurrence within three miles of the airport. It was also indicated that one or more native plants listed on the Arizona Native Plant Law and Antiquities Act have been documented within the vicinity of the airport.

Previous surveys conducted for airport development projects failed to locate any significant or sensitive habitat or threatened or endangered species.

Floodplains

Floodplains are defined in *Executive Order 11988, Floodplain Management*, as "the lowland and relatively flat areas adjoining inland and coastal waters…including at a minimum, that area subject to a one percent or greater chance of flooding in any given year" (i.e., that area would be inundated by a 100-year flood). Federal agencies, including the FAA, are directed to "reduce the risk of loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by floodplains." The airport is located within 100-year floodplains associated with Brawley Wash and its tributaries.

TABLE 1L Threatened or Endangered Species in Pima County, Arizona	
Species	**Federal Status**
California brown pelican	Endangered
Chiricahua leopard frog	Threatened
Desert pupfish	Endangered
Gila chub	Endangered
Gila topminnow	Endangered
Huachua water umbel	Endangered
Jaguar	Endangered
Kearney blue star	Endangered
Lesser long-nosed bat	Endangered
Masked bobwhite	Endangered
Mexican spotted owl	Threatened
Nichol Turk's head cactus	Endangered
Ocelot	Endangered
Pima pineapple cactus	Endangered
Sonoran pronghorn	Endangered
Southwestern willow flycatcher	Endangered
Acuna cactus	Candidate
Sonoyta mud turtle	Candidate
Yellow-billed cuckoo	Candidate
Source: FWS online listed species database, November 2007	

Wetlands/Waters of the U.S.

The U.S. Army Corps of Engineers regulates the discharge of dredged and/or fill material into waters of the United States, including adjacent wetlands, under Section 404 of the *Clean Water Act*. Wetlands are defined in *Executive Order 11990, Protection of Wetlands*, as "those areas that are inundated by surface or groundwater with a frequency sufficient to support and under normal circumstances does or would support a prevalence of vegetation or aquatic life that requires saturated or seasonably saturated soil conditions for growth and reproduction." Categories of wetlands include swamps, marshes, bogs, sloughs, potholes, wet meadows, river overflows, mud flats, natural ponds, estuarine areas, tidal overflows, and shallow lakes and ponds with emergent vegetation. Wetlands exhibit three characteristics: hydrology, hydrophytes (plants able to tolerate various degrees of flooding or frequent saturation), and poorly drained soils.

The east forks of Brawley Wash are located north and east of the airport. As seen on the United States Geological Survey (USGS) map, waters associated with the Brawley Wash are located east and west of the airport. It is not known if these waters are considered jurisdictional.

Historical, Architectural, and Cultural Resources

Determination of a project's impact to historical and cultural resources is made in compliance with the *National Historic Preservation Act* (NHPA) *of 1966*, as amended for federal undertakings. Two state acts also require consideration of cultural resources. The NHPA requires that an initial review be made of an undertaking's *Area of Potential Effect* (APE) to determine if any properties in, or eligible for inclusion in, the National Register of Historic Places are present in the area.

Coordination undertaken with the State Historic Preservation Officer (SHPO) during the 1990 EA indicated that the airport is located in an area where significant cultural resources might be located. Previous surveys undertaken for airport development projects did not reveal any cultural resources.

Department of Transportation Act: Section 4(f)

Section 4(f) properties include publicly owned land from a public park, recreational area, or wildlife and waterfowl refuge of national, state, or local significance; or any land from a historic site of national, state, or local significance. There are no Section 4(f) resources located on airport property. Previous coordination with the Pima County Parks and Recreation Department expressed concern regarding Vahalla Regional Park located approximately 2.5 miles southeast of the airport. The Arizona State Parks Department has previously expressed concern regarding air traffic over the San Xavier Del Bac Mission, which is located on the National Register of Historic Places. The mission is located eight miles southeast of the airport.

LAND USE

Existing Land Use and Zoning

The existing land use for the area surrounding Ryan Airfield is depicted on **Exhibit 1F**. As indicated on the exhibit, the areas in the immediate vicinity of the airport are largely undeveloped. Land cover in these areas consists of open rangeland with scrub vegetation. Development is limited north of the airport. There is a small industrial development located south of Snyder Hill Road and a water treatment facility north of the airport. Additionally, there are scattered single-family and mobile home residences in this area. To the west of the airport, there are several low-density single-family and mobile homes residence. East of the airport, there are two commercial properties, including a gun shooting range and an automobile salvage yard. The area directly south of the airport is undeveloped rangeland. Southeast of the airport, along Valencia Road, there are multiple single-family residential developments with existing residences, houses under construction, and available lots. The density of these developments is greater than the existing single-family developments north and west of the airport.

Although much of the area near Ryan Airfield is undeveloped, the potential for development remains. An examination of the Pima County zoning designations, although not permanent, can provide some insight into how the land could be developed. A parcel's zoning classification determines the type of development that may occur on the property as outlined in the county's zoning ordinance. According to the Pima County Assessor's office, the areas immediately surrounding the airport are zoned as Rural Homestead (RH). This classification allows residential uses and commercial and industrial development appropriate and necessary to serve the needs of rural areas. The land north of the airport is zoned as General Industrial (CI-2) which allows a variety of industrial and manufacturing land uses and airport facilities. There are also several smaller parcels zoned for a variety of residential and supporting commercial land uses located throughout the airport area. These parcels are zoned as Mixed Dwelling (CR-4), General Residential (GR-1), Transition (TR), and Local Business (CB-1). A detailed listing of the allowable uses within each of these zones can be found in Chapter 18 of the Pima County Code.

In addition to the primary zoning classifications, Pima County has established an airport overlay zone for Ryan Airfield that consists of a height overlay and a land use overlay. The height overlay establishes a maximum allowable height for structures near the airport. The intent of this zone is to protect the airspace in the arrival and departure corridors at the airport from potential obstructions. The land use overlay zone permits a variety of non-residential uses that are considered compatible with airport operations and establishes a minimum density of one dwelling unit per acre for residential land uses.

For further analysis of land use and zoning please refer to Appendix C.

SUMMARY

The information discussed on the previous pages provides a foundation upon which the remaining elements of the planning process will be constructed. Information on current airport facilities and utilization will serve as a basis, with additional analysis and data collection, for the development of forecasts of aviation activity and facility requirement determinations. The inventory of existing conditions is the first step in the process of determining those factors which will meet projected aviation demand in the community and the region.

DOCUMENT SOURCES

A variety of sources were used in the inventory of existing facilities. The following listing presents a partial list of reference documents. The list does not reflect some information collected by airport staff or through interviews with airport personnel.

AirNAV Airport information, website: http://www.airnav.com

Airport/Facility Directory, Southwest U.S., U.S. Department of Transportation, Federal Aviation Administration,

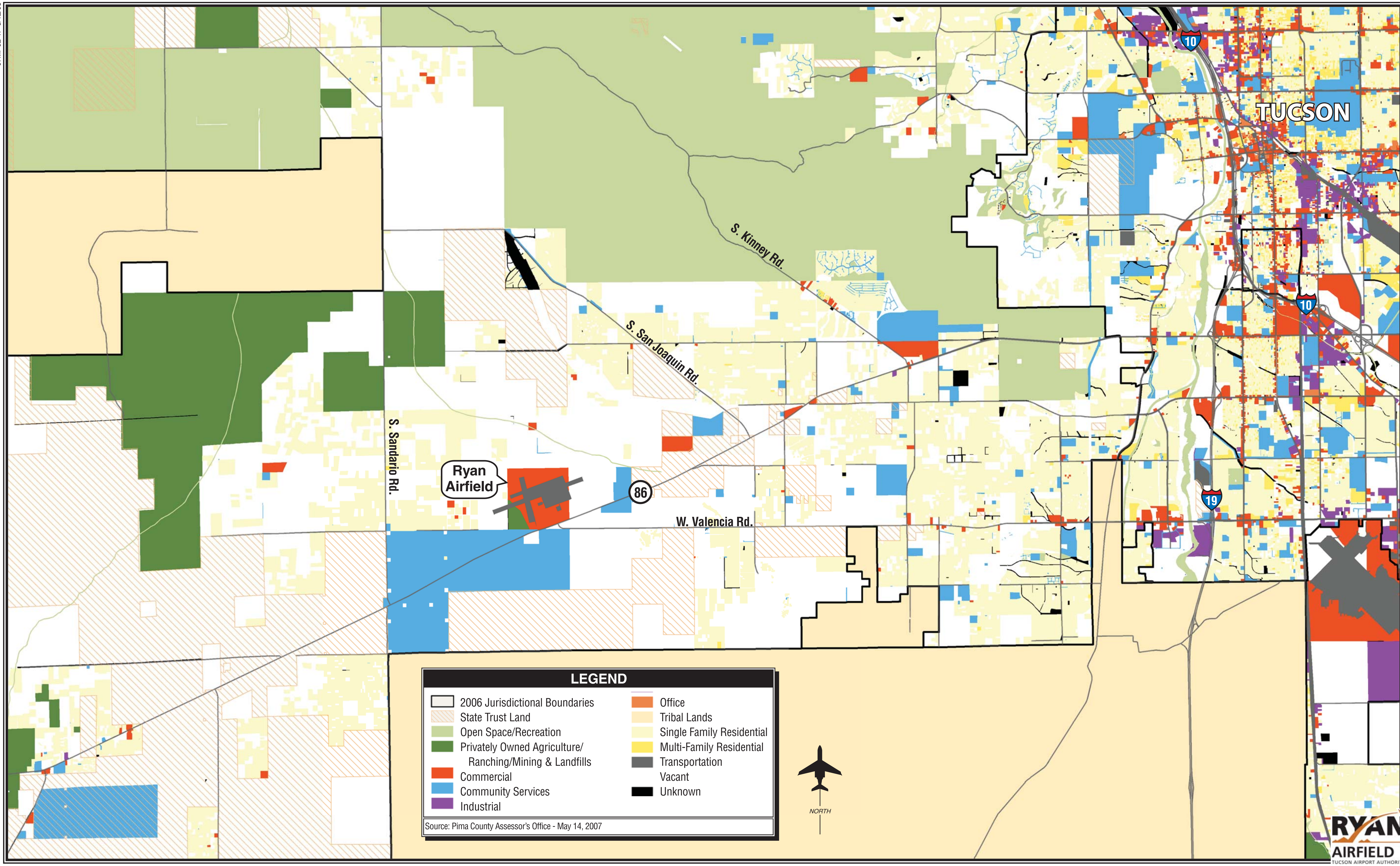


Exhibit 1F
2006 LAND USE MAP

National Aeronautical Charting Office, October 25, 2007 Edition

Arizona Department of Commerce, 2008

Arizona Department of Transportation; 2007

FAA 5010 Form, Airport Master Record; 2007

National Plan of Integrated Airport Systems (NPIAS), U.S. Department of Transportation, Federal Aviation Administration, 2007-2011

Pima Association of Governments (PAG); 2007

Ryan Airfield *Airport Master Plan*; 1999

Ryan Airfield *Master Plan & F.A.R. Part 150 Noise Compatibility Plan, Environmental Assessment*; 1990

Tucson Airport Authority (TAA)

U.S. Department of Commerce, Bureau of Economic Analysis; 2007

U.S. Terminal Procedures, Volume 4 of 4, Department of Transportation, Federal Aviation Administration, March 12, 2009 Edition.

Western Regional Climate Center; 2007

Woods & Poole Economics, *The Complete Economic and Demographic Data Source*; 2007

Chapter 2

FORECASTS

Chapter Two

Forecasts

An important factor in facility planning involves a definition of demand that may reasonably be expected to occur during the useful life of the facility's key components. In airport master planning, this involves projecting potential aviation activity over at least a twenty-year timeframe. For general aviation reliever airports such as Ryan Airfield, forecasts of based aircraft and general aviation operations (takeoffs and landings) serve as a basis for facility planning.

The Federal Aviation Administration (FAA) has a responsibility to review aviation forecasts that are submitted to the agency in conjunction with airport planning, including master plans, 14 CFR Part 150 Studies, and environmental studies. The FAA reviews such forecasts with the objective of including them in its Terminal Area Forecasts (TAF) and the National Plan of Integrated Airport Systems (NPIAS). In addition, aviation activity forecasts are an important input to the benefit-cost analyses associated with airport development, and the FAA reviews these analyses when federal funding requests are submitted.

As stated in FAA Order 5090.3C, Field Formulation of the National Plan of Integrated Airport Systems (NPIAS), dated December 4, 2004, forecasts should:

- Be realistic.
- Be based on the latest available data.
- Reflect current conditions at the airport.
- Be supported by information in the study.

- Provide adequate justification for the airport planning and development.

The forecast process for an airport master plan consists of a series of basic steps that can vary depending upon the issues to be addressed and the level of effort required to develop the forecast. The steps include a review of previous forecasts, determination of data needs, identification of data sources, collection of data, selection of forecast methods, preparation of the forecasts, and evaluation and documentation of the results.

The following forecast analysis for Ryan Airfield was produced following these basic guidelines. Other forecasts dating back to the previous master plan were examined and compared against current and historic activity. The historical aviation activity was then examined along with other factors and trends that could affect demand. The intent is to provide an updated set of aviation demand projections for Ryan Airfield that will permit the Tucson Airport Authority (TAA) to make planning adjustments as necessary to maintain a viable, efficient, and cost-effective facility.

NATIONAL AVIATION TRENDS

Each year, the FAA updates and publishes a national aviation forecast. Included in this publication are forecasts for passengers, airlines, air cargo, general aviation, and FAA workload measures. The forecasts are prepared to meet the budget and planning needs of the constituent units of the FAA and to provide information that can be used by state and local authorities, the aviation industry, and the general public.

The current edition when this chapter was prepared was *FAA Aerospace Forecasts - Fiscal Years 2009-2025*, published in March 2009. The forecasts use the economic performance of the United States as an indicator of future aviation industry growth. Similar economic analyses are applied to the outlook for aviation growth in international markets.

Since the events of September 11, 2001, the United States has experienced the impacts of heightened security concerns, the bankruptcy of four major airlines, record high fuel prices, and now a global economic crisis. It was determined by the National Bureau of Economic Research that the U.S. economy entered into a recession in December 2007. This economic situation is expected to dampen near-term growth in the general aviation industry.

According to the Bureau of Economic Analysis, Gross Domestic Product (GDP) fell 3.8 percent in the fourth quarter of calendar year (CY) 2008. The President's stimulus package and monetary policies are projected to pull the economy out of the recession in the second half of 2009. GDP is projected to grow between 2.4 and 4.5 percent annually between 2010 and 2013. Beyond 2013, GDP is projected to grow at a slower rate of 2.6 percent per year through 2025.

The world GDP is forecast to shrink in 2009 by 0.7 percent. Growth in world GDP is anticipated to resume in 2010 at a rate of 2.4 percent. Beyond 2010, world GDP is projected to grow at an average annual rate of 3.3 percent. This will positively influence the aviation industry, leading to passenger, air cargo, and general aviation growth throughout the forecast period.

GENERAL AVIATION

Following more than a decade of decline, the general aviation industry was revitalized with the passage of the *General Aviation Revitalization Act* in 1994, which limits the liability on general aviation aircraft to 18 years from the date of manufacture. This legislation sparked an interest to renew the manufacturing of general aviation aircraft due to the reduction in product liability, as well as renewed optimism for the industry. The high cost of product liability insurance had been a major factor in the decision by many American aircraft manufacturers to slow or discontinue the production of general aviation aircraft.

The sustained growth in the general aviation industry slowed considerably in 2001, negatively impacted by the events of 9/11. Thousands of general aviation aircraft were grounded for weeks due to no-fly zone restrictions imposed on operations of aircraft in security-sensitive areas. This, in addition to the economic recession that began in early 2001, had a negative impact on the general aviation industry. General aviation shipments by U.S. manufacturers declined for three straight years from 2001 through 2003.

Stimulated by an expanding U.S. economy, as well as accelerated depreciation allowances for operators of new aircraft, active general aviation aircraft staged a relatively strong recovery with a 2.2 percent average annual growth rate between 2003 and 2008.

In previous FAA forecasts, the entry of Very Light Jets (VLJs) was anticipated to redefine the business jet segment. VLJs are relatively inexpensive twin-engine aircraft that support a true on-demand air-taxi business service. It was forecast that 500 new VLJ aircraft would enter the fleet annually by 2010. However, since the previous forecast was prepared, Eclipse and DayJet have both filed for bankruptcy. VLJ deliveries totaled only 262 for 2008. Due to the state of the VLJ manufacturing industry, the updated FAA forecasts predict that approximately 200 VLJs will enter the GA fleet over the next two years, and then increase to a rate of 270 to 300 aircraft each year through 2025.

Despite the hardships for the VLJ market, turbojet aircraft are anticipated to grow at a strong rate of 4.8 percent through the forecast period. This increased demand is credited to interest by corporate travelers who would like to avoid flight delays and security issues at major airports. The total number of jets in the general aviation fleet is projected to grow from 11,400 in 2008, to 25,165 by 2025.

In 2008, there were an estimated 234,015 active general aviation aircraft in the United States. **Exhibit 2A** depicts the FAA forecast for active general aviation aircraft. The FAA projects an average annual increase of 1.0 percent through 2025, resulting in 275,230 active aircraft. Piston-powered aircraft are expected to grow at an average annual rate of 0.1 percent. This is driven primarily by a 5.0 percent annual increase in sport aircraft and growth in experimental and piston powered rotorcraft, as single engine fixed wing piston aircraft are projected to increase at just 0.1 percent annually, and multi-engine fixed wing piston aircraft are projected to decrease by 1.0 percent per year. It is expected that the new, light sport aircraft and the relatively inexpensive VLJs will dilute or weaken the replacement market for piston aircraft.

The "light sport" category of aircraft was created in 2005. Over 6,000 aircraft were registered as "light sport" aircraft by the end of 2007. The FAA projects this category to increase fairly rapidly in the short term with growth tapering off after 2013 reaching 15,865 registrations by 2025.

BASED AIRCRAFT

The number of aircraft based at an airport is, to some degree, dependent upon the nature and magnitude of aircraft ownership in the local service area. In addition, Ryan Airfield is one of several airports serving the general aviation needs of the Tucson metropolitan area. Therefore, the process of developing forecasts of based aircraft for Ryan Airfield begins with a review of historical aircraft registrations in the area.

REGISTERED AIRCRAFT FORECASTS

Historical records of aircraft ownership in Pima County, presented on **Table 2A**, were obtained from the U.S. Census of Civil Aircraft for the years 1987 through 1992; Aviation Goldmine for the years 1993 through 2000; Avantext, Inc., Aircraft & Airmen for the years 2001 to 2006; and the FAA for the years 2007 and 2008. Since 1987, registered general aviation aircraft in the county have grown from 940 to 1,447, for an annual average growth rate of 2.0 percent.

Table 2A also compares registered aircraft to active general aviation aircraft in the United States. The method used by the FAA to tabulate active general aviation aircraft changed in 1992, which is why annual counts before this time were not included in this study. The Pima County share of the U.S. market of general aviation aircraft has grown from 0.502 percent in 1992 to 0.618 percent in 2008.

Socioeconomic Trends

Pima County historical trends for key socioeconomic variables provide an indicator of the potential for creating growth in aviation activities at an airport. Typical variables used in evaluating potential for traffic growth include population and per capita personal income (PCPI). This data is readily available on an annual historic basis at the county level.

Table 2A presents historical population data for Pima County from 1987 to 2008. Population growth has been

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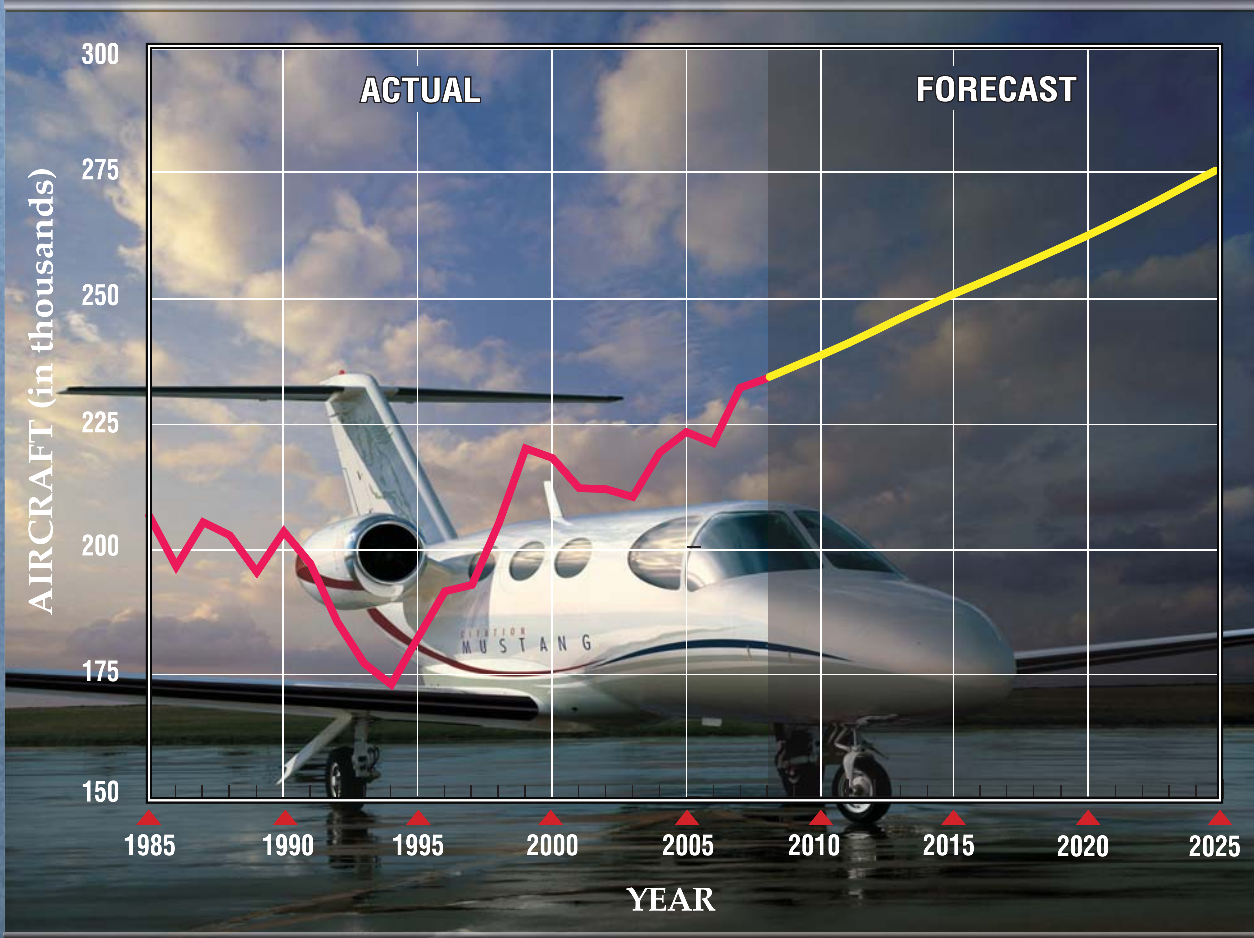
U.S. ACTIVE GENERAL AVIATION AIRCRAFT



U.S. ACTIVE GENERAL AVIATION AIRCRAFT (in thousands)

Year	FIXED WING PISTON Single Engine	FIXED WING PISTON Multi-Engine	FIXED WING TURBINE Turboprop	FIXED WING TURBINE Turbojet	ROTORCRAFT Piston	ROTORCRAFT Turbine	Experimental	Sport Aircraft	Other	Total
2008 (Est.)	146.6	19.1	9.6	11.4	3.1	7.1	24.1	7.0	6.0	234.0
2015	143.5	17.9	10.5	17.1	4.6	9.0	29.1	12.7	6.1	250.5
2020	144.9	17.0	11.5	20.9	5.3	9.9	32.0	14.4	6.0	261.8
2025	148.5	16.0	12.2	25.2	5.9	10.9	34.6	15.9	6.0	275.2

Source: FAA Aerospace Forecasts, Fiscal Years 2009-2025.

Notes: An active aircraft is one that has a current registration and was flown at least one hour during the calendar year.

RYAN AIRFIELD
TUCSON AIRPORT AUTHORITY

Exhibit 2A
U.S. ACTIVE GENERAL AVIATION AIRCRAFT FORECASTS

steady over the past 21 years with an increase of 354,923 residents and an average annual percentage increase of 2.1 percent.

TABLE 2A
Registered Aircraft and Independent Variables
Pima County

Year	Registered Aircraft	U.S. Active Aircraft	% of U.S. Market	Population	PCPI (2004 $)
1987	940	N/A	N/A	659,100	23,413
1988	919	N/A	N/A	664,400	23,305
1989	949	N/A	N/A	675,300	23,693
1990	918	N/A	N/A	668,500	23,128
1991	909	N/A	N/A	682,875	23,006
1992	932	185,650	0.502%	700,250	22,988
1993	1,033	177,120	0.583%	712,600	23,446
1994	1,074	172,935	0.621%	728,425	23,968
1995	1,102	182,605	0.603%	758,050	23,891
1996	1,101	187,312	0.588%	780,750	24,224
1997	1,131	189,328	0.597%	789,650	24,495
1998	1,127	205,700	0.548%	823,900	25,650
1999	1,165	219,500	0.531%	845,775	26,073
2000	1,260	217,533	0.579%	843,746	26,517
2001	1,279	211,535	0.605%	870,610	26,481
2002	1,284	211,345	0.608%	890,545	26,236
2003	1,298	209,788	0.619%	910,950	26,302
2004	1,301	219,426	0.593%	931,210	27,467
2005	1,337	224,352	0.596%	957,635	27,923
2006	1,341	226,422	0.604%	981,280	28,020
2007	1,448	231,606	0.625%	1,003,918	28,277
2008	1,447	234,015	0.618%	1,014,023	29,997
Constant Share of U.S. Active Aircraft					
2012	1,504	243,170	0.625%	1,113,749	31,400
2017	1,576	254,895	0.625%	1,215,512	33,739
2027	1,736	280,776	0.625%	1,393,778	39,555

Sources:
Registered Aircraft – U.S. Census of Civil Aircraft (1987-1992), Aviation Goldmine (1993-2000), Avantext, Inc., Aircraft & Airmen (2001-2006), FAA (2007-2008).
U.S. Active Aircraft – *FAA Aerospace Forecasts 2009-2025*
Population – Arizona Department of Economic Security
PCPI – U.S. Department of Commerce, Bureau of Economic Analysis (1987-2005), Woods & Poole *CEDDS*, 2008 (2006-2008, 2012, 2017, 2027).

In Arizona, the Population Technical Advisory Committee (POPTAC) reviews and approves the official population estimates and projections for the state, county, and sub-county levels. These approved estimates and projections are then sent to the Arizona Department of Economic Security (DES) Director as an advisory recommendation. POPTAC membership is made up of several state departments, State Universities, and Tribal Councils, as well as several government associations including the Pima Association of Governments (PAG). POPTAC produces population projections twice per decade. The most recent projections were produced in 2006, with forecast population levels through 2055. Population forecasts for this Master Plan's projection years, shown in **Table 2A**, increase the County's total population by almost 380,000 residents. This is an average annual increase of 1.69 percent.

Historical and projected PCPI for the County is also presented on **Table 2A** and are inflation-adjusted to year 2004 dollars. Inflation-adjusted PCPI for the County has been growing at an annual average of 1.19 percent over the last 21 years. Projected numbers through 2027 has PCPI growing at an average annual rate of 1.47 percent.

Registered Aircraft Projections

Based on the historical registered aircraft, U.S. active aircraft, population, and PCPI data, projections of registered aircraft in Pima County have been prepared and are shown in **Table 2B**. First, a market share analysis was developed which keeps Pima County's share of U.S. active aircraft constant through 2027, resulting in a 0.96 percent annual growth rate.

A time-series extrapolation of registered aircraft was developed based upon the period from 1987 to 2008. The correlation coefficient, (r^2), was determined to be 0.957 for this time-series extrapolation. The correlation coefficient (Pearson's "r") measures the association between changes in the dependent variable (registered aircraft) and the independent variable(s). An r^2 greater than 0.900 generally indicates good predictive reliability. A lower value may be used with the understanding that the predictive reliability is lower.

Several regression analyses were prepared to determine the association between socioeconomic indicators (population and PCPI) and registered aircraft growth. This association is represented by the correlation coefficient. **Table 2B** and **Exhibit 2B** present the resulting projections for comparison with the market share projection.

The results of the regression analysis indicate that the socioeconomic factor that associates closest with registered aircraft change is population. The time-series analysis resulted in a projection that was slightly lower than the other three regressions, and the PCPI regression resulted in a long-range forecast that was significantly higher than the rest. Therefore, the selected registered aircraft forecast was modeled after the single population regression, and the multiple regression with population and PCPI. This selected forecast projects registered aircraft to increase at 1.72 percent annually through the planning period, at almost the same growth rate as population (1.69 percent).

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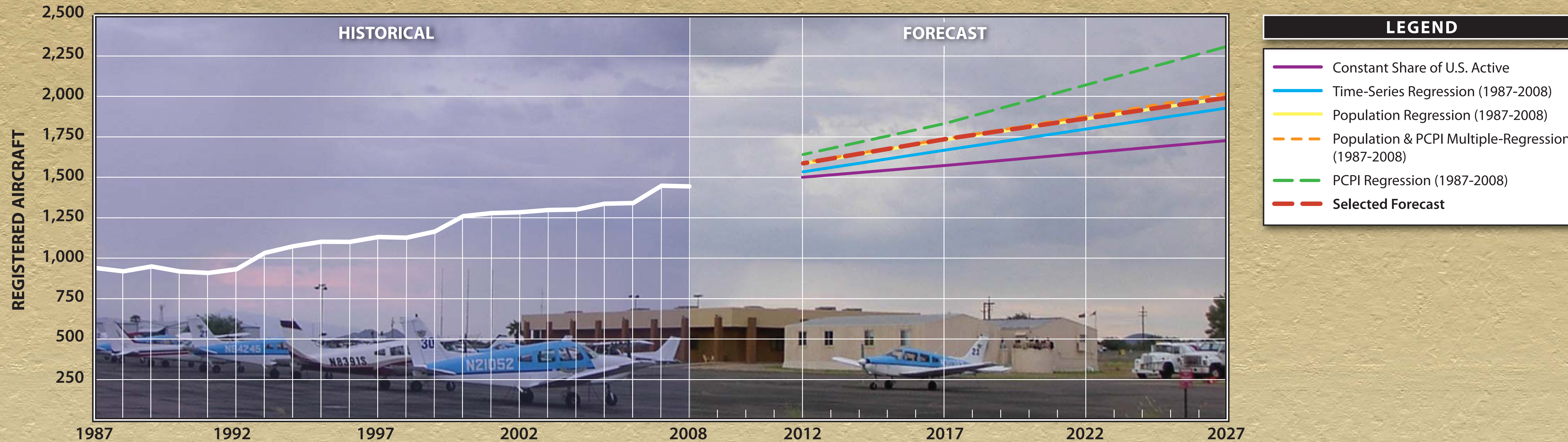
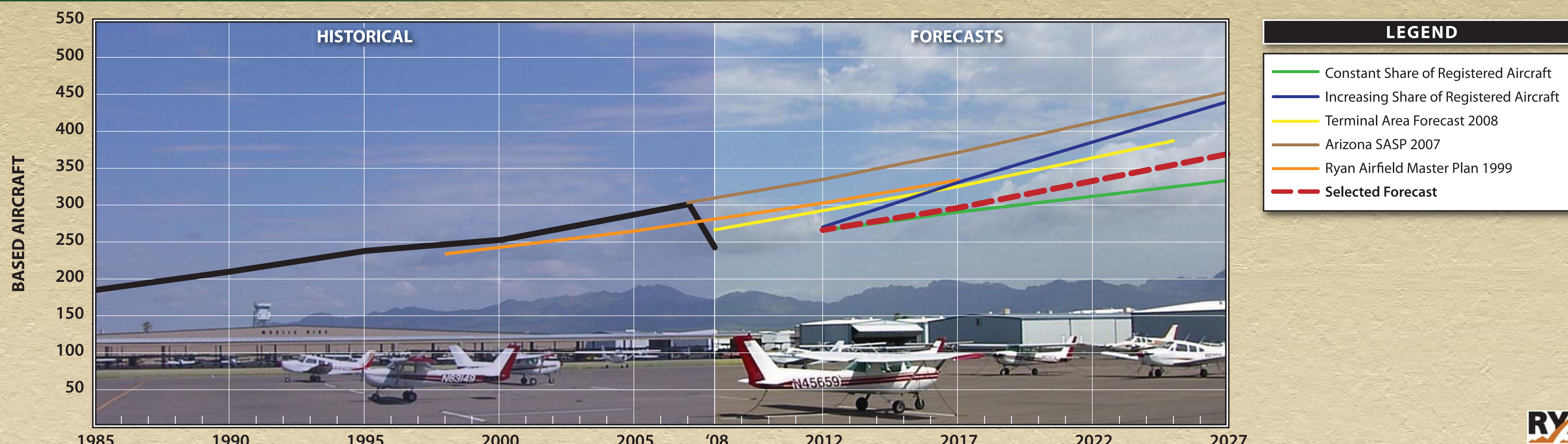
PIMA COUNTY REGISTERED AIRCRAFT



RYAN AIRFIELD BASED AIRCRAFT



RYAN AIRFIELD
TUCSON AIRPORT AUTHORITY

Exhibit 2B
PIMA COUNTY REGISTERED AIRCRAFT/
RYAN AIRFIELD BASED AIRCRAFT

TABLE 2B
Registered Aircraft Projections
Pima County

	r^2	2008	2012	2017	2027	Avg. Annual Growth Rate
Market Share Projection						
U.S. Active Aircraft		234,015	243,170	254,895	280,776	0.96%
Constant Share of U.S. Active Aircraft		1,447	1,504	1,576	1,736	0.96%
Regression Analysis Projections						
Time-Series 1987-2008	0.957	1,447	1,538	1,672	1,940	1.56%
Population & PCPI 1987-2008	0.960	1,447	1,595	1,748	2,027	1.79%
Population 1987-2008	0.961	1,447	1,589	1,738	1,999	1.71%
PCPI 1987-2007	0.912	1,447	1,645	1,837	2,316	2.51%
Selected Forecast		**1,447**	**1,590**	**1,740**	**2,000**	**1.72%**

BASED AIRCRAFT FORECAST

Before preparing new forecasts for based aircraft, previous based aircraft projections were reviewed for current validity. These included the FAA *Terminal Area Forecast* (TAF) 2008, Arizona *State Aviation System Plan* (SASP) 2008, and the previous *Ryan Airfield Master Plan* from 1999. Each of the previous forecasts use different base years as well as projection years. For comparison, these were interpolated and extrapolated to correlate with this Master Plan's projection years. Each of these previous based aircraft forecasts are presented in **Table 2C**.

TABLE 2C
Previous Based Aircraft Projections
Ryan Airfield

	Current	2008	2012	2017	2027
TAA Records	242				
FAA TAF 2008		267	293	326	405
Arizona SASP 2007		310	336	372	454
Previous Master Plan 1999		281	303	334	N/A

Since each of these previous studies was prepared at different times, it is expected that they will be different from each other and may not match recent historical counts. According to TAA records, the current based aircraft count at Ryan Airfield is 242. The interpolated 2007 projections for each of these previous studies are well above this number. This can be attributed to the recent loss of the flight school and a downturn in aviation activity in general in the past year.

Having forecast the aircraft ownership demand in Pima County, the historic basing at Ryan Airfield was reviewed to examine the change in market share over the years. **Table 2D** examines the based aircraft at Ryan Airfield as a percentage of the aircraft registered to owners' addresses in the County.

TABLE 2D
Updated Based Aircraft Projections
Ryan Airfield

Year	Registered Aircraft	Based Aircraft	% of Registered
1985	922	185	20.1%
1990	918	210	22.9%
1995	1,102	238	21.6%
2000	1,260	253	20.1%
2007	1,448	301	20.8%
2008	1,447	242	16.7%
Average Annual Growth	1985-2007: 2.1%	1985-2007: 2.2%	
Constant Share Projection			
2012	1,590	266	16.7%
2017	1,740	291	16.7%
2027	2,000	334	16.7%
Average Annual Growth	1.7%	1.7%	
Increasing Share Projection			
2012	1,590	270	17.0%
2017	1,740	331	19.0%
2027	2,000	440	22.0%
Average Annual Growth	1.7%	3.2%	
Selected Forecast			
2012	1,590	266	16.7%
2017	1,740	296	17.0%
2027	2,000	369	18.5%
Average Annual Growth	1.7%	2.3%	

Source: Based Aircraft – Ryan Airfield Master Plan, 1999 (1985, 1990); FAA TAF, 2006 (1995, 2000); TAA Records (2007, 2008)

Between 1985 and 2008, Ryan Airfield based aircraft grew from 185 to 242 at a rate of 1.2 percent annually. Despite it's current share of registered aircraft in the county (16.7 percent), Ryan Airfield has held fairly consistent between 20 and 22 percent of the market in the county historically. Two market share projections were generated based off the historical trends. The first projection keeps the current market share static at 16.7 percent, resulting in 334 based aircraft by 2027 and an annual average growth rate of 1.7 percent. A second projection was generated which increased Ryan Airfield's market share of registered aircraft over the planning period, resulting in 440 based aircraft by 2027 and an average annual growth rate of 3.2 percent.

A selected forecast was derived from these projections. The selected based aircraft forecast is shown on **Exhibit 2B** compared to the previous projections as well as the updated projections. The selected forecast has based aircraft growing to 266 by 2012, 296 by 2017, and 369 by 2027, at an average annual growth rate of 2.2 percent. Short term based aircraft growth will be limited due to current economic conditions; however, after 2012 it is anticipated that the airport will begin shifting to grow its market share closer to historic trends. The selected based aircraft forecast was formulated to take into account growth in market share that is likely to occur at Ryan Airfield over the planning period. Also, the demand for aircraft storage hangar facilities at Ryan Airfield is high which indicates that aircraft owners in the County wish to base their aircraft at Ryan Airfield, and will in the future if facilities are developed. Currently, undeveloped airport property that could be developed into hangar facilities in the future is plentiful; therefore, this assumption is reasonable.

BASED AIRCRAFT FLEET MIX

The based aircraft fleet mix at Ryan Airfield, as shown on **Table 2E**, was compared to the existing and forecast U.S. general aviation fleet mix trends as presented in *FAA Aerospace Forecasts Fiscal Years 2009-2025*. The FAA expects business jets will continue to be the fastest growing general aviation aircraft type in the future. The number of business jets in the industry fleet is expected to almost double in the next 14 years. VLJ aircraft may still have a boosting affect on turbine aircraft sales as well. The affordability and versatility of this aircraft will make them attractive to corporations and small business owners.

TABLE 2E
Based Aircraft Mix Forecast
Ryan Airfield

	Current		2012		2017		2027	
	Number	%	Number	%	Number	%	Number	%
RYAN AIRFIELD Based Aircraft								
Single Engine Piston	223	92.1	241	90.6	265	89.5	322	87.3
Multi-Engine Piston	13	5.4	14	5.3	15	5.1	19	5.1
Turboprop	2	0.8	4	1.5	6	2.0	12	3.3
Jet	1	0.4	3	1.1	5	1.7	10	2.7
Rotorcraft	3	1.2	4	1.5	5	1.7	6	1.6
Totals	**242**	**100.0%**	**266**	**100.0%**	**269**	**100.0%**	**369**	**100.0%**
U.S. Active Aircraft (from FAA Aerospace Fiscal Years [2009-2025])								
Single Engine Piston	177,655	75.9%	181,640	74.7	187,525	73.6	202,025	72.0
Multi-Engine Piston	19,130	8.2%	18,455	7.6	17,540	6.9	15,636	5.6
Turboprop	9,600	4.1%	10,015	4.1	10,935	4.3	12,565	4.5
Jet	11,400	4.9%	14,710	6.0	18,635	7.3	27,082	9.6
Rotorcraft	10,215	4.4%	12,260	5.0	14,220	5.6	17,493	6.2
Other	6,015	2.6%	6,090	2.5	6,040	2.4	5,975	2.1
Totals	**234,015**	**100.0%**	**243,170**	**100.0%**	**254,895**	**100.0%**	**280,776**	**100.0%**

Note: Experimental and sport aircraft are included under single engine piston.
Total percentages may not equal 100 due to rounding.

Single engine piston aircraft (including sport aviation and experimental aircraft), helicopter, and turboprop aircraft are expected to grow at slower rates. The number of multi-engine piston aircraft in the U.S. will actually decline slightly as older aircraft are retired, according to the FAA forecasts.

GENERAL AVIATION OPERATIONS

General aviation operations are classified by the airport traffic control tower (ATCT) as either local or itinerant. A local operation is a take-off or landing performed by an aircraft that operates within sight of the airport, or which executes simulated approaches or touch-and-go operations at the airport. Itinerant operations are those performed by aircraft with a specific origin or destination away from the airport. Generally, local operations are characterized by training operations. Typically, itinerant operations increase with business and commercial use, since business aircraft are operated on a higher frequency.

ITINERANT OPERATIONS

Table 2F depicts general aviation itinerant operations as counted by the ATCT at Ryan Airfield since 1997. Between 1997 and 2008, itinerant GA operations increased from 41,206 to 75,013 in 2007; however, a significant decrease was experienced in 2008 as itinerant operations dropped to 59,930.

TABLE 2F
General Aviation Itinerant Operations Forecast
Ryan Airfield

Year	Itinerant Operations	U.S. ATCT GA Itinerant (millions)	Ryan Market Share	Ryan Based Aircraft	Itinerant Ops Per Based Aircraft
1997	41,206	21.70	0.190%	250	165
2000	53,495	22.84	0.234%	253	211
2005	55,570	19.32	0.288%	255	218
2007	75,013	18.58	0.404%	301	249
2008	59,930	17.37	0.345%	242	248
Constant Market Share Projection					
2012	57,077	16.54	0.345%	266	215
2017	61,642	17.86	0.345%	296	176
2022	66,470	19,26	0.345%	330	163
2027	73,100	21.18	0.345%	369	154
Operations Per Based Aircraft Projection					
2012	66,500	16.54	0.402%	266	250
2017	81,400	17.86	0.456%	296	275
2022	99,000	19.26	0.663%	330	300
2027	119,925	21.18	0.785%	369	325
FAA-TAF Projection*					
2012	66,577	16.54	0.402%	293	227
2017	71,559	17.86	0.401%	326	220
2022	77,268	19.26	0.401%	363	213
2027	83,430	21.18	0.394%	405	206
Master Plan Forecast					
2012	61,000	16.54	0.369%	266	229
2017	70,500	17.86	0.395%	296	238
2022	81,500	19.26	0.423%	330	247
2027	100,000	21.18	0.472%	369	271

* 2027 FAA-TAF projections were extrapolated by Coffman Associates

Ryan Airfield's market share as a percentage of GA itinerant operations at towered airports across the country rose sharply from 1997 (0.190 percent) through 2008 (0.345 percent).

In *FAA Aerospace Forecasts Fiscal Years 2009-2025*, the FAA projects itinerant general aviation operations at towered airports. **Table 2F** presents this forecast, as well as a projection for Ryan Airfield, based upon maintaining its current share of the itinerant operations market. Current FAA forecasts do take into consideration the current recession.

The table also examines the relationship of annual operations to based aircraft. Itinerant operations per based aircraft grew from a low of 165 in 1997 to 248 in 2008.

The market share of itinerant operations can be expected to maintain at least its current level. This forecast has itinerant operations exceeding 73,000 by 2027. The second projection in **Table 2F** reflects the itinerant operational levels that could be expected if the operations per based aircraft ratio were to continue to increase into the future, reflecting the historical trend. This forecast results in 119,925 itinerant operations in 2027.

Based upon current economic conditions and historic trends at Ryan Airfield, it is likely that itinerant operations per based aircraft will remain static in the short term. After economic conditions begin to improve, itinerant operations should begin to increase. The resulting forecast is included at the bottom of **Table 2F**.

As can be seen from the table, the Master Plan forecast is higher than the FAA TAF by 2027. This difference is a result of a faster growth rate beginning in the intermediate term through the long term in this master plan forecast. As the airport facilities and services improve over the planning period and as the City of Tucson grows closer to the airport, it can be expected that more itinerant GA aircraft will choose to utilize Ryan Airfield over other airports in the region.

LOCAL OPERATIONS

A similar methodology was utilized to forecast local operations. **Table 2G** depicts the history of local operations at Ryan Airfield and examines its historic market share of GA local operations at towered airports in the United States. Local operations grew by more than 93,000 between 1997 (81,760) and 2007 (171,410). A flight school operating at Ryan Airfield ceased operations in 2008 resulting in a decrease in local operations.

Historically, the market share has grown from 0.539 percent to 0.749 percent. **Table 2G** presents a market share projection based upon carrying forward a constant share of 0.749 percent. This projection results in 107,993 local GA operations by 2027.

Local operations per based aircraft have also increased over time from 327 in 1997, to 431 in 2008, with a high of 569 in 2007. Again, this drop in activity is attributable to the loss of flight school operations. Flight school activity at Ryan Airfield has been historically cyclical; however, at this point it is uncertain whether the airport will regain a flight school. The second projection in **Table 2G** examines increasing local operations per based aircraft after 2012, to levels that can be anticipated if a flight school is established at Ryan Airfield after 2012. This projection results in 162,360 local operations by 2027.

TABLE 2G
General Aviation Local Operations Forecast
Ryan Airfield

Year	Local Operations	U.S. ATCT GA Local (millions)	Ryan Market Share	Ryan Based Aircraft	Local Ops Per Based Aircraft
1997	81,760	15.16	0.539%	250	327
2000	119,796	17.03	0.703%	253	474
2005	100,486	14.85	0.677%	255	394
2007	171,410	14.83	1.156%	301	569
2008	104,262	13.92	0.749%	242	431
Constant Market Share Projection					
2012	99,103	13.23	0.749%	266	373
2017	100,431	13.41	0.749%	296	287
2022	102,782	13.72	0.749%	330	252
2027	107,993	14.42	0.749%	369	227
Operations Per Based Aircraft Projection					
2012	114,646	13.23	0.866%	266	431
2017	128,760	13.41	0.960%	296	435
2022	144,210	13.72	1.051%	330	437
2027	162,360	14.42	1.126%	369	440
FAA-TAF Projection*					
2012	144,253	13.23	1.090%	293	492
2017	162,944	13.41	1.215%	326	500
2022	184,059	13.72	1.341%	363	507
2027	207,914	14.42	1.442%	405	513
Master Plan Forecast					
2012	107,000	13.23	0.809%	266	402
2017	119,500	13.41	0.891%	296	404
2022	133,000	13.72	0.969%	330	403
2027	150,000	14.42	1.040%	369	407

*2027 FAA-TAF projections were extrapolated by Coffman Associates

Due to economic conditions and the uncertainty that a flight school will operate at Ryan Airfield in the future, local operations are projected to grow slower than itinerant operations. The master plan forecast of local operations is depicted at the bottom of **Table 2G**.

The FAA TAF forecasts are also presented on **Table 2G**. The master plan forecast is lower in the long term range reflecting the lack of a flight school and the uncertainty of whether a flight school will conduct operations at Ryan Airfield in the future.

GENERAL AVIATION OPERATIONS SUMMARY

Table 2H depicts historical general aviation operations as counted by the ATCT at Ryan Airfield since 1997, as well as the updated Master Plan projections. **The operational forecasts have been adjusted downward to reflect the current economic climate and loss of flight school activity.** Total general aviation operations are projected to reach 168,000 in the short term at an average annual growth rate of 0.6 percent. Beyond 2012, total general aviation operations are forecast grow 2.7 percent annually through 2027 reflecting the return to historic growth rates. **Exhibit 2C** depicts a chart of the general aviation operations projections broken down by itinerant, and local through the planning period compared to the 1999 *Ryan Airfield Master Plan* forecasts and the 2008 FAA TAF. **Exhibit 2C** depicts a chart of total general aviation operations projections compared to the 1999 *Ryan Airfield Master Plan* and the 2008 FAA TAF forecasts.

TABLE 2H
General Aviation Operations Forecast Summary
Ryan Airfield

Year	Total Operations	Itinerant Operations	Local Operations	Based Aircraft	Itinerant Ops/BA	Local Ops/BA
1997	122,966	41,206	81,760	250	165	327
1998	157,072	50,101	106,971	234	214	457
1999	138,111	46,845	91,266	253	185	361
2000	173,291	53,495	119,796	253	211	474
2001	145,761	51,073	94,688	N/A	N/A	N/A
2002	142,405	48,300	94,105	N/A	N/A	N/A
2003	129,889	47,307	82,582	259	183	319
2004	154,723	53,462	101,261	N/A	N/A	N/A
2005	156,056	55,570	100,486	255	218	394
2006	199,104	60,775	138,329	260	234	532
2007	246,423	75,013	171,410	301	249	569
2008	164,192	59,930	104,262	242	248	431
Forecast						
2012	168,000	61,000	107,000	266	229	402
2017	190,000	70,500	119,500	296	238	404
2022	214,500	81,500	133,000	330	247	403
2027	250,000	100,000	150,000	369	271	401

MILITARY

Military operations account for the smallest portion of the operational traffic at Ryan Airfield. Due to Ryan Airfield's proximity to Davis Monthan Air Force Base, as well as several military operating areas (MOAs), military activity has fluctuated between 1,000 and 4,500 operations annually between 1997 and 2008. Unless there is an unforeseen mission change in the area, a significant change from these military operational levels is not anticipated. Therefore, annual military operations have been projected at 3,500 throughout the planning period. This is consistent with typical industry practices for projecting military operations. Military operational history and projections are presented in **Table 2J**.

TABLE 2J Military Operations Ryan Airfield			
Year	**Itinerant**	**Local**	**Total**
1997	664	494	1,158
1998	659	509	1,168
1999	987	2,261	3,248
2000	657	410	1,067
2001	783	453	1,236
2002	754	616	1,370
2003	1,205	1,247	2,452
2004	1,833	1,942	3,775
2005	2,175	2,380	4,555
2006	1,934	1,438	3,372
2007	1,431	1,547	2,978
2008	1,840	1,920	3,760
Forecast			
2012	1,750	1,750	3,500
2017	1,750	1,750	3,500
2022	1,750	1,750	3,500
2027	1,750	1,750	3,500

ANNUAL INSTRUMENT APPROACHES (AIAs)

Forecasts of annual instrument approaches provide guidance in determining an airport's requirements for navigational aid facilities. An instrument approach as defined by the FAA is "an approach to an airport with intent to land by an aircraft in accordance with an Instrument Flight Rule (IFR) flight plan, when visibility is less than three miles and/or when the ceiling is at or below the minimum initial approach altitude."

Data on instrument approaches to Ryan Airfield since 1994 were examined. True instrument weather conditions are not a common occurrence at Ryan Airfield. In fact, most years conclude with no AIAs being reported. The highest AIAs reported occurred in 2001 with six. Based on this historical data, AIAs are forecast to remain below 100 operations annually through the planning period.

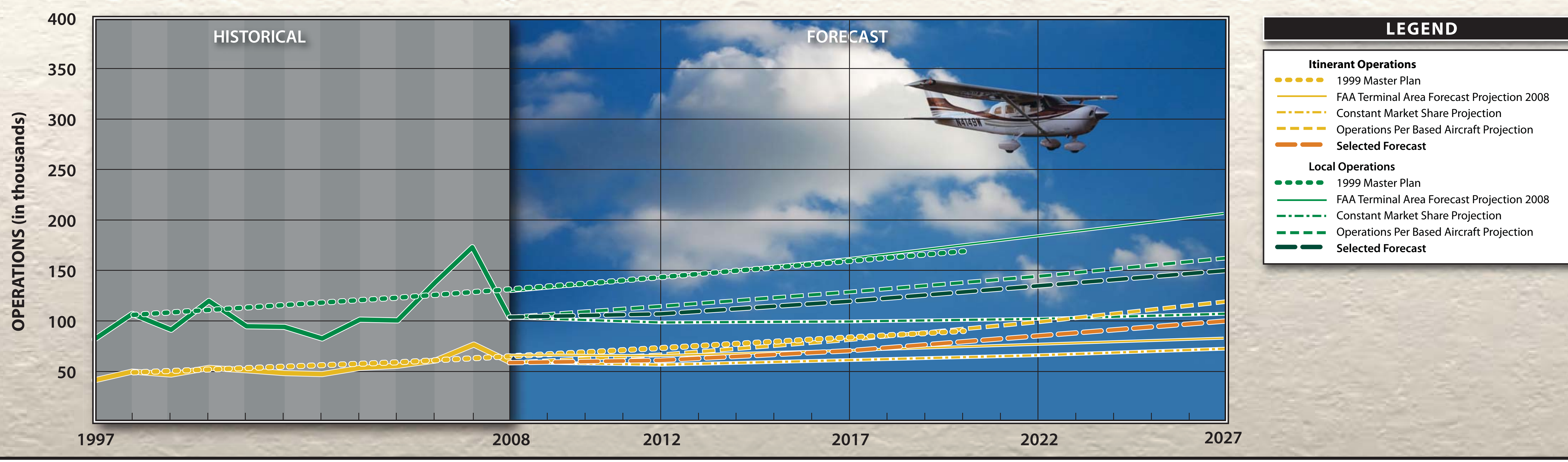
SUMMARY

This chapter has outlined the various activity levels that might reasonably be anticipated over the planning period. **Exhibit 2D** is a summary of the aviation forecasts prepared in this chapter. Actual activity is included for 2008, which was the base year for these forecasts.

Based aircraft at Ryan Airfield are expected to see steady growth over the planning period, but the extent of that growth will be dependent upon the availability of services and facilities (especially hangars) in the future.

The next step in the planning process is to assess the capabilities of the existing facilities to determine what upgrades may be necessary to meet future demands. The forecasts developed here will be taken forward in the next chapter as planning horizon activity levels that will serve as milestones or activity benchmarks in evaluating facility requirements. Peak activity characteristics will also be determined for the various activity levels for use in determining facility needs.

GENERAL AVIATION ITINERANT AND LOCAL OPERATIONS FORECAST



GENERAL AVIATION TOTAL OPERATIONS FORECAST

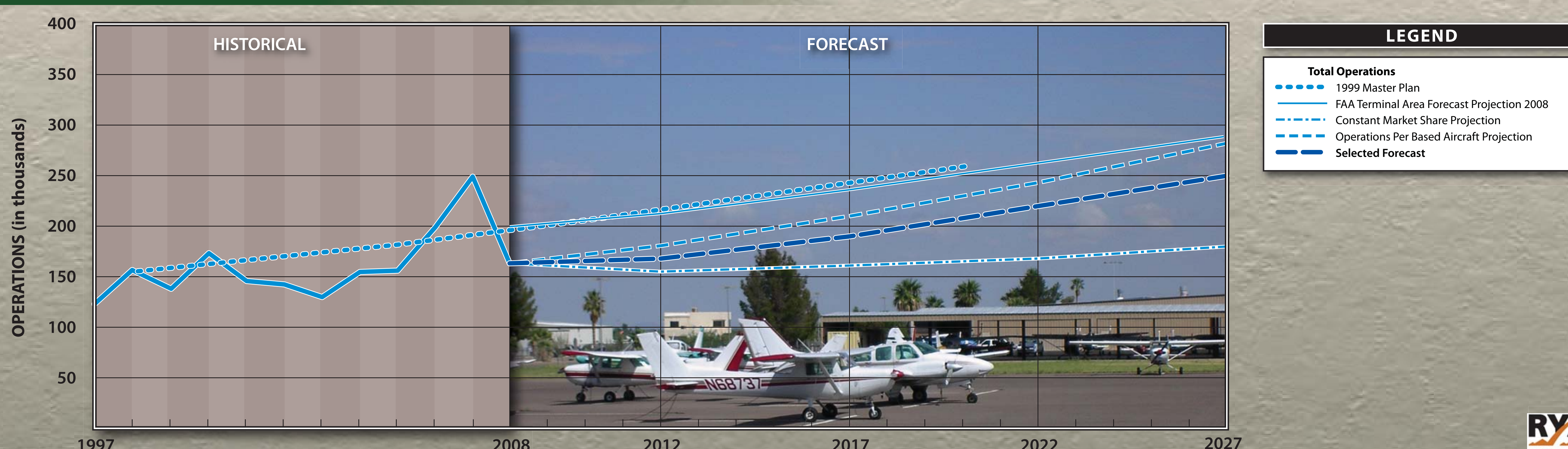


Exhibit 2C
RYAN AIRFIELD GENERAL AVIATION
OPERATIONS FORECASTS

07MP02-2D-9/14/09

	2008	2012	2017	2022	2027
OPERATIONS FORECASTS					
Itinerant Operations					
General Aviation	59,930	61,000	70,500	81,500	100,000
Military	1,840	1,750	1,750	1,750	1,750
Total Itinerant	*61,770*	*62,750*	*72,250*	*83,250*	*101,750*
Local Operations					
General Aviation	104,262	107,000	119,500	133,000	150,000
Military	1,920	1,750	1,750	1,750	1,750
Total Local	*106,182*	*108,750*	*121,250*	*134,750*	*151,750*
Total Operations	***167,952***	***171,500***	***193,500***	***218,000***	***253,500***
BASED AIRCRAFT FORECASTS					
Single Engine Piston	223	241	265	292	322
Multi-engine Piston	13	14	15	17	19
Turboprop	2	4	6	9	12
Jet	1	3	5	7	10
Rotorcraft	3	4	5	5	6
Total Based Aircraft	***242***	***266***	***296***	***330***	***369***

RYAN AIRFIELD
TUCSON AIRPORT AUTHORITY

Exhibit 2D
RYAN AIRFIELD
FORECAST SUMMARY

RYAN AIRFIELD
TUCSON AIRPORT AUTHORITY

Chapter 3

FACILITY REQUIREMENTS

Chapter Three

Facility Requirements

To properly plan for the future of Ryan Airfield, it is necessary to translate forecast aviation demand into the specific types and quantities of facilities that can adequately serve projected demand levels. This chapter uses the results of the forecasts prepared in Chapter Two, as well as established planning criteria, to determine the airfield (i.e., runways, taxiways, navigational aids, marking and lighting) and landside (i.e., hangars, general aviation terminal, aircraft parking apron, fueling, automobile parking and access) facility requirements.

The objective of this effort is to identify, in general terms, the adequacy of the existing airport facilities and outline what new facilities may be needed as well as when they may be needed to accommodate forecast demands. Having established these facility requirements, alternatives for providing these facilities will be evaluated in Chapter Four to determine the most cost-effective and efficient means for implementation.

PLANNING HORIZONS

The cost-effective, safe, efficient, and orderly development of an airport should rely more upon actual demand at an airport than a time-based forecast figure. Thus, in order to develop a master plan that is demand-based rather than time-based, a series of planning horizon milestones have been established that take into consideration the reasonable range of aviation demand projections.

Over time, the actual activity at the airport may be higher or lower than

the annualized forecast portrays. By planning according to activity milestones, the resultant plan can accommodate unexpected shifts or changes in the aviation demand in a timely fashion. The demand-based schedule provides flexibility in development, as the schedule can be slowed or expedited according to actual demand at any given time over the planning period. The resultant plan provides airport officials with a financially responsible and needs-based program. **Table 3A** presents the planning horizon milestones for each activity demand category.

TABLE 3A
Aviation Demand Planning Horizons
Ryan Airfield

	2008	Short Term (± 5 Years)	Intermediate Term (± 10 Years)	Long Term (± 20 Years)
ANNUAL OPERATIONS				
General Aviation				
Itinerant	59,930	61,000	70,500	100,000
Local	104,262	107,000	119,500	150,000
Military	3,760	3,500	3,500	3,500
Total Operations	167,952	171,500	193,500	253,500
Based Aircraft	242	266	296	369

PEAKING CHARACTERISTICS

Airport capacity and facility needs analyses typically relate to the levels of activity during a peak or design period. The periods used in developing the capacity analyses and facility requirements in this study are as follows:

- **Peak Month** - The calendar month when peak volumes of aircraft operations occur.

- **Design Day** - The average day in the peak month. This indicator is easily derived by dividing the peak month operations by the number of days in a month.

- **Busy Day** - The busy day of a typical week in the peak month. This descriptor is used primarily to determine general aviation transient ramp space requirements.

- **Design Hour** - The peak hour within the design day.

It is important to note that only the peak month is an absolute peak within a given year. All other peak periods will be exceeded at various times during the year. However, they do represent reasonable planning standards that can be applied without overbuilding or being too restrictive.

General Aviation Itinerant Operations Peak Periods

General aviation itinerant peak operational characteristics were also included in this analysis. The current peak month for itinerant operations was determined to be at 11 percent of the annual itinerant operations. This ratio was kept constant through the planning period. Busy day operations were calculated at 1.3 times design day operations. This ratio can be expected to decline as activity increases and becomes more balanced throughout the week. Design hour operations were calculated at 16 percent of design day operations in 2008. This percentage can also be expected to decline slightly as activity increases over the long term. **Table 3B** summarizes the peak operations forecast for the airport.

TABLE 3B
Peaking Characteristics
Ryan Airfield

	2008	Short Term (± 5 Years)	Intermediate Term (± 10 Years)	Long Term (± 20 Years)
OPERATIONS				
Total Operations				
Annual	167,952	171,500	193,500	253,500
Peak Month	17,803	18,179	20,511	26,871
Design Day	574	586	662	867
Busy Day	747	751	834	1,075
Design Hour	93	94	103	113
Itinerant General Aviation Operations				
Annual	59,930	61,000	70,500	100,000
Peak Month	6,592	6,710	7,755	11,000
Design Day	213	216	250	355
Busy Day	276	277	315	440
Design Hour	34	32	35	46

AIRFIELD CAPACITY

Airfield capacity is measured in a variety of different ways. The **hourly capacity** measures the maximum number of aircraft operations that can take place in an hour. The **annual service volume (ASV)** is an annual level of service that may be used to define airfield capacity needs. **Aircraft delay** is the total delay incurred by aircraft using the airfield during a given timeframe. FAA Advisory Circular 150/5060-5, *Airport Capacity and Delay*, provides a methodology for examining the operational capacity of an airfield for planning purposes. This analysis takes into account specific factors about the airfield. These various factors are depicted in **Exhibit 3A**. The following describes the input factors as they relate to Ryan Airfield:

- **Runway Configuration** – The existing airfield layout consists of two parallel runways (6R-24L and 6L-24R) and a crosswind runway (15-33), which intersects the parallel runways. Each runway end is equipped with taxiway access and Runway 6R is equipped for instrument approaches.

- **Runway Use** – Runway 6R-24L has a length of 5,500 feet and Runway 6L-24R has a length of 4,900 feet. Crosswind Runway 15-33 has a length of 4,000 feet. A preferential runway use system is in place, but it is subject to wind and weather conditions. The preferred uses are east flow (arrivals and departures on Runways 6R & 6L) in the morning hours, and west flow (arrivals and departures on Runways 24L & 24R). The change from Runway 6 to Runway 24 is due to common shifts in wind conditions throughout the day. Crosswind Runway 15-33 is used when crosswind conditions occur.

- **Exit Taxiways** - Based upon mix, taxiways located between 2,000 and 4,000 feet from the landing threshold count in the exit rating for each runway. There are currently two exits available within this range for each runway. Therefore, the exit rating is two for all runways.

- **Weather Conditions** – The airport operates under visual meteorological conditions (VMC) 99 percent of the time. Instrument meteorological conditions (IMC) occur when cloud ceilings are between 500 and 1,000 feet and visibility is between one and three statute miles. This occurs one percent of the time. Poor visibility conditions (PVC) apply for minimums below 500 feet and one mile. PVC is negligible for this analysis.

- **Aircraft Mix** - Descriptions of the classifications and the percentage mix for each planning horizon are presented in **Table 3C**.

- **Percent Arrivals** - Generally follows the typical 50-50 percent split.

- **Touch-and-Go Activity** - Percentages of touch-and-go activity are presented in **Table 3C**.

- **Operational Levels -** Operational planning horizons were outlined in the previous section of this chapter. The peak month averages 10.6 percent of the year. The design hour averages 16.1 percent of the operations in a day.

TABLE 3C
Aircraft Operational Mix – Capacity Analysis
Ryan Airfield

Aircraft Classification	Base Year 2008	Short Term (± 5 Years)	Intermediate Term (± 10 Years)	Long Term (± 20 Years)
Classes A & B	99.0%	98.9%	98.6%	98.0%
Class C	1.0%	1.1%	1.4%	2.0%
Class D	0.0%	0.0%	0.0%	0%
Touch-and-Go's	55.2%	54.9%	54.8%	54.6%

Definitions:
Class A: Small single-engine aircraft with gross weight of 12,500 pounds or less.
Class B: Small twin-engine aircraft with gross weight of 12,500 pounds or less.
Class C: Large aircraft with gross weights over 12,500 pounds up to 300,000 pounds.
Class D: Large aircraft with gross weights over 300,000 pounds.

07MP02-3A-6/12/08

Exhibit 3A
AIRFIELD CAPACITY FACTORS

HOURLY RUNWAY CAPACITY

The first step in determining overall airfield capacity involves the computation of the hourly capacity of each runway use configuration. Wind direction; the percentage use of each runway configuration in VFR, IFR, and PVC weather conditions; the amount of touch-and-go training activity; and the number and locations of runway exits become important factors in determining the hourly capacity of each runway configuration.

Considering the existing airfield configuration, the current aircraft mix, percentage of touch-and-go operations, and the exit taxiway ratings of each existing runway, the existing hourly capacity of each potential runway use configuration was computed. The existing maximum hourly capacity during VFR conditions totaled 270, while IFR operations totaled 137 operations per hour.

As indicated on **Table 3C**, the percentage of Class C aircraft can be expected to increase slightly through the long range planning horizon. This contributes to a slight decline in the hourly capacity over the long term planning horizon.

The weighted hourly capacity reflects the average capacity of the airfield taking into account VMC, IMC, and PVC conditions. The current and future weighted hourly capacities are depicted in **Table 3D**. At Ryan Airfield, the current weighted hourly capacity is 209.4 operations. This is expected to decline to 204.6 operations in the long term. This is still above the design hour demand of 192 operations expected in the long term.

TABLE 3D
Aircraft Operational Mix – Capacity Analysis
Ryan Airfield

	Base Year 2008	Short Term (± 5 Years)	Intermediate Term (± 10 Years)	Long Term (± 20 Years)
Operational Demand				
Annual	167,952	171,500	193,500	253,500
Design Hour	93	94	103	113
Capacity				
Annual Service Volume	380,000	381,000	391,000	460,000
Weighted Hourly Capacity	209.4	208.6	207.3	204.6
Percent Capacity	44.2%	45.0%	49.5%	55.1%
Delay				
Per Operation (Min.)	0.30	0.34	0.40	0.45
Total Annual (Hrs.)	800	1,000	1,300	1,900

ANNUAL SERVICE VOLUME

The weighted hourly capacity is utilized to determine the annual service volume in the following equation:

$$ASV = C \times D \times H$$

C = weighted hourly capacity;

D = ratio of annual demand to the average daily demand during the peak month; and

H = ratio of average daily demand to the design hour demand during the peak month.

The ratio of annual demand to average daily demand (D) at Ryan Airfield was determined to remain relatively constant in the future at 292. The ratio of average daily demand to average peak hour demand (H) was determined to currently be 6.20. This ratio will grow to 7.69 over the long term as peaks spread slightly with increased operations.

The current ASV was determined to be 380,000 operations. Slight changes in the weighted hourly capacity and in the daily and hourly demand ratios result in a slight increase in the ASV as activity increases. The ASV for the long term was calculated to be 460,000.

Annual operations for the long term planning horizon are 253,500, which would be 55.1 percent of the airport's ASV. **Table 3D** summarizes and compares the airport's ASV and projected annual operations over the planning horizons.

AIRCRAFT DELAY

As the number of annual aircraft operations approaches the airfield's capacity, increasing amounts of delay to aircraft operations begin to occur. Delays occur to arriving and departing aircraft in all weather conditions. Arriving aircraft delays result in aircraft holding outside the airport traffic area. Departing aircraft delays result in aircraft holding at the runway end until released by air traffic control.

Table 3D summarizes the aircraft delay analysis conducted for Ryan Airfield. The delay per operation represents an average delay per aircraft. It should be noted that delays of five to ten times the average could be experienced by individual aircraft during peak periods. Current total annual aircraft delay is 800 hours. As an airport's operations increase toward the annual service volume, delay increases exponentially. Analysis of delay factors for the long term planning horizon indicates that annual delay could potentially reach 1,900 hours.

CAPACITY ANALYSIS CONCLUSIONS

The current ASV was determined to be 380,000 operations. The current operational level represents 44 percent of the airfield's ASV. In the intermediate horizon, total operations are expected to represent 50 percent of ASV and 55 percent of annual service volume in the long term.

FAA Order 5090.3C, *Field Formulation of the National Plan of Integrated*

Airport Systems (NPIAS), indicates that improvements for airfield capacity purposes should begin to be considered once operations reach 60 to 75 percent of the annual service volume. Since the long-range operational forecast does not surpass the annual service volume level, improvements such as additional taxiway exits should provide adequate mitigation of aircraft delays and other congestion issues through the planning period.

CRITICAL AIRCRAFT

The selection of appropriate FAA design standards for the development and location of airport facilities is based primarily upon the characteristics of the aircraft which are currently using or are expected to use the airport. The critical design aircraft is defined as the most demanding category of aircraft, or family of aircraft, which conducts at least 500 itinerant operations per year at the airport. Planning for future aircraft use is of particular importance since design standards are used to plan separation distances between facilities. These future standards must be considered now to ensure that short term development does not preclude the long term potential needs of the airport.

The FAA has established a coding system to relate airport design criteria to the operational and physical characteristics of aircraft expected to use the airport. This airport reference code (ARC) has two components: the first component, depicted by a letter, is the aircraft approach category and relates to aircraft approach speed (operational characteristic); the second component, depicted by a Roman numeral, is the airplane design group and relates to aircraft wingspan (physical characteristic). Generally, aircraft approach speed applies to runways and runway-related facilities, while airplane wingspan primarily relates to separation criteria involving taxiways, taxilanes, and landside facilities.

According to FAA Advisory Circular (AC) 150/5300-13, *Airport Design*, an aircraft's approach category is based upon 1.3 times its stall speed in landing configuration at that aircraft's maximum certificated weight. The five approach categories used in airport planning are as follows:

Category A: Speed less than 91 knots.

Category B: Speed 91 knots or more, but less than 121 knots.

Category C: Speed 121 knots or more, but less than 141 knots.

Category D: Speed 141 knots or more, but less than 166 knots.

Category E: Speed greater than 166 knots.

The airplane design group (ADG) is based upon the aircraft's wingspan. The six ADGs used in airport planning are as follows:

Group I: Up to but not including 49 feet.

Group II: 49 feet up to but not including 79 feet.

Group III: 79 feet up to but not including 118 feet.

Group IV: 118 feet up to but not including 171 feet.

Group V: 171 feet up to but not including 214 feet.

Group VI: 214 feet or greater.

Exhibit 3B summarizes representative aircraft by ARC.

The FAA advises designing airfield facilities to meet the requirements of the airport's most demanding aircraft, or critical aircraft. An aircraft or group of aircraft within a particular Approach Category or ADG must conduct more than 500 operations annually to be considered the critical design aircraft. In order to determine facility requirements, an ARC should first be determined, and then appropriate airport design criteria can be applied. This begins with a review of aircraft currently using the airport and those expected to use the airport through the planning period.

Ryan Airfield is currently used by a variety of general aviation aircraft. General aviation aircraft using the airport include single and multi-engine aircraft less than 12,500 pounds, which fall within Approach Categories A and B and ADG I. Occasionally, aircraft in ADG II use the airport (such as the Beechcraft King Air 300 and the Cessna Citation 560). Turbojet aircraft currently use the airport on an infrequent basis. A review of completed instrument flight plans for calendar years 2004, 2005, 2006, and through November of 2007, reveal that turbojet aircraft averaged less than 31 operations annually during this period.

All based aircraft currently fall within ARC A-I and ARC B-I. Representative based aircraft include single-engine Cessna aircraft, although numerous other aircraft makes and models are based at the airport. McDonald Douglas C-54s are also based at Ryan Airfield however ARDCO, the operator of the C-54, has plans to eliminate its use at Ryan Airfield in the near future.

The aviation demand forecasts projected the mix of aircraft to use the airport to consist of mainly the single-engine and multi-engine piston-powered aircraft which fall within Approach Categories A and B and ADGs I and II. The turboprop aircraft projected to base at the airport in the future would also fall within similar categories. While ten turbojet aircraft are projected to base at the airport by the end of the planning period, business jet aircraft can include a wide range of Approach Categories and ADGs. The newest microjets being developed fall within ARC A-I. The most common business jet in use today, the Cessna Citation, falls within ARC B-II. Some larger business jets fall within ARCs C-I, C-II, D-I, and D-II.

As the community develops towards Ryan Airfield, business jet use of the airport is expected to increase in the future, and it can be anticipated that aircraft in Approach Category C or D will conduct 500 or more annual oper-

07MP02-3B-4/13/09

A-I

- Beech Baron 55
- Beech Bonanza
- Cessna 150
- Cessna 172
- Cessna Citation Mustang
- **Eclipse 500**
- Piper Archer
- Piper Seneca

C-I, D-I

- Beech 400
- **Lear** 25, 31, **35**, 45, 55, 60
- Israeli Westwind
- HS 125-400, 700

B-I *less than 12,500 lbs.*

- Beech Baron 58
- Beech King Air 100
- Cessna 402
- **Cessna 421**
- Piper Navajo
- Piper Cheyenne
- Swearingen Metroliner
- Cessna Citation I

C-II, D-II

- Cessna Citation III, VI, VIII, X
- **Gulfstream** II, III, **IV**
- Canadair 600
- ERJ-135, 140, 145
- CRJ-200, 700, 900
- Embraer Regional Jet
- Lockheed JetStar
- Super King Air 350

B-II *less than 12,500 lbs.*

- **Super King Air 200**
- Cessna 441
- DHC Twin Otter

C-III, D-III

- ERJ-170, 190
- Boeing Business Jet
- B 727-200
- **B 737-300 Series**
- MD-80, DC-9
- Fokker 70, 100
- A319, A320
- Gulfstream V
- Global Express

B-I, B-II *over 12,500 lbs.*

- Super King Air 300
- Beech 1900
- Jetstream 31
- Falcon 10, 20, 50
- Falcon 200, 900
- **Citation II**, III, IV, V
- Saab 340
- Embraer 120

C-IV, D-IV

- **B-757**
- B-767
- C-130
- DC-8-70
- DC-10
- MD-11
- L1011

A-III, B-III

- DHC Dash 7
- **DHC Dash 8**
- DC-3
- Convair 580
- Fairchild F-27
- ATR 72
- ATP

D-V

- **B-747** Series
- B-777

Note: Aircraft pictured is identified in bold type.

RYAN AIRFIELD
TUCSON AIRPORT AUTHORITY

Exhibit 3B
AIRPORT REFERENCE CODES

ations at the airport. The previous master plan established the ARC B-III/D-II design standards for the airport to accommodate the C-54, and in anticipation of faster business jet aircraft. With the departure of the C-54 aircraft, the focus for airfield development should be on meeting the needs of business jet aircraft. The current airfield is designed to ARC B-II standards. This Master Plan recognizes the potential for growth in business jet operations during the period of this Master Plan. Therefore, even though the majority of based aircraft are expected to fall within ARC B-II or below in the future, Ryan Airfield should establish and maintain ARC D-II design standards through the planning period.

AIRFIELD REQUIREMENTS

The analyses of the operational capacity and the critical design aircraft are used to determine airfield needs. This includes runway configuration, dimensional standards, and pavement strength, as well as navigational aids and lighting.

RUNWAY CONFIGURATION

Key considerations in the runway configuration of an airport involve the orientation for wind coverage and the operational capacity of the runway system. The airfield capacity analysis indicated that additional airfield capacity will not need to be considered through the long-term planning horizon.

FAA Advisory Circular 150/5300-13, *Airport Design,* recommends that a crosswind runway should be made available when the primary runway orientation provides less than 95 percent wind coverage for any aircraft forecast to use the airport on a regular basis. The 95 percent wind coverage is computed on the basis of the crosswind component not exceeding 10.5 knots (12 mph) for ARC A-I and B-I; 13 knots (15 mph) for ARC A-II and B-II; 16 knots (18 mph) for ARC A-III, B-III, and C-I through D-II; and 20 knots (23 mph) for ARC C-III through D-IV.

Ten years of accumulated wind data were not available for this study; therefore, wind data collected from Tucson International Airport was used to produce a wind rose for Ryan Airfield. The most recent ten years of wind data from Tucson International Airport at the time of this analysis was 1997-2006. This data is graphically depicted on the wind rose in **Exhibit 3C**.

Runway 6-24 provides 94.5 percent coverage for 10.5 knot crosswinds, 97.4 percent coverage for 13 knot crosswinds, 99.4 percent coverage for 16 knot crosswinds, and 99.9 percent coverage for 20 knot crosswinds. Based on this data, the primary and parallel runway system does not meet the 95 percent wind coverage standard for all aircraft using the airport; therefore, the crosswind runway is necessary at Ryan Airfield for small aircraft in approach categories A and B.

The crosswind runway provides 92.1 percent coverage for 10.5 knot crosswinds, 95.7 percent coverage for 13 knot crosswinds, 98.7 percent coverage for 16 knot crosswinds, and 99.8 percent coverage for 20 knot crosswinds. Combined, Runways 6-24 and 15-33 provide 98.5 percent coverage for 10.5 knot crosswinds, 99.6 percent coverage for 13 knot crosswinds, 99.9 percent coverage for 16 knot crosswinds, and 99.9 percent coverage for 20 knot crosswinds. Thus, the existing runway configuration has adequate wind coverage for all sizes and speeds of aircraft.

RUNWAY DIMENSIONAL REQUIREMENTS

Runway dimensional standards include the length and width of the runway, as well as the dimensions associated with runway safety areas and other clearances. These requirements are based upon the design aircraft, or group of aircraft. The runway length must consider the performance characteristics of individual aircraft types, while the other dimensional standards are generally based upon the most critical airport reference code expected to use the runway. Dimensional standards are outlined for the planning period for the primary, parallel, and crosswind runways.

Runway Length

The aircraft performance capability is a key factor in determining the runway length needed for takeoff and landing. The performance capability and, subsequently, the runway length requirement of a given aircraft type can be affected by the elevation of the airport, the air temperature, the gradient of the runway, and the operating weight of the aircraft.

The airport elevation at Ryan Airfield is 2,417 feet above mean sea level (MSL). The mean maximum daily temperature during the hottest month is 99.6 degrees Fahrenheit. The gradient for the primary runway is 0.08 percent.

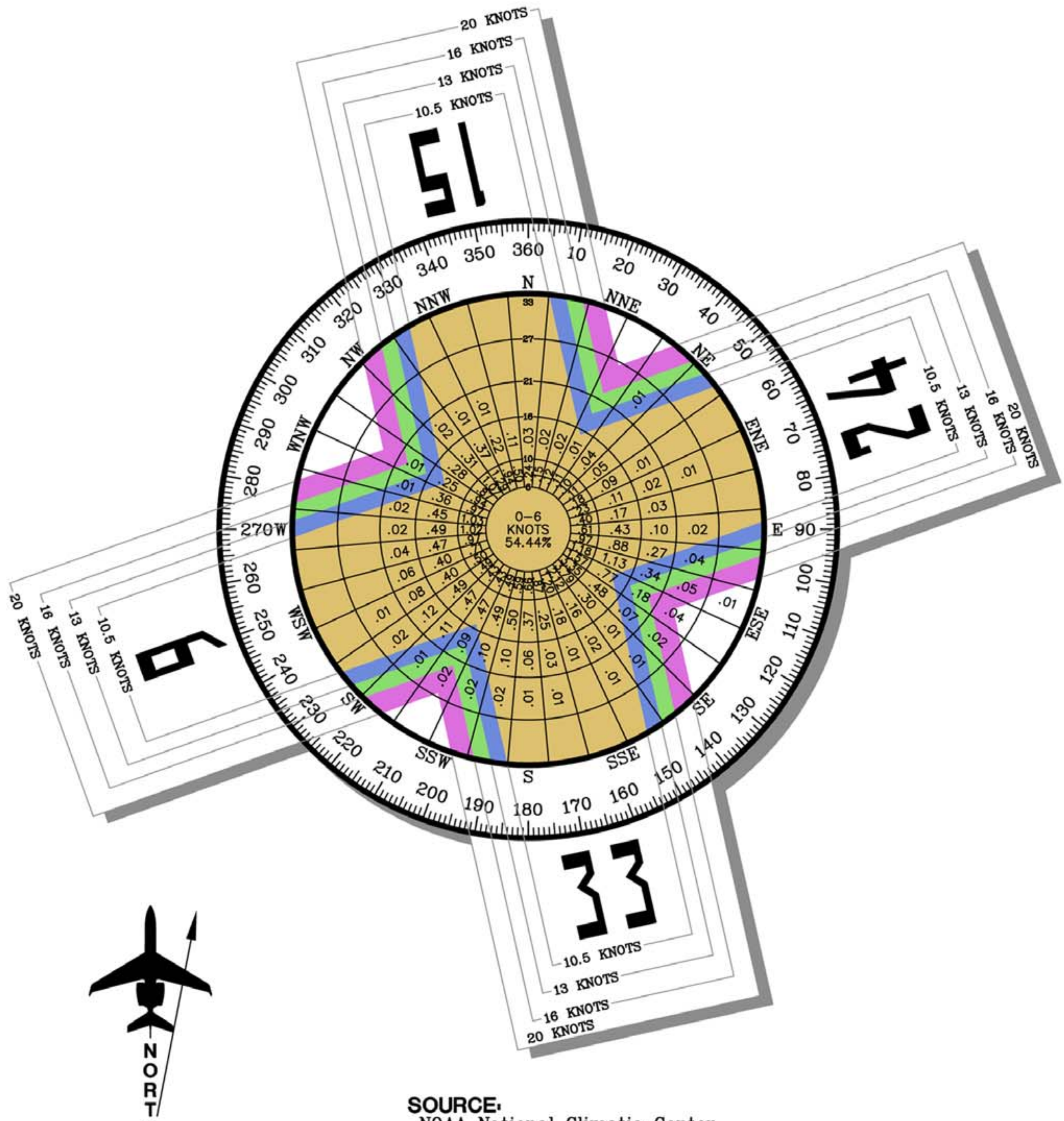
Table 3E outlines the runway length requirements for various classifications of general aviation aircraft specific to Ryan Airfield. These were derived utilizing the FAA Airport Design Computer Program. This program uses performance figures provided in AC 150/5325-4B, *Runway Length Requirements for Airport Design*. These runway lengths are based upon groupings or "families" of aircraft. As discussed earlier, the runway design required should be based upon the most critical family of aircraft with at least 500 annual operations.

Small aircraft are defined as aircraft weighing 12,500 pounds or less. Small airplanes make up the vast majority of general aviation activity at Ryan Airfield and most other general aviation airports. In particular, piston-powered aircraft make up the majority of the small airplane operations.

According to the table, the present primary runway length of 5,500 feet is adequate to accommodate all small airplanes with 10 or more passenger seats and 75 percent of large airplanes at 60 percent useful load. This includes all small aircraft in the ARC B-II category and some business jet aircraft. Future fleet mix is anticipated

ALL WEATHER WIND COVERAGE

Runways	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 6-24	*94.47%*	*97.36%*	*99.43%*	*99.88%*
Runway 15-33	*92.10%*	*95.65%*	*98.72%*	*99.75%*
Combined	*98.47%*	*99.58%*	*99.92%*	*99.99%*



Magnetic Variance
10° 51' East (November 2007)
Annual Rate of Change
00° 06' West (November 2007)

SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
Tucson International Airport (TUS)
Tucson, Arizona

OBSERVATIONS:
78,630 All Weather Observations
1997-2006

RYAN AIRFIELD
TUCSON AIRPORT AUTHORITY

Exhibit 3C
WINDROSE

to include more business jet airplanes that fall in the large airplane category. To accommodate a larger portion of the business jet fleet at 60 percent useful load, a runway length of 7,200 feet is needed. Aircraft that would be able to operate at the airfield with this runway length include Gulfstream business jets and Bombardier Challenger series business jets. Longer haul business jet operations to the east coast would require business jets to carry larger fuel loads. A runway length of 8,300 feet is recommended for 75 percent of large airplanes at 90 percent useful load. Based on the demand of the future critical aircraft to be able to conduct operations to any part of the country from Ryan Airfield, the primary runway length should be planned to an ultimate length of 8,300 feet.

TABLE 3E
General Aviation Runway Length Requirements
Ryan Airfield

AIRPORT AND RUNWAY DATA	
Airport elevation	2,417 feet
Mean daily maximum temperature of the hottest month	99.6 F
Maximum difference in runway centerline elevation	5 feet
RUNWAY LENGTHS RECOMMENDED FOR AIRPORT DESIGN	
Small airplanes with less than 10 passenger seats	
75 percent of these small airplanes	3,500 feet
95 percent of these small airplanes	4,300 feet
100 percent of these small airplanes	**4,800 feet**
Small airplanes with 10 or more passenger seats	5,000 feet
Large airplanes of 60,000 pounds or less	
75 percent of these large airplanes at 60 percent useful load	5,500 feet
100 percent of these large airplanes at 60 percent useful load	7,200 feet
75 percent of these large airplanes at 90 percent useful load	**8,300 feet**
100 percent of these large airplanes at 90 percent useful load	10,400 feet

Chapter Two of AC 150/5325-4B, *Runway Length Requirements for Airport Design*, no changes included.

The parallel runway provides the airfield with additional capacity. To do this effectively, the parallel runway should be capable of serving at least 90 percent of the operational fleet mix at the airport. Comparing to **Table 3E**, the present runway length of 4,900 feet can accommodate 100 percent of the small airplane fleet. The critical aircraft anticipated to use the parallel runway through the planning period should remain within the small airplane category. Therefore, the present runway length of 4,900 feet should be maintained through the long-term planning horizon.

The crosswind runway was constructed to meet crosswind demands at the airport. Its present length is 4,000 feet. A runway length of 4,800 feet will meet the needs of 100 percent of small airplanes with less than 10 passenger seats. FAA Advisory Circular 150/5325-4A, *Runway Length Requirements for Airport Design,* suggests that a crosswind runway should have a length of at least 80 percent of the design length. The 4,000-foot runway length meets this rule-of-thumb criterion; however, the long-term plan for the crosswind runway should be to extend it 800 feet to meet the 4,800-foot design standard.

Pavement Strength

An important feature of airfield pavement is the ability to withstand repeated use by aircraft of significant weight. Runways 6R-24L and 6L-24R are both strength-rated at 12,500 pounds single wheel loading (SWL) and 30,000 pounds dual wheel loading (DWL). The crosswind runway is strength rated at 12,500 pounds SWL. Future design aircraft such as the Gulfstream IV, can weigh up to 75,000 pounds on dual wheel gear. Based on anticipated design aircraft the primary runway pavement strength should be planned to 75,000 pounds DWL in the long-term.

The parallel runway should be planned to accommodate at least 90 percent of the airport's operational fleet mix. At 12,500 pounds SWL, the parallel runway pavement strength will be adequate through the planning period. The crosswind runway is needed almost exclusively for small aircraft only. A 12,500-pound design strength should be adequate through the planning period.

Dimensional Design Standards

Runway dimensional design standards define the widths and clearances required to optimize safe operations in the landing and takeoff areas. These dimensional standards vary depending upon the ARC for the runway. **Table 3F** outlines key dimensional standards for the airport reference codes most applicable to Ryan Airfield, both now and in the future.

The primary runway currently meets ARC B-II design requirements. The primary runway should be planned to meet and maintain its critical ARC, which is D-II through the long-range planning horizon. The parallel runway currently meets ARC B-II design requirements, which should be maintained through the planning period. The crosswind runway serves primarily small airplanes, therefore it should maintain ARC B-I small airplanes exclusive design standards through the planning period.

The following considers those areas where standards will need to be met for each runway:

Runway Width – The current width of each runway (75 feet) meets the 75-foot design requirement for ARC B-II. The primary runway will need to be widened to 100 feet to meet D-II design requirements.

Runway Safety Area – The runway safety area (RSA) is defined in FAA Advisory Circular 150/5300-13, *Airport Design*, as a surface surrounding the runway, prepared or suitable for reducing the risk of damage to airplanes in the event of an overshoot, undershoot, or excursion from the runway. The RSA is centered on the runway and extends beyond either end. The FAA requires the RSA to be cleared and graded, drained by grading or storm sewers, capable of accommodating fire and rescue vehicles, and free of obstacles not fixed by navigational purposes.

The RSA standard for Category D-II aircraft is 500 feet wide and extends 1,000 feet beyond each runway end. The existing airport layout should allow these standards to be met without affecting any existing airport facilities. Land beyond the primary runway ends will need to be graded to meet the extended RSA design standards.

The parallel and crosswind runways currently meet ARC B-II design requirements. These RSAs should be maintained through the planning period.

TABLE 3F
Airfield Design Standards
Ryan Airfield

Airport Reference Code	Available Primary Runway (ft.)	Available Parallel & Crosswind (ft.)	B-II (Small Airplane Only) (ft.)	B-II ¾-Mile Visibility (ft.)	D-II ½-Mile Visibility (ft.)
Runway Width	75	75	75	75	100
Runway Safety Area					
Width	300	150	150	150	500
Length Beyond End	300	300	300	300	1,000
Runway Object Free Area					
Width	500	500	500	500	800
Length Beyond End	300	300	300	300	1,000
Runway Centerline to:					
Holding Position	200/150	125	125	200	275
Parallel Taxiway	300	240	240	240	425
Parallel Runway	700	700	700	700	700
Taxiway Width	50	35	35	35	35
Taxiway Centerline to:					
Fixed or Movable Object	93	65.5	65.5	65.5	65.5
Parallel Taxilane	152	105	105	105	105
Taxilane Centerline to:					
Fixed or Movable Object	57.5	57.5	57.5	57.5	57.5
Parallel Taxilane	140	97	97	97	97
Runway Protection Zones - One mile or greater visibility					
Inner Width	500	250	250	500	500
Length	1,000	1,000	1,000	1,000	1,700
Outer Width	700	450	450	700	1,010
Not Lower than ¾-Mile					
Inner Width	N/A	N/A	1,000	1,000	1,000
Length	N/A	N/A	1,700	1,700	1,700
Outer Width	N/A	N/A	1,510	1,510	1,510
Lower than ½-Mile					
Inner Width	N/A	N/A	1,000	1,000	1,000
Length	N/A	N/A	2,500	2,500	2,500
Outer Width	N/A	N/A	1,750	1,750	1,750

Runway Object Free Area – The object free area (OFA) is an area centered on the runway to enhance the safety of aircraft operations by having an area free of objects, except for objects that need to be located in the OFA for air navigation or ground maneuvering purposes. The OFA must provide clearance of all ground-based objects protruding above the runway safety area (RSA) edge elevation, unless the object is fixed by a function serving air or ground navigation.

For ARC B-II, the OFA extends 300 feet beyond the runway end and has a width of 500 feet. OFA design standards for ARC D-II extend 1,000 feet beyond the runway end and 800 feet in width. The primary runway will need to extend this safety area to the full ARC D-II design standards in the future.

The parallel and crosswind runways meet ARC B-II design requirements for the OFA at 500 feet wide and 300 feet beyond the runway end. These design requirements should be maintained through the planning period.

Aircraft Holding Positions – The current hold positions for the primary runway are marked 200 feet from the runway centerline on Taxiway B6 and on Runway 15-33, where it intersects with the end of Runway 6R. This 200-foot separation meets the standard for ARC B-II runways. On all other exit taxiways from the primary runway, the hold positions are marked 150 feet from the runway centerline, which exceeds the standard for ARC B-II small airplanes but does not meet the 200-foot separation standards for aircraft over 12,500 pounds. The separation standard for ARC D-II is 250 feet with an additional foot added for each 100 feet the airport's elevation is above sea level resulting in a separation distance of 275 feet. The holding positions for the parallel and crosswind runways are marked at 125 feet from the runway centerline. This meets small aircraft exclusive design requirements.

Runway Protection Zone – The runway protection zone (RPZ) is an area off the runway end that enhances the protection of people and property on the ground. This is best achieved through airport owner control over the RPZs. Such control includes maintaining RPZ areas clear of incompatible objects and activities.

The RPZ is trapezoidal in shape and is centered on the extended runway centerline. The dimensions of the RPZ are a function of the critical aircraft and the approach visibility minimums associated with the runway. Runway 6R is currently equipped with an instrument landing system (ILS) approach with approach visibility minimums that are not lower than one mile. The existing RPZ on the Runway 6R end currently meets design requirements for this type of instrument approach. The RPZ on the Runway 24L end meets ARC B-II one mile or greater visibility design standards. The RPZs on the parallel runway meet design standards for greater than one mile visibility for an ARC B-II runway. The RPZs on the crosswind runway meet design standards for greater than one mile visibility for an ARC B-II small airplanes only runway.

Table 3F depicts the RPZ requirements for runway ends equipped with low-visibility instrument approach procedures. Based upon the capabilities of any instrument approach procedures developed in the future, the RPZs for each runway end would become larger in the future if instrument approach procedures had visibility minimums less than one mile.

TAXIWAY REQUIREMENTS

Taxiways are constructed primarily to facilitate aircraft movements to and from the runway system. Some taxiways are necessary simply to provide access between the aprons and runways, whereas other taxiways become necessary as activity increases at an airport to provide safe and efficient use of the airfield.

As detailed in Chapter One, each runway is served by a full-length parallel taxiway. **Table 3F** outlines the runway-to-taxiway centerline separation standards for ARCs B-II and D-II. Taxiway B currently meets ARC B-II design standards; however, when ARC D-II design standards are implemented, the taxiway separation standard extends to 425 feet taking the airport elevation into account. Taxiways A, D, and E currently meet ARC B-II separation standards.

Bottlenecks can occur near the takeoff end of a runway when a preceding aircraft is not ready to takeoff and blocks the access taxiway for the aircraft next in line. This can be a common occurrence at airports such as Ryan Airfield where there is a high amount of training activity. Holding bays provide flexibility in ground circulation by permitting departing aircraft to maneuver around an aircraft that is not ready to depart. Holding bays are recommended when runway operations exceed 30 per hour. Holding bays are currently available at each end of the parallel and crosswind runways.

Presently, it is not uncommon for several of the holding bays to become overcrowded which causes heavy two-way traffic congestion between the terminal area and the runway system. To alleviate some of these circulation issues, it is recommended that dual taxiways be included in the short range planning horizon.

Exit taxiways provide a means to enter and exit the runways at various points on the airfield. The type and number of exit taxiways can have a direct impact on the capacity and efficiency of the airport as a whole. The primary runway has a total of five exit taxiways. Exit taxiways are effective when planned at least 800 feet apart. Taxiways B3 and B4 are separated by 600 feet; therefore, the five exit taxiways are essentially equivalent to four. The parallel and crosswind runways both have three exit taxiways. Exit Taxiways D2 and B for Runway 15-33 are separated by 430 feet. Right-angled exits require an aircraft to be nearly stopped before it can safely exit the runway. Angled exits (high-speed exits) allow aircraft to use a higher safe exit speed while exiting the runway. Potential locations for new exit taxiways that may improve capacity or efficiency will be examined in Chapter Four, Alternatives.

Dimensional standards for the taxiways are depicted on **Table 3F**. Taxiway width and clearance standards are based upon the ADG for a particular runway or taxiway. Taxiway B currently exceeds ADG II width standards, and Taxiway A and D currently meets ADG II standards.

NAVIGATIONAL AIDS AND INSTRUMENT APPROACH PROCEDURES

Navigational Aids

Navigational aids are electronic devices that transmit radio frequencies which properly equipped aircraft and pilots translate into point-to-point guidance and position information. The very high frequency omnidirectional range (VOR), Global Positioning System (GPS), non-directional beacon (NDB), and LORAN-C are available for pilots to navigate to and from Ryan Airfield. These systems are sufficient for navigation to and from the airport; therefore, no other navigational aids are needed at the airport.

Instrument Approach Procedures

Instrument approach procedures consist of a series of predetermined maneuvers established by the FAA for navigation during inclement weather conditions. Currently, there are two established instrument approach procedures for Ryan Airfield. Due to 99 percent VFR weather, the demand for instrument approaches is based primarily on training activity. The best minimums to Ryan Airfield are provided by the ILS approach to Runway 6R. This approach provides weather minimums down to 250-foot AGL cloud ceilings and one mile visibility for Approach Categories A to D. To acquire Category I minimums of one-half mile visibility would require the installation of a medium intensity approach lighting system with runway alignment indicator lights (MALSR). This should be a consideration in the long-term planning horizon.

A GPS modernization effort is underway by the FAA and focuses on augmenting the GPS signal to satisfy requirements for accuracy, coverage, availability, and integrity. For civil aviation use, this includes the continued development of the Wide Area Augmentation System (WAAS), which was initially launched in 2003. The WAAS uses a system of reference stations to correct signals from the GPS satellites for improved navigation and approach capabilities. Where the non-WAAS GPS signal provides for enroute navigation and limited instrument approach (lateral navigation) capabilities, WAAS provides for approaches with both course and vertical navigation. This capability was historically only provided by an instrument landing system (ILS), which requires extensive on-airport facilities. The WAAS upgrades are expected to allow the development of approaches to most airports with cloud ceilings as low as 200 feet above the ground and visibilities restricted to one-half mile, after 2015.

Nearly all new instrument approach procedures developed in the United States are being developed with GPS. GPS approaches are currently categorized as to whether they provide only lateral (course) guidance or a combination of lateral and vertical (descent) guidance. An approach procedure with vertical guidance (APV), GPS approach provides both course and descent guidance. A lateral navigation approach (LNAV) only provides course guidance. In the future, as WAAS is upgraded, precision approaches similar in capability to the existing ILS will become available. These approaches are currently categorized as the Global Navigation Satellite System Landing System (GLS). A GLS approach may be able to provide for approaches with one-half-mile visibility and 200-foot cloud ceilings. A GLS would be implemented in lieu of an ILS approach.

Since both course guidance and descent information is desirable for an instrument approach to Ryan Airfield and GPS does not require the installation of costly navigation equipment at the airport, a GLS should be planned to the Runway 24L end. APV approaches may be considered for the parallel and crosswind runways to provide one mile visibility minimums.

AIRFIELD LIGHTING, MARKING, AND SIGNAGE

There are a number of lighting and pavement marking aids serving pilots using Ryan Airfield. These lighting and marking aids assist pilots in locating the airport during night or poor weather conditions, as well as assist in the ground movement of aircraft.

Identification Lighting

The location of an airport at night is universally indicated by a rotating beacon. The rotating beacon at the airport is located on top of the airport traffic control tower (ATCT). The rotating beacon is sufficient and should be maintained through the planning period.

Runway and Taxiway Lighting

The medium intensity runway edge lighting (MIRL) currently available along the primary runway will be adequate for the planning period. The parallel and crosswind runways should each have MIRL systems installed during the planning period. Entrance/exit Taxiways B2, B3, B4, B5, and B6 are equipped with medium intensity taxiway lighting (MITL). In the short term, MITL should be planned for the full-length of all existing taxiways. All future taxiway construction should include the installation of MITL.

Airfield Signs

Airfield signage assists pilots in identifying their location on the airport. Signs located at intersections of taxiways provide crucial information to avoid conflicts between moving aircraft and potential runway incursions. Directional signage also instructs pilots as to the location of taxiways and apron areas. The existing unlit directional signage should be lighted during the planning period.

Visual Approach Lighting

In most instances, the landing phase of any flight must be conducted in visual conditions. To provide pilots with visual guidance information during landings to the runway, electronic visual approach aids are commonly provided at airports. Runway 24L is currently equipped with a visual approach slope indicator (VASI-4). This lighting system should be upgraded to a precision approach path indicator (PAPI-4) lighting system to better serve larger aircraft. PAPI-4s should be planned for all other runway ends.

Approach and Runway End Identification Lighting

Runway end identifier lights (REILs) are flashing lights located at each runway end that facilitate identification of the runway end at night and during poor visibility conditions. REILs provide pilots with the ability to identify runway ends and distinguish the runway end lighting from other lighting on the airport and in the approach areas. REILs are installed at the end of Runway 6R. These lighting aids should be maintained through the planning period. REILs should also be planned at the end of Runway 24L, and at both ends of the parallel and crosswind runways.

Distance Remaining Signs

Distance remaining signage should be planned for the primary runway. These lighted signs are placed in 1,000-foot increments along the runway to notify pilots of the length of runway remaining.

Pilot-Controlled Lighting

Ryan Airfield 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. PCL also provides for more efficient use of airfield lighting energy. 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. Any future taxiway lighting and visual approach lighting should be added to the PCL system.

Pavement Markings

In order to facilitate the safe movement of aircraft about the field, airports use pavement markings, lighting, and signage to direct pilots to their destinations. Runway markings are designed according to the type of instrument approach available on the runway. FAA Advisory Circular 150/5340-1H, *Marking of Paved Areas on Airports*, provides the guidance necessary to design airport markings.

The primary runway currently has precision markings on the Runway 6R end, and basic markings on the Runway 24L end. Precision runway markings identify the runway centerline, threshold, designation, touchdown point, aircraft holding positions, and provide side strips. The basic markings identify the runway centerline, aiming point, and designation. Precision markings should be added to the Runway 24L end when a GLS approach is implemented for that runway. The parallel and crosswind runways are currently marked with basic markings. The parallel and crosswind runways should be planned for non-precision markings to accommodate the planned GPS APV approaches.

Holdlines need to be marked on all taxiways connecting to the runway. The holdlines for the primary runway are currently required to be placed 200 feet from the runway centerline. The parallel and crosswind runways have holdline markings placed 125 feet from the runway centerline which meets small airplane only design standards. These markings assist in reducing runway incursions as aircraft must remain behind the holdline until taking the active runway for departure. As it was discussed previously, the holdlines for the primary runway will need to be relocated to meet ARC D-II separation standards.

Taxiway and apron areas also require marking to assure that aircraft remain on the pavement and clear of any objects located along the taxiway/taxilane. Yellow centerline stripes are currently painted on all taxiway and apron surfaces at the airport to provide assistance to pilots in taxiing along these surfaces at the airport. Besides routine maintenance, these markings will be sufficient through the planning period.

HELIPADS

The airport does not have a designated helipad. Helicopters utilize the same areas as fixed-wing aircraft. Helicopter and fixed-wing aircraft should be segregated to the extent possible. Facility planning should include establishing a designated transient helipad at the airport. Lighting should be provided to allow safe operation to the helipad at night.

WEATHER REPORTING

The airport has a lighted wind cone that provides pilots with information about wind conditions. A segmented circle provides traffic pattern information to pilots. These facilities are sufficient and should be maintained in the future.

The airport 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). The AWOS is sufficient and should be maintained through the planning period.

REMOTE COMMUNICATIONS FACILITIES

Ryan Airfield 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. This RTR should be maintained through the planning period.

AIRPORT TRAFFIC CONTROL

Ryan Airfield is presently equipped with an ATCT operated on a contract basis. The existing tower is undersized and needs to be expanded in the short horizon to provide adequate office space. Ultimately, a new ATCT will need to be considered to meet the long term needs of the airport. Currently, the ATCT is in operation between the hours of 6:00 a.m. and 8:00 p.m. As activity increases, particularly in late night or evening hours, the operational hours of the ATCT may need to be extended.

LANDSIDE FACILITIES

Landside facilities are those necessary for handling general aviation aircraft and passengers while on the ground. This section is devoted to identifying future landside facility needs during the planning period for the following types of facilities normally associated with general aviation terminal areas:

- Hangars
- Aircraft Parking Apron
- General Aviation Terminal Services
- Support Requirements

HANGARS

The demand for hangar facilities typically depends on the number and type of aircraft expected to be based at the airport. Hangar facilities are generally classified as T-hangars and conventional hangars. Conventional hangars can include individual hangars (executive hangars) or multi-aircraft hangars. These different types of hangars offer varying levels of privacy, security, and protection from the elements.

Demand for hangars varies with the number of aircraft based at the airport. Another important factor is the type of based aircraft. Smaller single-engine aircraft usually prefer T-hangars, while larger, more expensive and sophisticated aircraft will prefer conventional hangars. The weather also plays a role in the demand for hangar facilities. The hot summers that are experienced in the Tucson area create a high demand for enclosed or shaded parking spaces. Rental costs will also be a factor in the choice.

Surveys of Ryan Airfield based aircraft owners indicated that the hangar type most in demand at Ryan Airfield are executive box hangars followed closely by T-hangars. It was also indicated that most based aircraft owners that presently store their aircraft on an uncovered tie-down spot desire T-hangar facilities more than any other aircraft storage type.

Ryan Airfield has two T-hangar storage facilities, providing 30 storage units. T-hangar space available at the airport totals approximately 54,000 square feet for aircraft storage. A planning standard of 1,200 square feet per based aircraft stored in T-hangars was used. Analysis of future T-hangar requirements, as depicted on **Table 3G**, indicates that additional T-hangar positions are needed currently, and will be needed as the number of based aircraft grows.

TABLE 3G
Hangar Storage Requirements
Ryan Airfield

	Available	Current Need	Short Term	Intermediate Term	Long Term
BASED AIRCRAFT					
Piston		236	255	280	341
Turbine		3	7	11	22
Rotor		3	4	5	6
Total		242	266	296	369
AIRCRAFT TO BE HANGARED					
Piston		214	225	257	319
Turbine		3	7	11	22
Rotor		3	4	5	6
Total		220	236	273	347
HANGAR POSITIONS					
T-Hangar	30	36	46	60	78
Shade Hangar[1]	64	50	54	58	71
Executive/Conventional	157	133	136	155	198
Total Hangar Positions	251	220	236	273	347
HANGAR AREA REQUIREMENTS (s.f.)					
T-Hangar	54,000	43,700	55,400	71,800	94,200
Shade Hangar	37,800	29,600	31,800	34,400	41,700
Executive/Conventional	343,030	202,600	211,400	243,300	318,500
Total Hangar Area	434,830	275,900	298,600	349,500	454,400
Maintenance Hangars	44,000	42,350	46,550	51,800	64,575

[1] Nose shade hangars are considered tie-downs and are not included here.

There are currently 157 conventional/executive general aviation hangar positions on the airport, totaling approximately 343,030 square feet. This type of hangar is typically used to store multiple single-engine aircraft or one or more corporate aircraft. Currently, more than 50 percent of based aircraft are stored in conventional or executive hangars. Based on the Ryan Airfield general aviation user surveys, the demand for conventional and executive hangars is already high and will increase as based aircraft grows over the planning period. Conventional/executive hangar space will need to be planned to at least accommodate the turbine aircraft, as well as a large segment of the piston aircraft forecast to base at Ryan Airfield. For conventional/executive hangars, a planning standard of 1,500 square feet for piston and rotary aircraft was used, while 2,500 square feet per turbine aircraft was used.

There is currently no full-service fixed base operator (FBO) on the airport. The based aircraft owners survey indicated the highest priority improvement for the airport is a FBO and aircraft maintenance services. Some FBO-related services are provided through the specialty operators on the airport.

Requirements for maintenance and FBO hangar area were estimated at 175 square feet per based aircraft. **Table 3G** compares the existing hangar space to the future hangar requirements. It is evident from the table that there is a need for additional enclosed hangar storage space throughout the planning period.

AIRCRAFT PARKING APRON

A parking apron should be provided for at least the number of locally based aircraft that are not stored in hangars, as well as be capable of accommodating transient aircraft during the busy day of the peak month. The north apron, south apron, and the flight school apron currently provide approximately 63,400 square yards of total apron. The 6,055 square-yard apron area north of the Vista West hangars, which include 16 tiedown spots and 15 nose shades, are also included in the local ramp positions. There are an additional five aircraft tiedown positions north of the flight school hangar facilities on approximately 1,044 square yards of apron.

The Ryan Airfield based aircraft owner survey indicated that only three percent of based aircraft owners prefer ramp storage over hangar storage. Currently, approximately nine percent of Ryan Airfield aircraft owners utilize tiedowns for aircraft storage. The number of local tiedowns needed through the planning period was determined based on increasing the current level slightly through the short term to take into account based aircraft owners who may decide to pay cheaper storage rates on the ramp as opposed to a hangar, then a gradual decrease through the long term.

TABLE 3H
General Aviation Apron Requirements
Ryan Airfield

	Available	Current Need	Short Term	Intermediate Term	Long Term
Based Aircraft in Tiedowns		22	30	23	22
Busy Day Itinerant Operations		276	277	315	440
Local Ramp Positions	109	22	30	23	22
Transient Ramp Positions	51	48	48	55	77
Total Ramp Positions	160	71	78	78	99
Apron Area (s.y.)	70,499	32,300	35,000	35,850	46,500

FAA Advisory Circular 150/5300-13, *Airport Design*, suggests a methodology by which transient apron requirements can be determined from knowledge of busy-day itinerant operations. At Ryan Airfield, the number of transient spaces required was determined to be approximately 17.5 percent of busy-day itinerant operations. A planning criterion of 360 square yards per local parking space and 500 square yards per transient parking space was used to determine future apron requirements. The number of local and itinerant tiedowns and apron space for the planning period is presented in **Table 3H**.

The available local parking positions are currently more than adequate to meet the local aircraft parking demands at Ryan Airfield. Transient ramp positions will need to be expanded through the planning period to meet forecasted demand.

TERMINAL FACILITIES

Terminal facilities are often the first impression of the community that air travelers or tourists will encounter. Terminal facilities at an airport provide space for passenger waiting, a pilots' lounge and flight planning, concessions, management, storage, and various other needs. At Ryan Airfield, much of this is accommodated in the 2,500 square-foot airport administration building. An additional 800 square feet of public terminal area is also provided by Air Centers West.

The methodology used in estimating terminal facility needs was based upon the number of airport users expected to utilize the terminal facilities during the design hour, as well as FAA guidelines. Space requirements for terminal facilities were based on providing 90 square feet per design hour itinerant passenger. **Table 3J** outlines the space requirements for terminal services at Ryan Airfield through the long term planning horizon.

TABLE 3J
General Aviation Terminal Area Facilities
Ryan Airfield

	Available	Short Term	Intermediate Term	Long Term
General Aviation Terminal Building Area (s.f.)	3,300	5,300	5,700	7,500
Design Hour Itinerant Passengers		58	63	83
Auto Parking Spaces	252	194	212	272

SUPPORT REQUIREMENTS

Various facilities that do not logically fall within classifications of airfield, terminal building, or general aviation facilities have been identified for inclusion in this Master Plan. Facility requirements have been identified for these remaining facilities:

- Automobile Parking
- Airport Access

- On-Airport Access
- Aviation Fuel Storage
- Aircraft Wash Facility
- Airport Maintenance
- Perimeter Fencing
- Security
- Aircraft Rescue and Firefighting

Automobile Parking

Vehicle parking requirements were examined based on an evaluation of the existing airport use, as well as industry standards. Vehicle parking spaces were calculated at 33 percent of based aircraft plus the product of design hour itinerant passengers and the industry standard of 1.8. Automobile parking requirements are summarized in **Table 3J**.

Airport Access

In airport facility planning, both on- and off-airport vehicle access is important. For the convenience of the user (and to provide maximum capacity), access to the airport should include (to the extent practical) connections to the major arterial roadways near the airport.

Access to Ryan Airfield is available from State Route 86 (Ajo Highway) and West Valencia Road. Both are currently two-lane arterial roadways with turn lanes in the vicinity of the airport. Ajo Highway runs along the southern boundary of Ryan Airfield, while West Valencia Road terminates at its intersection with the highway and Airfield Drive, one of two entrances to the airport. This intersection is unsignalized with turn lanes from the highway. The airport's other entrance, Aviator Lane, has an unsignalized intersection with the highway.

The capacity of a roadway is the maximum number of vehicles that can pass over a given section of roadway during a given time period. It is normally preferred that a roadway operate below capacity to provide reasonable flow and minimize delay to the vehicles using it.

As with the airfield, the means of describing the operational efficiency of a given roadway segment is defined in terms of six descriptive service levels. These various levels of service (LOS) range from A to F and are defined as follows:

- **LOS A** – Free flowing traffic with minimal delays.
- **LOS B** - A stable flow of traffic, with occasional delays due to the noticeable presence of others in the traffic stream.
- **LOS C** – Still stable flow, but operations become more significantly affected by the traffic stream. Periodic delays are experienced.
- **LOS D** – Flow becomes more high density, and speed and freedom to maneuver become severely restricted. Regular delays are experienced.
- **LOS E** – Maximum capacity operating conditions. Delays are extended and speeds are reduced to a low, relatively uniform level.
- **LOS F** – Forced flow with excessive delays. A condition where more traffic is approaching a point than can traverse the point.

Level of Service "D" is generally considered as the threshold of acceptable traffic conditions during peak periods in an urban area, and is commonly used by Pima County and the Pima Association of Governments (PAG) in transportation planning.

According to information included in the *Pima County Southwest Infrastructure Plan*, the average daily traffic (ADT) on West Valencia Road near the intersection is currently 5,200. Ajo Highway carries 8,400 ADT northeast of the intersection and 8,600 ADT southwest of the intersection. Both roadways currently operate under LOS D capacity.

Using trip generation estimates from the *Institute of Transportation Engineers (ITE) Trip Generation Model, Version 5*, design day traffic generated by Ryan Airfield can be expected to grow from a current level of 1,600 to 2,500 by the long range planning horizon.

The *2030 Regional Transportation Plan*, adopted by PAG in 2006, includes recommendations for both Ajo Highway and West Valencia Road to be widened to four lanes to accommodate anticipated traffic increases.

The on-airport access roads were joined by an on-airport connector road after the recommendation in the previous master plan. The two lane design of these roads should be adequate to accommodate on-airport traffic in the future.

On-Airport Access

Occasionally, private vehicles use the apron and taxilanes for movement as there is no dedicated interior access road. The segregation of vehicle and aircraft operational areas is supported by FAA guidance established in June 2002. FAA AC 50/5210-20, *Ground Vehicle Operations on Airports*, states, "The control of vehicular activity on the airside of an airport is of the highest importance." The AC further states, "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. 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.

Aviation Fuel Storage

The TAA has the only fuel storage facilities at Ryan Airfield. These storage facilities combined total 25,000 gallons of 100LL Avgas storage and 5,500 gallons of Jet A fuel storage.

Fuel storage requirements are typically based upon keeping a one-month supply of fuel during an average month; however, more frequent deliveries can reduce the fuel storage capacity requirement. Based on historical fuel sales from Ryan Airfield and similar general aviation airports, an average of two gallons per piston operation was used to project Avgas fuel storage requirements.

Turbine aircraft operations at Ryan Airfield have been comprised primarily of turboprop fixed wing aircraft and turbine-powered helicopters. Business jet operations have been infrequent with less than 200 operations annually.

Surveys of turbine aircraft owners in the Tucson area as well as users of both Ryan Airfield and Tucson International Airport (TIA) indicate that convenience is the primary factor in why most of these aircraft currently use TIA or Marana Regional Airport. As the community continues to develop towards Ryan Airfield, additional activity from jet aircraft can be expected.

Projections of future Jet A fuel storage requirements were based upon average Jet A fuel sales per turbine operation at Ryan Airfield over the past five years. A ratio of 60 gallons per turbine operation was used. Turbine operations were estimated at 300 annual operations per based turbine aircraft. Based upon these ratios, turbine operations will reach 6,600 annually in the long range.

100LL Avgas and Jet A fuel storage requirements are summarized in **Table 3K**. Available fuel storage meets the current demand at Ryan Airfield, however it is projected that this will need to be expanded over the planning horizon.

TABLE 3K
Fuel Storage Requirements
Ryan Airfield

	Available	Current Need	Short Term	Intermediate Term	Long Term
Two-Week Fuel Storage Requirements					
100LL Avgas (gal)	25,000	16,000	16,300	18,300	23,800
Jet A (gal)	5,500	2,400	4,000	6,700	15,300

Aircraft Wash Facility

Ryan Airfield currently has an aircraft wash facility which is located on the north apron. This wash facility provides an area for the collection of aircraft cleaning fluids used during the cleaning process. This facility is sufficient and should be maintained through the planning period.

Airport Maintenance Building

The TAA has a three building dedicated maintenance facility at Ryan Airfield. These facilities provide shelter for maintenance equipment used for general maintenance activities, which assist in the cost-effective and time-efficient maintenance of the airport. This maintenance facility sufficiently meets the maintenance needs of the airport and should be maintained through the planning period.

Perimeter Fencing

Perimeter fencing is used at airports to primarily secure the aircraft operations area. The physical barrier of perimeter fencing provides the following functions:

- Gives notice of the legal boundary of the outermost limits of a facility or security-sensitive area.
- Assists in controlling and screening authorized entries into a secured area by deterring entry elsewhere along the boundary.
- Supports surveillance, detection, assessment, and other security functions by providing a zone for installing intrusion-detection equipment and closed-circuit television (CCTV).
- Deters casual intruders from penetrating a secured area by presenting a barrier that requires an overt action to enter.
- Demonstrates the intent of an intruder by their overt action of gaining entry.
- Causes a delay to obtain access to a facility, thereby increasing the possibility of detection.
- Creates a psychological deterrent.
- Optimizes the use of security personnel while enhancing the capabilities for detection and apprehension of unauthorized individuals.
- Demonstrates a corporate concern for facility security.
- Provides a cost-effective method of protecting facilities.
- Limits inadvertent access to the aircraft operations area by wildlife.

The airport perimeter is equipped with 8-foot 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 remote security controlled. There are several manual access gates around the perimeter of the airport. The existing perimeter fence is adequate and should be maintained through the planning period.

Security

In cooperation with representatives of the general aviation community, the Transportation Security Administration (TSA) published security guidelines for general aviation airports. These guidelines are contained in the publication entitled, Security Guidelines for General Aviation Airports, published in May 2004. Within this publication, the TSA recognized that general aviation is not a specific threat to national security. However, the TSA does believe that general aviation may be vulnerable to misuse by terrorists as security is enhanced in the commercial portions of aviation and at other transportation links.

To assist in defining which security methods are most appropriate for a general aviation airport, the TSA defined a series of airport characteristics that potentially affect an airport's security posture. These include Airport Location, Based Aircraft, Runways and Operations.

Based upon the results of the security assessment, the TSA recommends 13 security enhancements for Ryan Airfield. These enhancements include Access Controls, Lighting System, Personal ID System, Challenge Procedures, Law Enforcement Support, Security Committee, Transient Pilot Sign-In/Sign-Out Procedures, Signs, Documented Security Procedures, Positive/Passenger/Cargo/Baggage ID, Aircraft Security, Community Watch Program and Contact List.

- **Implemented Security Measures**

Several security measures outlined above have already been implemented at Ryan Airfield. Implementation measures include:

- Access Controls
- Security Signage
- Security Lighting System
- Law Enforcement Support
- Community Watch Program

Access Control measures have been implemented by the construction of an interior perimeter fence for approximately 50% of the airfield. The perimeter fence is a six-foot high chain link fence with a three-stranded barbed wire on top. Gates are electronically controlled with keyed switch and wireless clicker access.

Security signs are located on the interior perimeter fence. The signs provide a deterrent by warning of the airport boundary as well as notification of the consequences for violation.

The Security Lighting System is in place for the apron and hanger areas. Lighting is provided for vehicle access, detection of intruders, deterrent of illegal entrants, and pilot and employee recognition. In addition, personnel in the control tower have a view of the airport and are able to detect unusual activity within the airport. As an additional deterrent for illegal activity, the tower lights in the cab are left on after traffic controllers are off duty. This gives an impression that there are air traffic controllers in the tower and are able to detect any unusual activity.

Law Enforcement Support is provided by the Tucson Airport Authority Police Department. They have implemented proactive crime suppression patrols comprised of uniformed police officers in patrol vehicles, police bicycle and explosion detection canine patrols on a regular schedule or as needed.

A Community Watch Program has been implemented as part of a monthly Ryan Airfield Users Meeting. The Tucson Airport Authority Police Department provides a "Community Policing" presence at Ryan whereby officers attend community functions to be able to interact and be proactive in crime prevention, to offer assistance and guidance to the community as well as in return the Department becomes more informed and better able to prevent problems and to keep the community safe and informed.

- **Recommended Security Measures To Be Implemented**

Several security measures are recommended for implementation at Ryan Airfield. Recommended Implementation of security measures include:

- Access Controls
- Tower Operating Hours
- Documented Security Procedures

Access controls include the completion of the interior perimeter fence to secure the airfield. The existing interior perimeter fence is adequate but the completion of the fence would provide additional security within the airport. In addition extending the airport perimeter road around the airfield would provide access for maintenance vehicles and repair of the interior perimeter fence as well as responding to entrants accessing the airfield from the perimeter.

An additional security measure would be to expand the operating hours of the traffic control operators. This would extend the hours that traffic controller operators are able to detect unusual activity within the airport.

Documenting security procedures would include having a security plan written down encompassing security measure already in place as well as additional measures. A security procedure would include airport and law enforcement contact information, alternatives if available and utilization of a program to increase airport user awareness of security precautions and an airport watch program.

Aircraft Rescue and Firefighting (ARFF)

The requirements for Aircraft Rescue and Firefighting (ARFF) equipment and services at an airport are determined by whether the airport is required to be certificated under 14 CFR Part 139 and the size of the aircraft. Ryan Airfield is presently not required to be certificated under 14 CFR Part 139; therefore, there is no requirement now for ARFF equipment or facilities. However, the Tucson Airport Authority (TAA) has assigned an Index A ARFF vehicle to Ryan Airfield, which is stored in the maintenance facilities on the airport.

SUMMARY

The intent of this chapter has been to outline the facilities required to meet aviation demands projected for Ryan Airfield through the long term planning horizon. A summary of the airfield and general aviation facility requirements are presented on **Exhibits 3D** and **3E**.

Following the facility requirements determination, the next step is to develop a direction for development to best meet these projected needs. The remainder of the Master Plan will be devoted to outlining this direction, its schedule, and its costs.

07MP02-3D-4/13/09

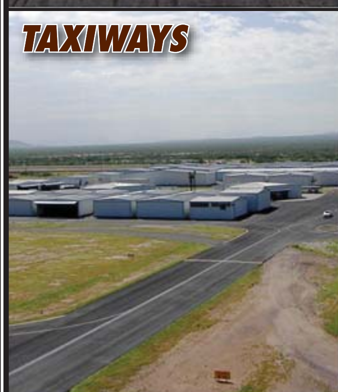
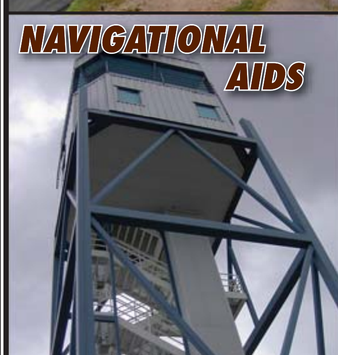
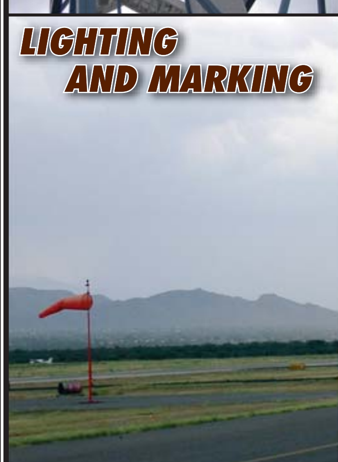
	EXISTING	SHORT TERM NEED	LONG TERM NEED
RUNWAYS 	**Runway 6R-24L** 5,500'x75' 12,500# SWL 30,000# DWL ARC B-II **Runway 6L-24R** 4,900'x75' 12,500# SWL 30,000# DWL ARC B-II **Runway 15-33** 4,000'x75' 12,500# SWL ARC B-I (small airplane exclusive)	**Runway 6R-24L** 5,500'x75' 73,000# DWL ARC B-II **Runway 6L-24R** 4,900'x75' 12,500# SWL 30,000# DWL ARC B-II **Runway 15-33** 4,000'x75 12,500# SWL ARC B-I (small airplane exclusive)	**Runway 6R-24L** 8,300'x100' 75,000# DWL ARC D-II **Runway 6L-24R** 4,900'x75' 12,500# SWL 30,000# DWL ARC B-II **Runway 15-33** 4,800'x75' 12,500# SWL ARC B-I (small airplane exclusive)
TAXIWAYS 	**Runway 6R-24L** 50' Wide Full Length Parallel **Runway 6L-24R** 35' Wide Full Length Parallel **Runway 15-33** 35' Wide Full Length Parallel	**Runway 6R-24L** High Speed Exits Dual-Parallel Taxiway **Runway 6L-24R** 35' Wide Full Length Parallel **Runway 15-33** 35' Wide Full Length Parallel	**Runway 6R-24L** High Speed Exits Dual-Parallel Taxiway **Runway 6L-24R** 35' Wide Full Length Parallel **Runway 15-33** 35' Wide Full Length Parallel
NAVIGATIONAL AIDS 	ATCT, AWOS, NDB, GPS, VOR-DME **Runway 6R-24L** ILS (6R), LOC (6R), GPS (6R) **Runway 6L-24R** None **Runway 15-33** None	ATCT, AWOS, NDB, GPS, VOR-DME **Runway 6R-24L** ILS (6R), LOC (6R), GPS (6R) **Runway 6L-24R** None **Runway 15-33** None	ATCT, AWOS, NDB, GPS, VOR-DME **Runway 6R-24L** ILS (6R), LOC (6R), CAT-1 (6R), GPS-GLS (24L) **Runway 6L-24R** GPS-APV **Runway 15-33** GPS-APV
LIGHTING AND MARKING 	Airport Beacon, Windcones **Runway 6R-24L** MIRL, REIL (6R), VASI-4 (24L) Precision/Basic Marking **Runway 6L-24R** Basic Marking **Runway 15-33** Basic Marking	Airport Beacon, Windcones, MITL **Runway 6R-24L** MIRL, REIL, PAPI-4 (6R) VASI-4 (24L) Precision Markings **Runway 6L-24R** MIRL, REIL, PAPI-4 Non-Precision Marking **Runway 15-33** MIRL, REIL, PAPI-4, Basic Marking	Airport Beacon, Windcones, MITL **Runway 6R-24L** MIRL, REIL, PAPI-4 MALSR (6R, 24L) Precision Markings **Runway 6L-24R** MIRL, REIL, PAPI-4 Non-Precision Marking **Runway 15-33** MIRL, REIL, PAPI-4, Non-Precision Marking

Exhibit 3D
AIRFIELD SUMMARY

07MP02-3E-9/14/09

AIRCRAFT STORAGE HANGAR REQUIREMENTS

	Available	Short Term	Intermediate Term	Long Term
Aircraft to be Hangared	220	236	273	347
T-Hangar Positions	30	46	60	78
Shade Hanger Positions	64	54	58	71
Conventional/Executive Hangar Positions	157	136	155	198
T-Hangar Area (s.f.)	54,000	55,400	71,800	94,200
Shade Hangar (s.f.)	37,800	31,800	34,400	41,700
Conventional Hangar Area (s.f.)	343,030	211,400	243,300	318,500
Total Hangar Area (s.f.)	**434,830**	**298,600**	**349,500**	**454,400**
Maintenance Area (s.f.)	44,000	46,550	51,800	64,675

AIRCRAFT PARKING APRON REQUIREMENTS

	Available	Short Term	Intermediate Term	Long Term
Single, Multi-Engine Transient Aircraft Positions	51	48	55	77
Locally-Based Aircraft Positions	109	30	23	22
Total Positions	160	78	78	99
Total Apron Area (s.y.)	**70,499**	**35,000**	**35,850**	**46,500**

TERMINAL FACILITIES

	Available	Short Term	Intermediate Term	Long Term
General Aviation Terminal Building Area (s.f.)	3,300	5,300	5,700	7,500
Total Airport Automobile Parking Spaces	252	194	212	272

OTHER FACILITIES

	Available	Short Term	Intermediate Term	Long Term
	Maintenance Facility Aircraft Wash Rack	Maintenance Facility Aircraft Wash Rack	Maintenance Facility Aircraft Wash Rack Heliport	Maintenance Facility Aircraft Wash Rack Heliport

FUEL STORAGE REQUIREMENTS

	Available	Short Term	Intermediate Term	Long Term
100LL Augas (gal.)	25,000	16,300	18,300	23,800
Jet A (gal.)	5,500	4,000	6,700	15,300

Exhibit 3E
LANDSIDE FACILITY REQUIREMENTS

RYAN AIRFIELD
TUCSON AIRPORT AUTHORITY

Chapter 4

AIRPORT DEVELOPMENT ALTERNATIVES

Chapter Four

Airport Development Alternatives

Prior to formulating a development program for Ryan Airfield, it is important to consider development potential and constraints at the airport. The purpose of this chapter is to consider the actual physical facilities which are needed to accommodate projected demand and meet the program requirements as previously defined in Chapter Three, Aviation Facility Requirements.

In this chapter, a number of airport development alternatives are considered for the airport. For each alternative, different physical facility layouts are presented for the purposes of evaluation. The ultimate goal is to develop the underlying rationale which supports the final recommended master plan development concept. Through this process, an evaluation of the highest and best uses of airport property is made while considering local development goals, physical and environmental constraints, and appropriate federal airport design standards.

Any development proposed by a master plan evolves from an analysis of projected needs. Though the needs were determined by the best methodology available, it cannot be assumed that future events will not change these needs. Therefore, to ensure flexibility in planning and development to respond to unforeseen needs, the landside alternatives consider the maximum development potential of airport property.

The alternatives presented in this chapter have been developed to meet

the overall program objectives for the airport in a balanced manner. Through coordination with the Tucson Airport Authority (TAA), the Planning Advisory Committee (PAC), and the public, the alternatives (or combination thereof) will be refined and modified as necessary to develop the recommended development concept. Therefore, the alternatives presented in this chapter can be considered a beginning point in the development of the recommended concept for the future development of Ryan Airfield.

REVIEW OF PREVIOUS PLANNING DOCUMENTS

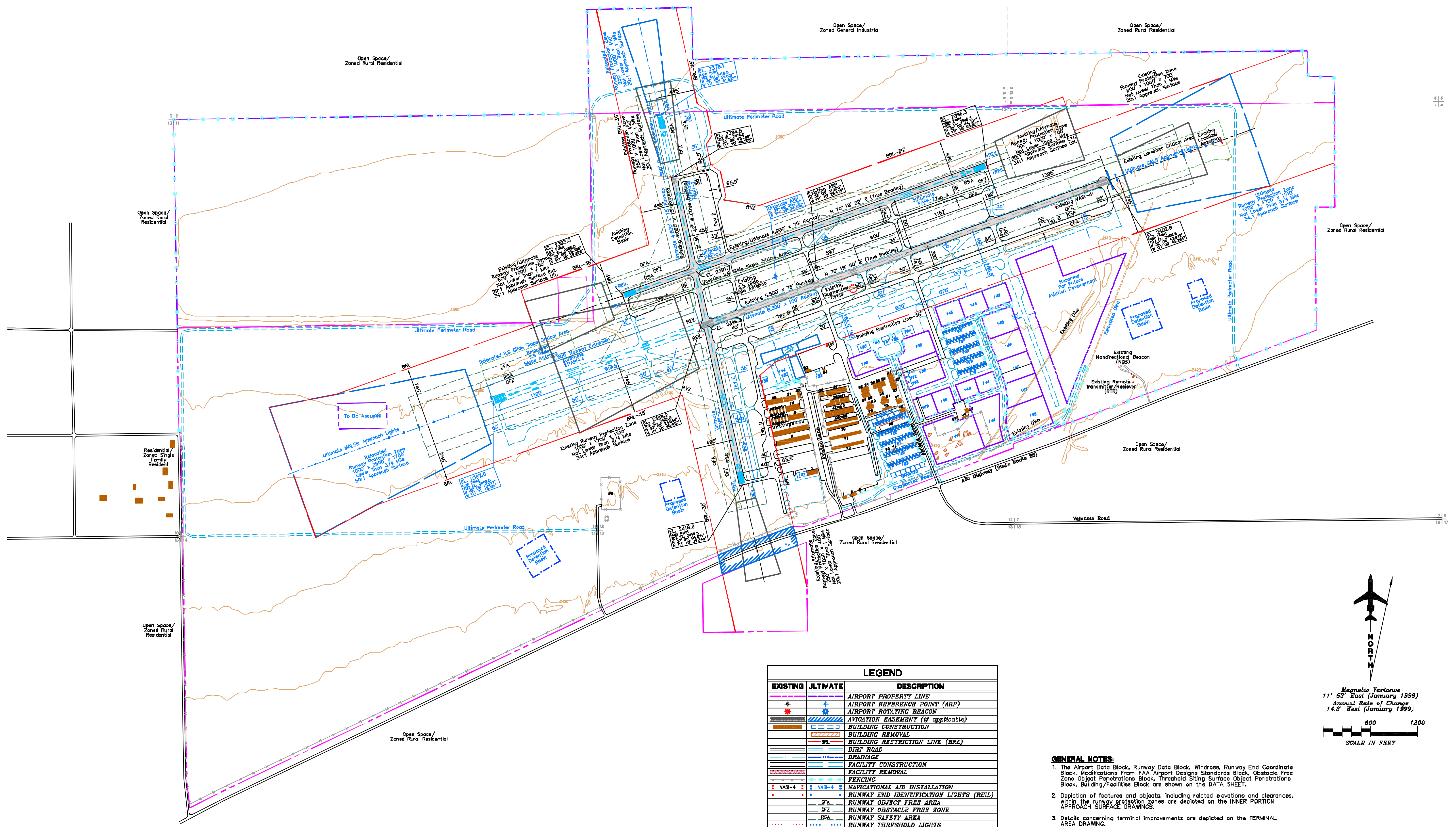
The most recent planning document prepared for Ryan Airfield was the *Ryan Airfield Airport Master Plan* completed in June 1999. The master plan study recommended the continued development of the existing airport into the long-term horizon.

Recommended airfield developments included upgrading the primary runway design standards to serve ARC D-II aircraft, improving instrument approach minimums with use of Global Positioning System (GPS) technology, taxiway circulation improvements, the construction of a helicopter landing area, and land acquisitions for the protection of the runway approaches. Since these recommendations, the TAA has constructed new taxiways and resurfaced other taxiways to improve taxiway circulation. Adjacent land has been acquired to protect the runway approaches and to allow for future development opportunities. In addition, Runway 6R now has a published GPS instrument approach.

Landside development recommended in the previous master plan study included the establishment of a terminal focal point on the flightline, locations for various hangar developments, expansion areas for a potential flight school, access and service road circulation improvements, and expansion plans for fuel storage facilities and the maintenance facility. Since the previous master plan, several new aircraft storage hangars have been constructed to the east of the airport administration building, and the north apron has been expanded to provide additional aircraft parking positions. The airport layout plan (ALP) drawing shown on **Exhibit 4A** depicts the airside and landside improvements recommended in the previous master plan.

NON-DEVELOPMENT ALTERNATIVES

Non-development alternatives include the “No Action” or “Do Nothing” alternative, transferring service to an existing airport, or developing an airport at a new location. Several previous planning efforts have also considered these alternatives. All have resulted in the same conclusion: continue to develop the existing airport site to meet the general aviation needs of the Tucson metropolitan area.



LEGEND

EXISTING	ULTIMATE	DESCRIPTION
		AIRPORT PROPERTY LINE
		AIRPORT REFERENCE POINT (ARP)
		AIRPORT ROTATING BEACON
		AVIGATION EASEMENT (if applicable)
		BUILDING CONSTRUCTION
		BUILDING REMOVAL
	BRL	BUILDING RESTRICTION LINE (BRL)
		DIRT ROAD
		DRAINAGE
		FACILITY CONSTRUCTION
		FACILITY REMOVAL
		FENCING
VASI-4	VASI-4	NAVIGATIONAL AID INSTALLATION
		RUNWAY END IDENTIFICATION LIGHTS (REIL)
	OFA	RUNWAY OBJECT FREE AREA
	OFZ	RUNWAY OBSTACLE FREE ZONE
	RSA	RUNWAY SAFETY AREA
		RUNWAY THRESHOLD LIGHTS
	RVZ	RUNWAY VISIBILITY ZONE
		SEGMENTED CIRCLE/WIND INDICATOR
		SECTION CORNER
		TOPOGRAPHIC CONTOURS
		WIND INDICATOR (Lighted)

GENERAL NOTES:

1. The Airport Data Block, Runway Data Block, Windrose, Runway End Coordinate Block, Modifications From FAA Airport Designs Standards Block, Obstacle Free Zone Object Penetrations Block, Threshold Siting Surface Object Penetrations Block, Building/Facilities Block are shown on the DATA SHEET.
2. Depiction of features and objects, including related elevations and clearances, within the runway protection zones are depicted on the INNER PORTION APPROACH SURFACE DRAWINGS.
3. Details concerning terminal improvements are depicted on the TERMINAL AREA DRAWING.
4. Recommended land uses are depicted on the AIRPORT LAND USE DRAWING.
5. Building Restriction Line (BRL) is established in accordance with F.A.R. Part 77 criteria. Location utilizes 35 foot vertical object height. BRL location may vary in accordance with runway object free area, runway protection zone, naviad critical areas, and areas required for terminal instrument procedures.

RYAN AIRFIELD
TUCSON AIRPORT AUTHORITY

Exhibit 4A
1999 AIRPORT LAYOUT PLAN

NO ACTION

In analyzing and comparing the advantages and disadvantages of various development alternatives, it is important to consider the consequences of no future development at Ryan Airfield. The "no-build" or "do-nothing" alternative essentially considers keeping the airport in its present condition and not providing for any type of expansion or improvement to the existing facilities (other than general airfield, pavement, and administration building maintenance projects). The primary result of this alternative, as with any growing air transportation market, would be the eventual inability of the airport to satisfy the increasing demands of the airport service area. The growth of activity at Ryan Airfield is partially a result of the growing economy and population of the Tucson metropolitan area, as well as growth within the general aviation industry as a whole. Air travel is the fastest means to cover long distances, and it provides businesses the capability to expand their markets nationally and globally. It provides tourists the means to maximize their vacation experience within the time available. It can be argued that the airlines provide the most successful form of mass transportation in the United States today.

Ryan Airfield's role as a general aviation reliever to Tucson International Airport is one of the most important components to the Tucson metropolitan area air transportation system. The airport's forecasts and analysis indicate future needs for improvements throughout the facility. The airport's runway system will need to be upgraded to accommodate future use by an expanding corporate aircraft fleet that includes very light jet aircraft. Hangar development at Ryan Airfield will also be crucial as the demand for aircraft storage units will continue to be strong into the future.

Faced with continual growth in air traffic activity, the runway system may not be able to efficiently accommodate air traffic, and delays would increase. Following the no-build alternative would not allow for airfield capacity improvements or improvements which are needed to meet new Federal Aviation Administration (FAA) design standards for instrument approaches and safety areas.

Following the no-build alternative would also not support the private businesses that have made investments at Ryan Airfield. As these businesses grow, the airport will need to be able to accommodate the infrastructure needs of new hangars, expanded apron areas, and automobile parking needs. Each of the businesses on the field provides jobs for local residents, interjects economic revenues into the community, and pays taxes for local government operations.

By owning and operating Ryan Airfield, the TAA is charged with the responsibility of developing aviation facilities necessary to accommodate aviation demand and to minimize operational constraints. Flexibility must be programmed into airport development to assure adequate capacity should market conditions change unexpectedly. While these objectives may not be all-inclusive, they should provide a point of reference in the alternatives evaluation process.

In essence, the no-build alternative is inconsistent with the long-term goals of the Arizona Department of Transportation – Aeronautics Division and the FAA, which are to enhance local and interstate commerce. This alternative, if pursued, would affect the long-term viability of the airport and its services to the Tucson area.

TRANSFERRING AVIATION SERVICES

Transferring services to another airport, existing or new, is one that will typically be favored by many residing close to an existing airport. Relocating an airport, however, is very complex and expensive.

In addition to the major financial investment, the development of a new general aviation reliever airport also takes a commitment of extensive land area. The location for a new site is usually undeveloped. As a result, the potential for impacts to wildlife habitat and cultural resources is higher than at an existing site which still has development capability.

A new airport also requires the duplication of investment in airport facilities, supporting access, and infrastructure that are already available at the existing airport site. A new airport site would require the construction of an entirely new airfield, landside support facilities, as well as ground access. In addition, utilities such as water, sewer, electricity, and gas would have to be extended to a new site.

The economic realities of relocating to a new airport must also be considered. The construction of a new general aviation airport can require a financial commitment of several million dollars. Virtually the entire cost of this development is financed by taxes, rates, and charges that are being paid by air travelers and the aviation industry as a whole. While it is appropriate that the airport user pay for aviation facilities and its operation, the airport proprietor still has a duty to be fiscally responsible.

The high costs associated with new airport development will continue to limit the number of new major facilities that the aviation industry and the public can absorb. Therefore, it is prudent to maximize existing public investment to meet future needs before abandoning that investment simply to duplicate it elsewhere.

The alternative of relocating services to another airport in the Tucson area has also been considered. The closest general aviation airport with similar capabilities is Marana Regional Airport (AVQ) in Marana, Arizona, located approximately 21 statute miles northwest of downtown Tucson, and 16 nautical miles north of Ryan Airfield. AVQ is anticipated to experience similar growth patterns to Ryan Airfield over the planning period. To accommodate this growth, AVQ has developed its own plan for airfield and landside development. Taking on Ryan's projected demand would tax the capabilities of AVQ's plan. In addition, AVQ is located at a relatively greater distance from the Ryan Airfield service area, which encompasses the south and west sides of the metropolitan area. Due to these factors, it is concluded that transferring aviation services from Ryan Airfield to AVQ is not feasible.

In summary, the development of a new airport or upgrade of an existing airport to replace Ryan Airfield would be more expensive, more time-consuming, provide less convenient service, and could potentially create a direct cost burden on the local tax base. The size and magnitude of the facilities required for a full replacement of Ryan Airfield would dictate extensive airfield, landside, and building construction, as well as infrastructure development. The distance from Tucson to any other general aviation airport would result in higher costs and inconvenience to existing airport users.

Given the major investment in the existing facilities at Ryan Airfield, relocation to another location is not prudent or feasible at this time since the existing airport has the capability to accommodate future demands with far less additional capital.

AIRSIDE DEVELOPMENT CONSIDERATIONS

The purpose of this section is to identify and evaluate various airside development considerations at Ryan Airfield to meet program requirements set forth in Chapter Three. Airfield facilities are, by nature, the focal point of an airport complex. Because of their primary role and the fact that they physically dominate airport land use, airfield facility needs are often the most critical factor in the determination of viable airport development alternatives. In particular, the runway system requires the greatest commitment of land area and defines minimum building set-back distances from the runways and object clearance standards. These criteria, depending upon the areas around the airport, must be defined first in order to ensure that the fundamental needs of the airport are met. Therefore, airside requirements will be considered prior to detailing land use development alternatives.

The issues to be considered in this analysis are summarized on **Exhibit 4B**. These issues are the result of the findings of the Aviation Demand Forecasts and Aviation Facility Requirements evaluations, and they include input from PAC and TAA staff.

AIRFIELD CAPACITY

A finding in the aviation facility requirements chapter indicated that the forecast operational demand would reach levels over 55 percent of the Ryan Airfield annual service volume (ASV) in the long-term planning horizon. This would generate an estimated 1,900 hours of total annual delay assuming the long-term planning horizon operational levels are achieved.

While the projected demand level should remain well below the airport's ASV, three potential methods of improving airfield capacity were analyzed: improving taxiway circulation by adding exit taxiways, a dual-parallel taxiway, and additional holding aprons; and constructing a third parallel runway for small (less than 12,500 pounds) aircraft.

The capacity analysis revealed that high-speed exit taxiways on Runway 6R-24L are needed to maximize capacity on that runway. The primary advantage of high-speed exit taxiways is that they allow aircraft to exit a runway at higher speeds compared to right-angled exit taxiways. Additional exit taxiways on the parallel and crosswind runways would also help to improve airfield capacity. A dual-parallel taxiway for Runway 6R-24L and additional holding aprons would help reduce taxiway congestion and improve the overall flow of the airfield. The alternatives to follow will consider each of these methods to improve airfield capacity.

Since the long-term forecast operational levels do not exceed the forecast ASV for Ryan Airfield, taxiway improvements should be adequate in mitigating aircraft delay issues. However, should operational levels exceed the projections of this master plan, a third parallel runway should be considered to ensure that the airfield capacity would be adequate to meet these higher than expected operational levels. The potential third parallel runway (Runway 6L-24R) would be aligned north of the existing Runway 6L-24R (ultimately 6C-24C), partially on land owned by the TAA, and land northeast of existing airport property that would need to be acquired.

RUNWAY LENGTH

The facility requirements indicated the primary runway should be planned with a runway length of 8,300 feet to accommodate 75 percent of large aircraft at 90 percent useful load. This recommended runway length is consistent with the FAA runway length requirements contained in FAA AC 150/5325-4A, *Runway Length Requirements for Airport Design*.

Three alternatives can be considered for the runway extension: place the entire extension on the Runway 6R end, place the entire extension on the Runway 24L end, or split the extension between each end. Since land currently owned by the TAA is available for the entire 2,800-foot extension on the Runway 6R end, it is neither necessary nor practical to consider placing the extension on the Runway 24L end or splitting the extension.

It has also been recommended that Runway 15-33 be extended by 800 feet to an ultimate length of 4,800 feet. At this length, the crosswind runway would have adequate length to serve 100 percent of small airplanes with less than 10 passenger seats. There is adequate land available north and south of Runway 15-33 to split the extension. The location of Ajo Highway south of Runway 33 would prevent the full extension to the south, and a land acquisition would be required to allow for the full extension to the north of Runway 15.

Runway 6L-24R (4,900 feet) currently exceeds its recommended design

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AIRSIDE CONSIDERATIONS

- Meet ARC D-II design standards for Runway 6R-24L
- Extend Runway 6L-24R to 5,005 feet
- Meet ARC B-II design standards for Runway 6L-24R
- Extend Runway 15-33 to 4,800 feet
- Meet ARC B-I (small airplane exclusive) design standards for Runway 15-33
- Establish instrument approaches to each runway end utilizing GPS technology
- Taxiway circulation and runway exits
- Protection of runway approaches
- Future land acquisition needs
- Construct airport perimeter service road
- Locations for helipad
- Extend Runway 6R-24L to 8,300 feet and widen to 100 feet
- A third parallel runway to increase airport capacity

LANDSIDE CONSIDERATIONS

- Locations for aircraft storage hangar development
- Locations for revenue support development
- Vehicle parking locations
- Road circulation
- Expansion of aprons
- Flight school expansion areas

RYAN AIRFIELD
TUCSON AIRPORT AUTHORITY

Exhibit 4B
KEY PLANNING ISSUES

length of 4,800 feet. However, it has been recommended by TAA staff that a 105-foot extension to at least 5,005 feet of Runway 6L-24R would improve the runway's versatility for high operational periods and during construction periods for the primary Runway 6R-24L. The 105-foot extension would also result in the existing and ultimate runway threshold entrance taxiways to meet separation standards. There is adequate land both east and west of Runway 6L-24R for the full 105-foot extension.

The potential third parallel runway would primarily serve as a training runway exclusively for small aircraft. The recommended runway length for this type of use is 4,800 feet. The airfield alternatives analysis will propose a location for this 4,800-foot third parallel runway.

AIRPORT REFERENCE CODE (ARC) DESIGNATION

The design of airfield facilities is based, in part, on the physical and operational characteristics of aircraft using the airport. The FAA utilizes the Airport Reference Code (ARC) system to relate airport design requirements to the physical (wingspan) and operational (approach speed) characteristics of the largest and fastest aircraft conducting 500 or more itinerant operations annually at the airport. While this can at times be represented by one specific make and model of aircraft, most often the airport's ARC is represented by several different aircraft which collectively conduct more than 500 annual itinerant operations at the airport.

The FAA uses the 500 annual itinerant operations threshold when evaluating the need to develop and/or upgrade airport facilities to ensure that an airport is cost-effectively constructed to meet the needs of those aircraft that are using, or have the potential to use, the airport on a regular basis. It should be recognized that aircraft that are outside the ARC design of the airport may still operate there. This is due to these aircraft not meeting the 500 annual itinerant operations threshold.

At Ryan Airfield, the majority of based aircraft fall within ARC A-I and B-II. However, the mix of transient aircraft is more diverse and includes aircraft in ARCs C-I, C-II, and D-I. Aircraft in ARCs C-II and D-I are the most demanding aircraft to operate at the airport currently (due to their higher approach speeds and wider wingspans); however, these aircraft currently conduct less than 500 annual itinerant operations at the airport. Therefore, at this time, the most demanding approach category for the airport is Approach Category B. The wingspans of the most demanding aircraft fall within Airplane Design Group (ADG) II.

The current critical aircraft at Ryan Airfield fall within ARC B-II design standards. The potential exists in the future for increased use of the airport by business turbojet aircraft, which fall within ARC D-II. This follows with the national trend of increased business and corporate use of turbojet aircraft, strong sales and deliveries of turboprop and turbojet aircraft, and expanded fractional ownership programs for these aircraft. Local factors that might also contribute to the increased use of these more demanding aircraft include the expansion of the Tucson metropolitan area, which will result in more transient business jet operators utilizing the less congested Ryan Airfield instead of Tucson International Airport. Casinos in the southwestern part of Tucson with close proximity to Ryan Airfield should also attract transient jet aircraft activity.

Common business jet and turboprop aircraft have higher approach speeds than the current critical aircraft operating at the airport; however, most of these aircraft have similar wingspans to the existing critical aircraft operating at the airport. The higher approach speeds of these aircraft are expected to have the potential of changing the critical aircraft designation for the airport. Ultimately, the airport is expected to accommodate aircraft within ARC D-II. One of the most notable effects of the ARC D-II design standards is that Runway 6R-24L will need to be widened from 75 feet to 100 feet. Having this extra width will make operations safer for aircraft with faster landing and takeoff speeds.

Runways 6L-24R and 15-33 are used primarily by smaller aircraft conducting training operations. The most demanding aircraft anticipated to use Runway 6L-24R in the future fall within ARC B-II design standards. Runway 15-33 will continue to be used by small aircraft (ARC B-I small aircraft exclusively) for training operations through the planning period.

Table 4A summarizes the ultimate (ARC D-II) design standards for Runway 6R-24L, Runway 6L-24R (ARC B-II), Runway 15-33 (ARC B-I small aircraft exclusive), and the potential third parallel runway (ARC B-I small aircraft exclusive). Each of these design standards are met in the proposed airfield alternatives.

PRECISION INSTRUMENT APPROACH

The facility requirements analysis indicated a need for improved instrument approach capabilities at Ryan Airfield. **Table 4A** indicates the ultimate visibility minimums for each runway. Runway 6R is currently equipped with an instrument landing system (ILS) approach which provides both vertical and course guidance to pilots. This precision instrument approach is available for use in visibility conditions down to a minimum of one mile. To achieve ½-mile visibility minimums to Runway 6R will require the installation of an approach lighting system. The typical equipment recommended is a medium intensity approach lighting system with runway alignment indicator lights (MALSR). The MALSR lighting system is depicted on each of the airfield alternatives.

TABLE 4A
Airfield Safety and Facility Dimensions (in feet)

	Ultimate Runway 6R-24L	Ultimate Runway 6L-24R	Ultimate Runway 15-33/ Potential Third Parallel
Airport Reference Code (ARC)	D-II	B-II	B-I (small aircraft)
Approach Visibility Minimums	½ Mile Each End	One Mile Each End	One Mile Each End
Runway			
Length	8,300	5,005	4,800
Width	100	75	75
Runway Safety Area (RSA)			
Width	500	150	150
Length Beyond Runway End	1,000	300	300
Object Free Area (OFA)			
Width	800	500	500
Length Beyond Runway End	1,000	300	300
Obstacle Free Zone (OFZ)			
Width	400	400	250
Length Beyond Runway End	200	200	200
Precision Obstacle Free Zone (POFZ)			
Width	800	N/A	N/A
Length Beyond Runway End	200	N/A	N/A
Runway Centerline To:			
Hold Line	275	200	125
Parallel Taxiway Centerline	425	240	240
Edge of Aircraft Parking Apron	500	250	250
Runway Protection Zone (RPZ)			
Inner Width	1,000	500	250
Outer Width	1,750	700	450
Length	2,500	1,000	1,000
Obstacle Clearance	50:1	20:1	20:1
Taxiways			
Width	35	35	35
Safety Area Width	79	79	79
Object Free Area Width	131	131	131
Taxiway Centerline To:			
Parallel Taxiway/Taxilane	105	105	105
Fixed or Moveable Object	65.5	65.5	65.5
Taxilanes			
Taxilane Centerline To:			
Parallel Taxilane Centerline	97	97	97
Fixed or Moveable Object	57.5	57.5	57.5
Taxilane Object Free Area	115	115	115

Source: FAA Advisory Circular (AC) 150/5300-13, *Airport Design*; 14 CFR Part 77, *Objects Affecting Navigable Airspace*

It was also determined in the facility requirements that a Global Navigation Satellite System Landing System (GLS) approach is desirable to provide Runway 24L with precision instrument approach capabilities. The GLS utilizes GPS technology, which limits the amount of costly on-site navigation equipment needed at the airport. Like an ILS system, a GLS would require the installation of an approach lighting system to achieve ½-mile visibility minimums. Therefore, a MALSR lighting system is also shown on each of the airfield alternatives on the Runway 24L end.

HELIPAD

Helicopter training is currently conducted at Ryan Airfield primarily utilizing crosswind Runway 15-33 for approach. To segregate helicopter operations from fixed-wing operations to the extent possible, helipad positions are considered in the airfield alternatives. Two different helipad layouts are proposed in the alternatives. The first type includes a helipad for approaches and helicopter parking spaces adjacent to a landside facility that would have ground vehicular access. The second layout would be a helicopter training helipad, which would not have parking positions or any landside facilities. Each of these helipad layouts are proposed to be located at a minimum of 2,500 feet from the centerline of any runway so that simultaneous helicopter/fixed-wing operations may be conducted. Having the ability to conduct these operations simultaneously without interruption to the runway system will also benefit the airport's ASV.

AIRPORT PERIMETER SERVICE ROAD

A paved airport perimeter service road is proposed to provide service and emergency vehicles access to all areas of the airfield. The airfield alternatives show proposed alignments for this perimeter service road, which should encompass all airfield facilities. The perimeter service road would be closed to public traffic by use of security gates, which would limit access to authorized personnel.

LAND ACQUISITIONS

When considering different alternatives for airfield expansion, it is common that ultimate facilities and safety areas may extend beyond current airport property boundaries. In these cases, it is recommended that land beyond current airport property boundaries that may be needed for future projects or for the protection of runway approaches is acquired through fee simple acquisition.

This airfield alternative analysis considers fee simple acquisition of two sections of land that can be identified on each airfield alternative exhibit by blue dashed lines. Both land acquisitions are along the northern edge of the existing property line. The parcel located north of the Runway 15 end encompasses approximately 79.8 acres and would be needed to protect the ultimate Runway 15 RPZ from inadequate land uses and for the construction of an airport perimeter service road. The second land acquisition consideration is a 39.5 acre parcel north of the Runway 24R end. This acquisition would be needed for the potential construction of a third parallel runway as well as an airport perimeter service road. Each of these land acquisitions were previously proposed in the 1999 master plan.

SEGMENTED CIRCLE/LIGHTED WIND INDICATORS

The airport is currently equipped with a segmented circle and lighted wind indicator near midfield of the airport to aid pilots in determining appropriate traffic patterns and wind direction and intensity. These navigation aids currently fall within the Runway 6R-24L object free area (OFA). It is defined in AC 150/5300-13, *Airport Design*, that the OFA should be cleared of objects protruding above the runway safety area edge elevation. Therefore, the segmented circle and lighted wind indicator should be relocated so that they lay completely outside the OFA. Each airfield alternative depicts the segmented circle and lighted wind indicator relocated north of Runway 6L-24R (6C-24C on Airfield Alternative 3). This is a central location on the airfield and would be highly visible to pilots operating in local airspace.

AIRSIDE ALTERNATIVES

AIRFIELD ALTERNATIVE 1

The proposed airside configuration of Airfield Development Alternative 1 is shown on **Exhibit 4C**. This alternative closely follows the 1999 Master Plan and incorporates the following:

1. Extension of Runway 6R by 2,800 feet to the west. This runway extension would include the extension of Taxiway B and the construction of a holding apron where Taxiway B meets the end of Runway 6R.

2. Widen Runway 6R-24L to 100 feet.

3. Extension of Runway 15-33 and Taxiway D 800 feet to the north.

4. Extension of Runway 6L-24R and Taxiway A 105 feet to the east.

5. Construction of a dual parallel taxiway south 105 feet south of the centerline of Taxiway B.

6. Construction of a helipad with helicopter parking spaces and a hangar facility north of Ajo Highway and southeast of the airfield.

As it was discussed in the airside development considerations section of this chapter, a 105-foot extension to Runway 6L-24R would improve the runway's overall versatility. Along with the extension to the Runway, Taxiway A would also be extended 105 feet resulting in the construction of a new entrance taxiway to the Runway 24R threshold. This would create parallel entrance taxiways with a separation distance of 105 feet. The ADG II parallel taxiway separation standard is 105 feet. Therefore, this and each subsequent airfield alternative proposes a 105-foot Runway 6L-24R and Taxiway A extension to meet this parallel taxiway separation standard.

This alternative proposes a number of exit taxiway improvements for each runway. Three high-speed exit taxiways are proposed for Runway 6R. These high-speed exits are spaced so that they are capable of being utilized by a high percentage of aircraft in approach categories A to D. A single high-speed exit is proposed for Runway 24L, at a location where it will allow small aircraft to exit the runway quickly. Runway 6L-24R would also have two high-speed exits constructed at about the midpoint of the runway. At this location, a high percentage of small aircraft will be able to exit. A single right-angled exit is shown 1,600 feet from the ultimate Runway 15 threshold. This will allow aircraft to exit the runway before crossing the parallel runways.

Holding aprons are proposed at each runway end. These holding aprons will help reduce taxiway congestion, while providing a location for pre-flight engine run-ups.

The location of the helipad facility, southeast of the airfield and the landside facilities, would allow for simultaneous approach operations to each parallel runway and the helipad. This location would also be located near areas of proposed landside development, which would keep it within close proximity to airport maintenance and fueling facilities. The helipad could also be readily expandable to the east to provide additional helipads and parking spaces.

Airfield Alternative 1 and each subsequent airfield alternative show the proposed realignment of West Valencia Road. This is the result of a study conducted by the Pima County Regional Transportation Authority. The realignment would not shift the intersection of West Valencia Road and Ajo Highway and should not have an effect on the flow of traffic to and from the airport.

AIRFIELD ALTERNATIVE 2

The proposed airside configuration of Airfield Alternative 2 is shown in **Exhibit 4D**. The following projects proposed in Airfield Alternative 2 differ from Airfield Alternative 1:

1. Extension of Runway 6R-24L by 2,800 feet to the west. The ultimate extension would include the extension of Taxiway B and the construction of holding aprons.

2. Split 800-foot extension of Runway 15-33, including a 400-foot extension of both the 15 and the 33 ends. Splitting the extension could ultimately be a disadvantage as it generates two separate construction projects. This will increase construction costs by necessitating the relocation of both runway end thresholds and extensions to both taxiway ends as opposed to one.

3. Extension of Runway 6L-24R by 105 feet to the west.

4. Construction of a helicopter training helipad southwest of the airfield.

This airfield alternative has a few taxiway circulation differences from the previous airfield alternative. This alternative looks at extending Taxiway A from the Runway 6L end to the ul-

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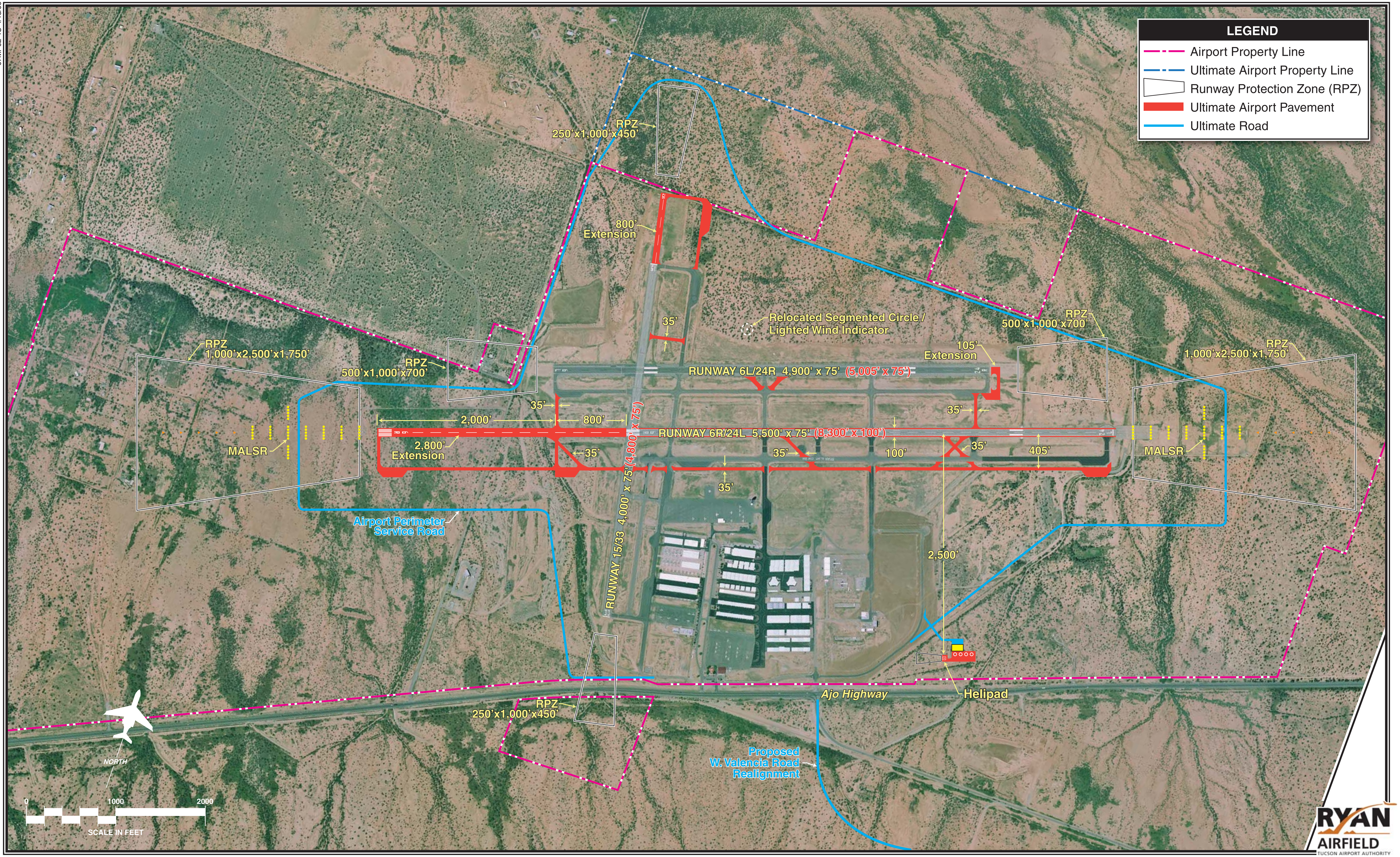

Exhibit 4C
AIRFIELD ALTERNATIVE 1

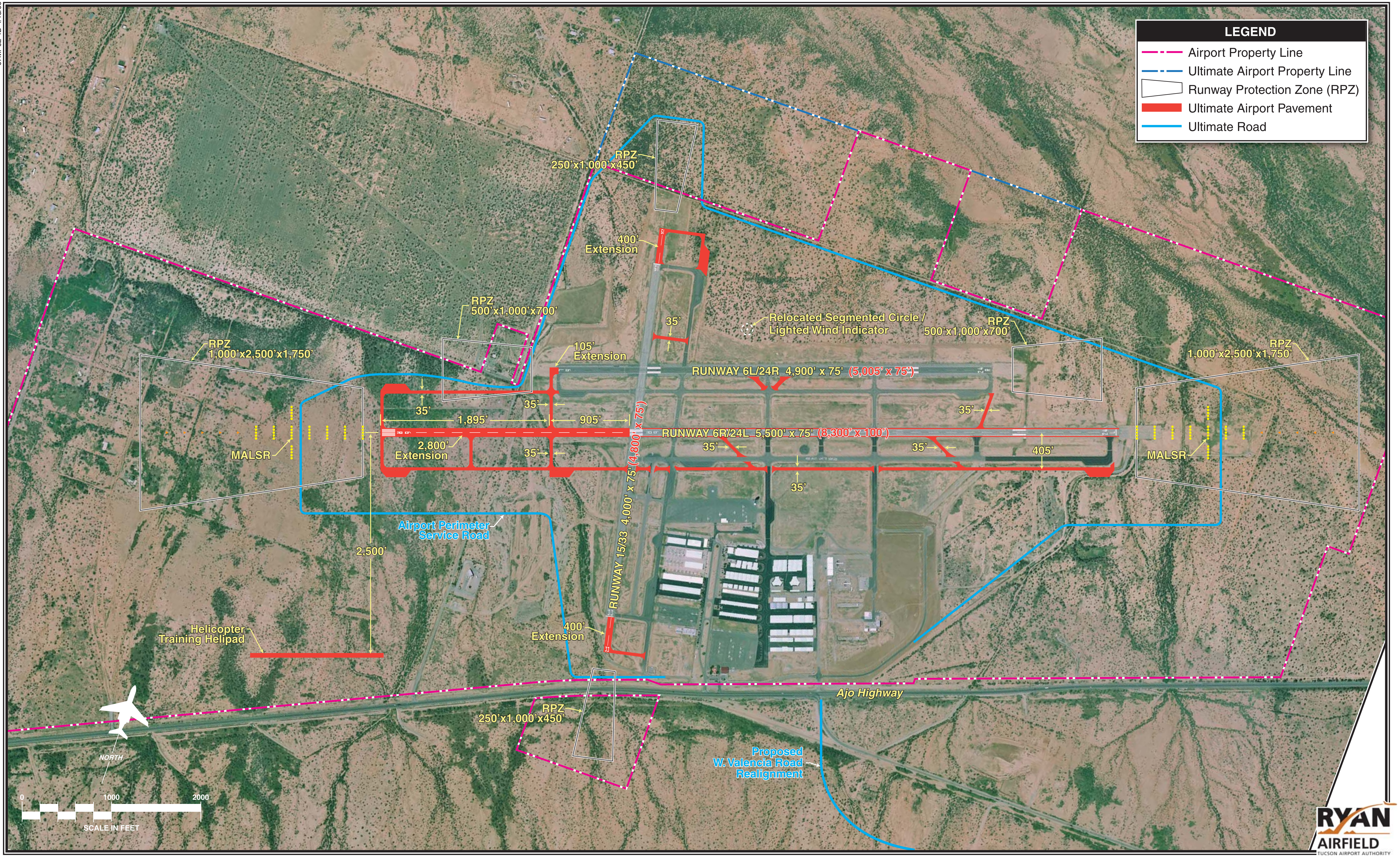

Exhibit 4D
AIRFIELD ALTERNATIVE 2

timate Runway 6R end. This could help reduce taxiway congestion on Taxiway B by providing an alternate route to the Runway 6R threshold. A disadvantage of this would be that Taxiway A would lay within the Runway 6L RPZ.

FAA AC 150/5300-13, *Airport Design*, states that the function of the RPZ is "to enhance the protection of people and property on the ground" through owner control of the RPZ and maintaining the RPZ clear of incompatible objects. While the FAA design standards do not specifically prohibit a runway or taxiway from extending through an RPZ, the FAA desires that runways and taxiways be located outside the RPZ.

High speed exit taxiways are still considered for Runway 6R at locations for all aircraft types. Runway 24L would not be served by high speed exits but would continue to use the existing right-angled exits. This would create higher runway occupancy times when Runway 24L is in use due to aircraft not being able to exit the runway quickly. A right-angled exit is considered 1,000 feet from the ultimate Runway 6R threshold, which would serve only a small percentage of aircraft.

The helipad considered in this airfield alternative would be located southwest of the airfield and would have dimensions of 1,500 feet long and 50 feet wide. This helipad proposal would be used exclusively by helicopters for training purposes. This location would allow for simultaneous approaches by fixed wing aircraft to the parallel runways and helicopters operating on the training helipad. This facility would not provide helicopter parking spaces or any landside facilities.

AIRFIELD ALTERNATIVE 3

The proposed airside configuration of Airfield Alternative 3 is shown in **Exhibit 4E**. The following projects proposed in Airfield Alternative 3 differ from the previous airfield alternatives:

1. Construction of a third parallel runway (Runway 6L-24R). Runway 6L-24R would have a length of 4,800 feet and a width of 75 feet to conform to ARC B-II design standards. Existing Runway 6L-24R would be renamed Runway 6C-24C.

2. Construction of a full-length parallel taxiway for potential third parallel Runway 6L-24R.

3. Construction of a helipad and supporting landside facilities southwest of airfield adjacent Ajo Highway.

This airfield alternative differs only slightly from Airfield Alternative 2. The most obvious difference is the addition of a third parallel runway. This runway would alleviate capacity issues that go beyond what is projected in this master plan. Ultimate Runway 6L-24R would be used exclusively by small aircraft for training operations.

This airfield alternative proposes a helipad with helicopter parking spaces as well as support landside facilities.

Its location will allow for future expansion of the helipad and parking area if the demand rises. A disadvantage of this location is that it is secluded from other landside facilities, specifically fuel storage facilities. If this location is selected as the most desirable, it may need to have its own fuel storage capabilities.

LANDSIDE DEVELOPMENT CONSIDERATIONS

The purpose of this section is to identify and evaluate various viable landside development alternatives at Ryan Airfield to meet program requirements set forth in Chapter Three. While the airfield is comprised of facilities where aircraft movement occurs (runways, taxiways, ramps) other "landside" functions occur outside of this area. The primary functions to be accommodated on the landside of Ryan Airfield include terminal services, aircraft storage hangar development, aircraft parking aprons, revenue support, flight school facilities expansion, and automobile parking and access. The interrelationship of these functions is important to defining a long-range landside layout for general aviation uses at the airport. Runway frontage should be reserved for those uses with a high level of airfield interface or need of exposure. Other uses with lower levels of aircraft movements or little need for runway exposure can be planned in more isolated locations.

Landside development considerations are summarized on **Exhibit 4B**. The following sections briefly describe proposed landside facility improvements.

TERMINAL SERVICES

Currently, a combination of the TAA and several specialty operators located at Ryan Airfield provide a variety of terminal services. Typical services that are provided at a general aviation airport include passenger waiting areas, a pilot's lounge and flight planning area, concessions, management, storage, and various other needs. The facility requirements analysis indicated that through the long-term planning horizon, Ryan Airfield will need an additional 6,800 square feet of terminal service area. The landside alternatives analysis will identify potential locations for fixed base operator (FBO) development to meet the projected terminal service needs. The FBO facilities depicted on the landside alternative exhibits vary in size from 8,500 to 15,000 square feet to allow for their cross-utilization as aircraft storage facilities and a terminal service provider.

AIRCRAFT STORAGE HANGARS

The facility requirements analysis indicated a need for the development of various types of aircraft storage hangars. This includes single aircraft storage facilities such as T-hangars, box hangars, and shade hangars, executive conventional hangars which typically are used for the storage of larger multiengine turboprop and business jet aircraft, and clearspan conventional hangars for accommodating several

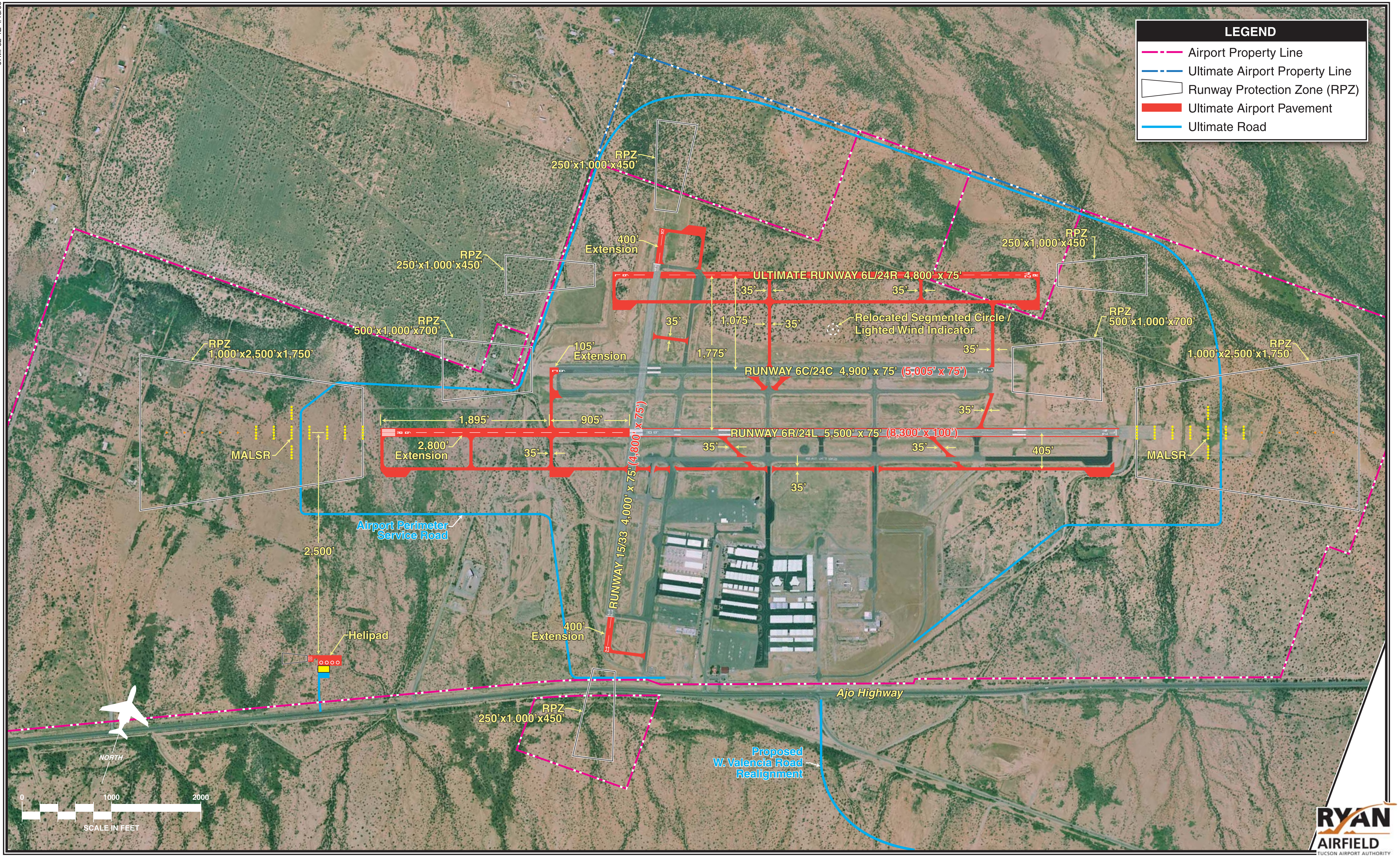

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Exhibit 4E
AIRFIELD ALTERNATIVE 3

aircraft simultaneously. Limited utility services are needed for these areas. Typically, this involves electricity, but may also include water and sanitary sewer.

AIRCRAFT PARKING APRON

As the number of transient and based aircraft increase through the planning period it will be important to provide adequate aircraft parking positions. It will be particularly important as turboprop and jet aircraft operations increase at Ryan Airfield that there is adequate parking for these larger, heavier aircraft. The landside alternative analysis will identify potential locations for aircraft parking apron expansion.

AUTOMOBILE PARKING

As based aircraft and operations at Ryan Airfield grow, automobile parking spaces will need to be increased. The existing automobile parking spaces at the airport are located adjacent to the restaurant/airport administration building and along Aviator Lane. Future areas of automobile parking expansion will be examined in each landside alternative.

FLIGHT SCHOOL FACILITIES EXPANSION

Areas for expansion of the flight school facilities will need to be considered in the landside alternatives analysis. While the airport is currently without a flight training operation, historically the flight school presence at Ryan Airfield has been cyclical. Therefore it is important to plan for the presence of a flight school in the future. Expansion needs for a potential flight school include a larger facility for classrooms and offices, aircraft parking spaces, and automobile parking.

REVENUE SUPPORT

The landside alternatives to follow consider options for the TAA to reserve parcels of land for aviation development, which will serve as revenue support for the airport. Aviation developments include but are not limited to hangar development, FBOs, and aviation specialty operators.

LANDSIDE ALTERNATIVES

LANDSIDE ALTERNATIVE 1

The layout for Landside Alternative 1 is depicted on **Exhibit 4F**. This landside alternative focuses hangar development to the east side of the terminal area with FBO development at the north end of Airfield Drive. The two 15,000 square foot FBO facilities would be located adjacent a 34,500 square yard apron that would serve a range of small single engine aircraft to larger turboprop and business jet aircraft. South of the FBO facilities are two 2.0 acre aviation development parcels that would be reserved for additional specialty operators or other aviation-related businesses. A 7,800-square-yard automobile parking lot would serve each of these facilities. An advantage of this layout is that it allows for the expansion of the apron to the north, and it centralizes the terminal services along the flight line. The expansion area for the flight school facility is located in the southwest corner of the terminal area. The proposed layout of the flight school area includes a 15,000 square foot facility with adjacent automobile parking, and an 18,000 square yard aircraft parking apron expansion. A 1.8 acre parcel of land would be reserved for any future expansion of flight school facilities.

Several aviation development parcels are located along the south end of Airfield Drive adjacent to the existing airport maintenance facilities. These parcels range in size from 1.0 acre to 2.0 acres. A 2.5 acre business park is located in the same area. Business park occupants would not have direct access to the airfield facilities, but would have good visibility from Ajo Highway to the south. A disadvantage of the layout of these parcels is that it limits expansion possibilities of the airport maintenance facility. An additional 13.2 acre aviation development parcel is located east of the proposed hangar development area. This parcel would be reserved for an aviation-related business that would need a large area of land for its facilities, or for additional hangar development.

The bulk of future hangar development would be located north of the business park and east of the FBO development area. This landside alternative proposes a total of 10 T-hangar facilities that would provide approximately 190 aircraft storage positions; 35 box hangar facilities ranging in size from 2,500 square feet to 3,600 square feet; one shade hangar facility that would provide 32 positions; eight executive conventional hangars ranging in size from 3,600 square feet to 5,850 square feet; and 25 5,625 square foot conventional hangars. A disadvantage of the hangar development area is if hangars are constructed along the flight line, it may limit apron expansion possibilities in the future.

A helicopter terminal area is also shown on Landside Alternative 1 southeast of the proposed business park. This helicopter terminal area includes a helipad, helicopter parking spaces, a terminal building, and automobile parking. This location is carried over from the airfield alternatives, so that this potential helipad location can be visualized along with potential landside development.

LANDSIDE ALTERNATIVE 2

The layout for Landside Alternative 2 is depicted on **Exhibit 4G**. In this alternative, a single 15,000 square foot FBO facility is located at the north end of Airfield Drive. The adjacent 21,950 square yard apron adjacent to the FBO facility would be considerably smaller than the apron proposed in Landside Alternative 1. A 2,000 square yard automobile parking lot would accompany the FBO facility.

Two 2.1 acre aviation development parcels are located to the south of the FBO facility. These parcels would be available for additional FBO or specialty operator development. These parcels are large enough for the

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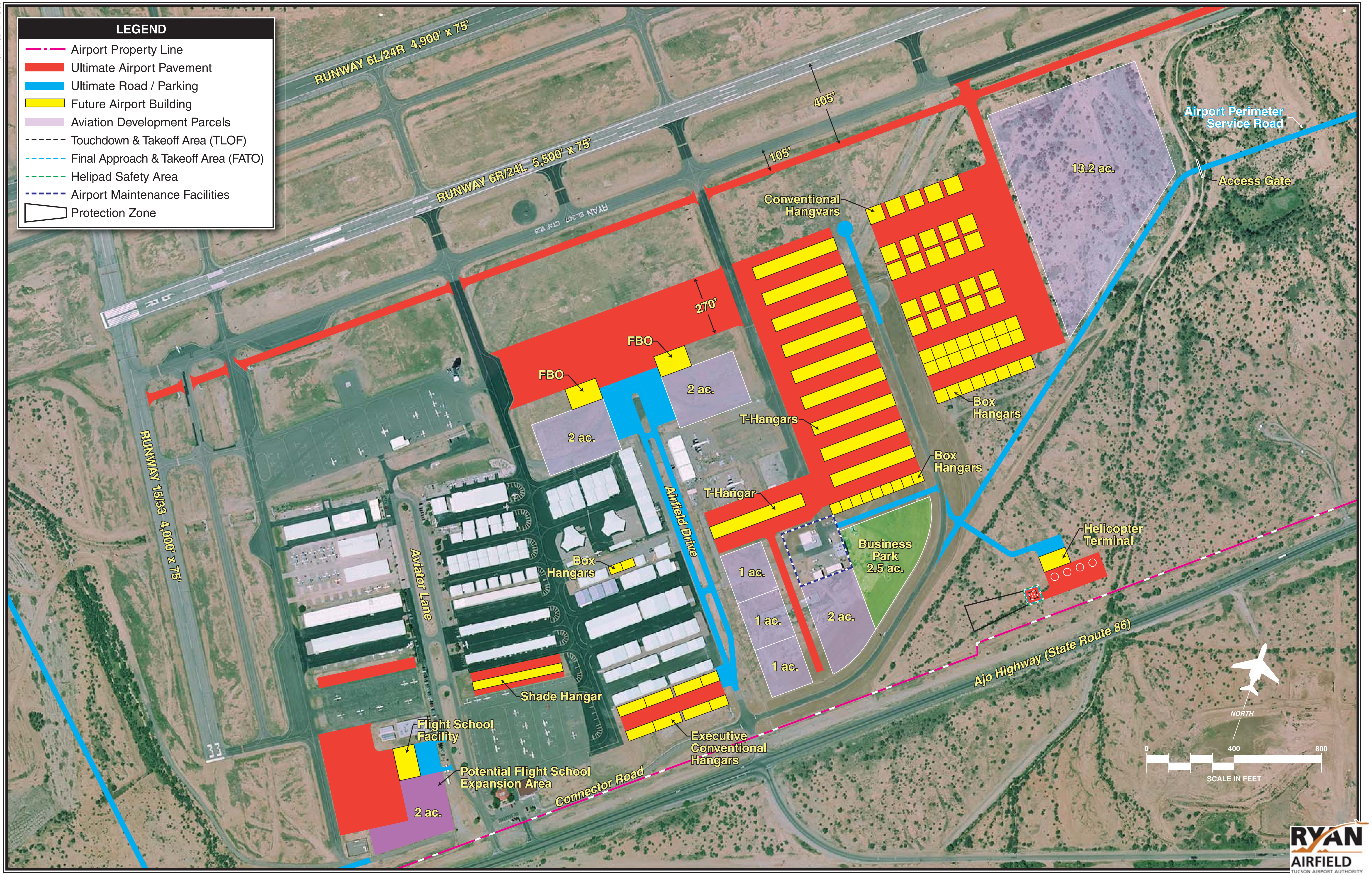

Exhibit 4F
LANDSIDE ALTERNATIVE 1

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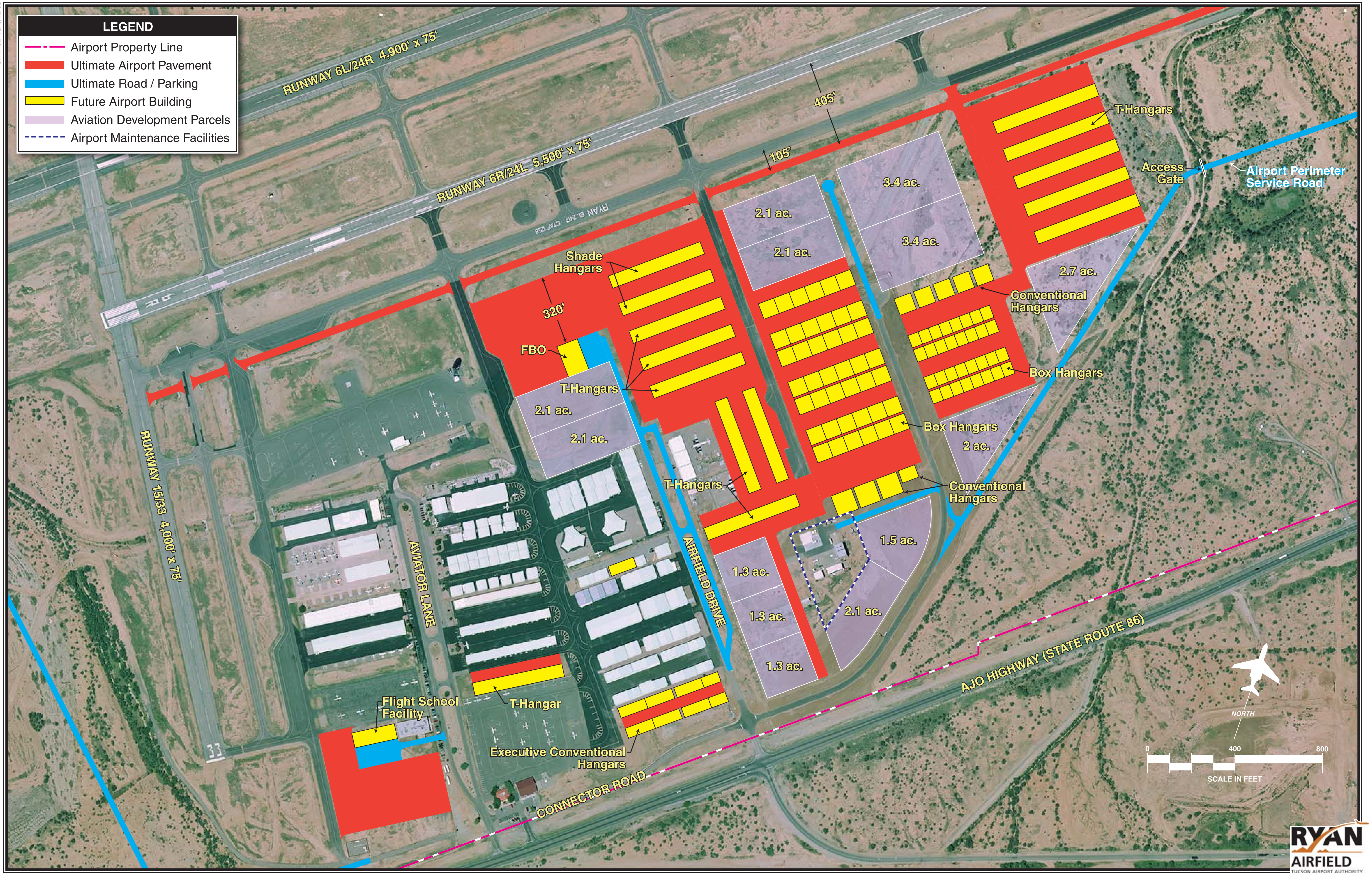

Exhibit 4G
LANDSIDE ALTERNATIVE 2

construction of a hangar facility, apron area, and automobile parking. Several other aviation development parcels are located in the terminal area. These parcels, ranging in size from 1.3 acres to 3.4 acres, would be available for hangar, FBO, or specialty operator development.

This alternative shows a similar layout for flight school facilities expansion as Landside Alternative 1. The layout closely follows the 1999 ALP proposal with a 14,000 square foot facility, automobile parking, and a 19,225-square-yard aircraft parking apron expansion.

Proposed hangar development in this alternative would provide significantly more hangar positions than Landside Alternative 1. This alternative proposes 12 T-hangar facilities that would provide approximately 242 total positions; two shade hangar positions providing 68 positions; 74 box hangars ranging in size from 3,000 square feet to 5,625 square feet; nine executive conventional hangars ranging in size from 3,600 square feet to 6,075 square feet; and nine conventional hangars ranging in size from 4,500 square feet to 10,000 square feet. The location of several of the shade hangar and T-hangar facilities could ultimately impede apron expansion in the future, especially in areas adjacent to the proposed FBO facility.

The airport maintenance facilities would remain in their present location in this alternative with a small section of land immediately south of the existing facilities reserved for future expansion needs. A new access road to these facilities would be constructed to the east.

LANDSIDE ALTERNATIVE 3

The layout for Landside Alternative 3 is depicted on **Exhibit 4H**. This alternative most closely resembles the layout for landside facilities presented on the 1999 ALP. The main focus of the landside facilities would be to develop the terminal area's central hub around FBO facilities and a large 50,800 square yard apron. A 6,700-square-yard automobile parking lot would serve the FBO facilities.

This landside development alternative gives more focus to aviation development parcels. There are a total of 14 aviation development parcels proposed in the terminal area ranging in size from 1.1 acre to 3.5 acres. These parcels give more flexibility to the TAA and developers when it comes to the layout of facilities within the given parcels. A 6.6 acre business park is located south of the existing airport maintenance facility. This area would serve as a center for businesses on the airport that would not need immediate airfield access. A flight school expansion area is shown adjacent to the existing flight school facilities. This development parcel encompasses the same development area proposed in the previous landside alternatives. Again, the advantage of showing a parcel as opposed to the layout of facilities is to allow for flexibility.

Hangar development in this landside alternative is much more limited compared to the previous landside alternatives. This is due to the increased focus on aviation development parcels. However, it is anticipated that several of the aviation development parcels would be utilized for the construction of hangar facilities. Hangar storage units depicted on Landside Alternative 3 include seven T-hangar facilities proposed east of the FBO development area that would provide approximately 119 storage positions; one shade hangar that would provide 32 storage positions; 10 2,500-square-foot box hangars; and one 6,000-square-foot conventional hangar. The hangar facilities on this alternative are shown to be located away from the flight line. This is to allow for easier expansion of the apron and to provide for additional locations for FBO and specialty operator development.

SUMMARY

The process utilized in assessing airside and landside development alternatives involved a detailed analysis of short and long-term requirements, as well as future growth potential. Current airport design standards were considered at each stage of development.

These alternatives present an ultimate configuration of the airport that would need to be able to be developed over a long period of time. The next phase of the Master Plan will define a reasonable phasing program to implement a preferred master plan development concept over time.

Upon review of this chapter by the TAA, the public, and the PAC, a final Master Plan concept can be formed. The resultant plan will represent an airside facility that fulfills safety and design standards, and a landside complex that can be developed as demand dictates.

The preferred master plan development concept for the airport must represent a means by which the airport can grow in a balanced manner, both on the airside as well as the landside, to accommodate forecast demand. In addition, it must provide for flexibility in the plan to meet activity growth beyond the 20-year planning period.

The remaining chapters will be dedicated to refining these basic alternatives into a final development concept with recommendations to ensure proper implementation and timing for a demand-based program.

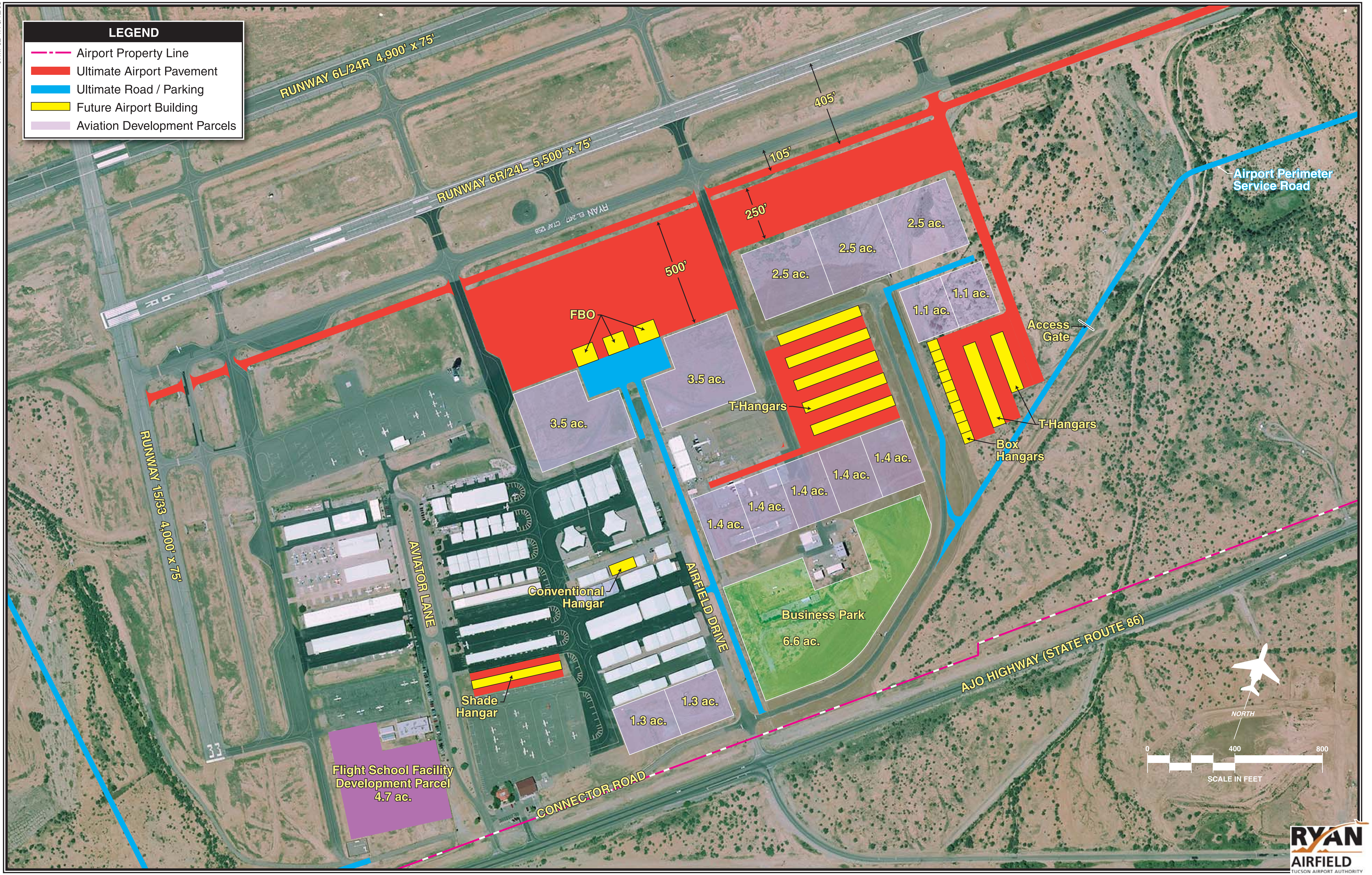

Exhibit 4H
LANDSIDE ALTERNATIVE 3

RYAN AIRFIELD
TUCSON AIRPORT AUTHORITY

Chapter 5

AIRPORT PLANS

Chapter Five

Airport Plans

The planning process for the Ryan Airfield Master Plan has involved several analytic efforts in the previous chapters intended to project potential aviation demand, establish airside and landside facility needs, and evaluate options for improving the airport to meet those airside and landside facility needs. The process, thus far, has included the presentation of two draft working paper reports (representing the first four chapters of the Master Plan) to the Planning Advisory Committee (PAC) and the Tucson Airport Authority (TAA). A plan for the use of Ryan Airfield has evolved considering their input. The purpose of this chapter is to describe, in narrative and graphic form, the plan for the future use of Ryan Airfield.

AIRFIELD PLAN

The airfield plan for Ryan Airfield focuses on meeting Federal Aviation Administration (FAA) design and safety standards and improving airfield efficiency and safety. Several different methods of improving the airfield efficiency and safety will be undertaken including: an 800-foot extension on the west end of Runway 6R-24L to relocate the threshold west of the crosswind runway; additional exit taxiways; dual-parallel taxiways for the primary runway; additional holding aprons; and a helicopter training touchdown and lift-off area (TLOF) and heliport which will separate rotorcraft operations from fixed-wing operations.

Additional airfield improvements will be undertaken to accommodate increased use by a wider range of business jet aircraft and to meet FAA recommended runway lengths for the design aircraft of each runway. This results in projects to ultimately extend primary Runway 6R-24L to achieve an ultimate runway length of 8,300 feet, lengthening parallel Runway 6L-24R to achieve an ultimate length of 5,005 feet, and lengthening crosswind Runway 15-33 to 4,800 feet.

Exhibit 5A graphically depicts the proposed airfield improvements. The following text summarizes the elements of the airfield plan.

AIRFIELD DESIGN STANDARDS

As discussed in Chapter Three, Facility Requirements, the primary runway at Ryan Airfield is currently designed to Airport Reference Code (ARC) B-II standards. Ultimately, as business jet activity at Ryan Airfield increases, the airport's critical aircraft will be in the ARC D-II category. To accommodate these larger and faster business jet aircraft, the primary runway will need to meet ARC D-II design standards. Assigning ARC D-II to the ultimate design of the primary runway provides for a wider range of corporate aircraft, including the Cessna Citation X, Challenger 600, and the Gulfstream IV.

One of the most notable effects of the ARC D-II design standards is that Runway 6R-24L will need to be widened to 100 feet. The runway safety area (RSA) and object free area (OFA) will widen and extend 1,000 feet beyond the runway end. Having extra runway width and larger safety areas will make operations safer for aircraft with faster landing and takeoff speeds.

The parallel runway is planned to be designed to ARC B-II standards. This will allow it to be used by a wide range of aircraft from small single engine-piston to a variety of business jet aircraft. These design standards will allow the majority of aircraft operating at Ryan Airfield to utilize the parallel runway in situations when the primary runway is unavailable for use.

ARC B-I (small airplane only) design standards will be applied to Runway 15-33. The purpose of Runway 15-33 will continue to provide an alternative to the parallel runways during periods of high cross-winds, exclusively for small aircraft.

The ultimate airfield safety and facility design standards for each runway are shown in **Table 5A**.

AIRFIELD DEVELOPMENT

In addition to capacity and airfield design improvements, drainage improvements throughout the airfield system will need to be undertaken. The airport is located in a 100-year floodplain, and as a result, its facilities need to be able to handle water runoff that flows from the south of the airport to the north. When Runway 6R-24L and its associated taxiways were originally constructed, drainage facilities, such as culverts under the runway, were not installed. As a result, water collects on the south side of the runway and sheet flows across the tax-

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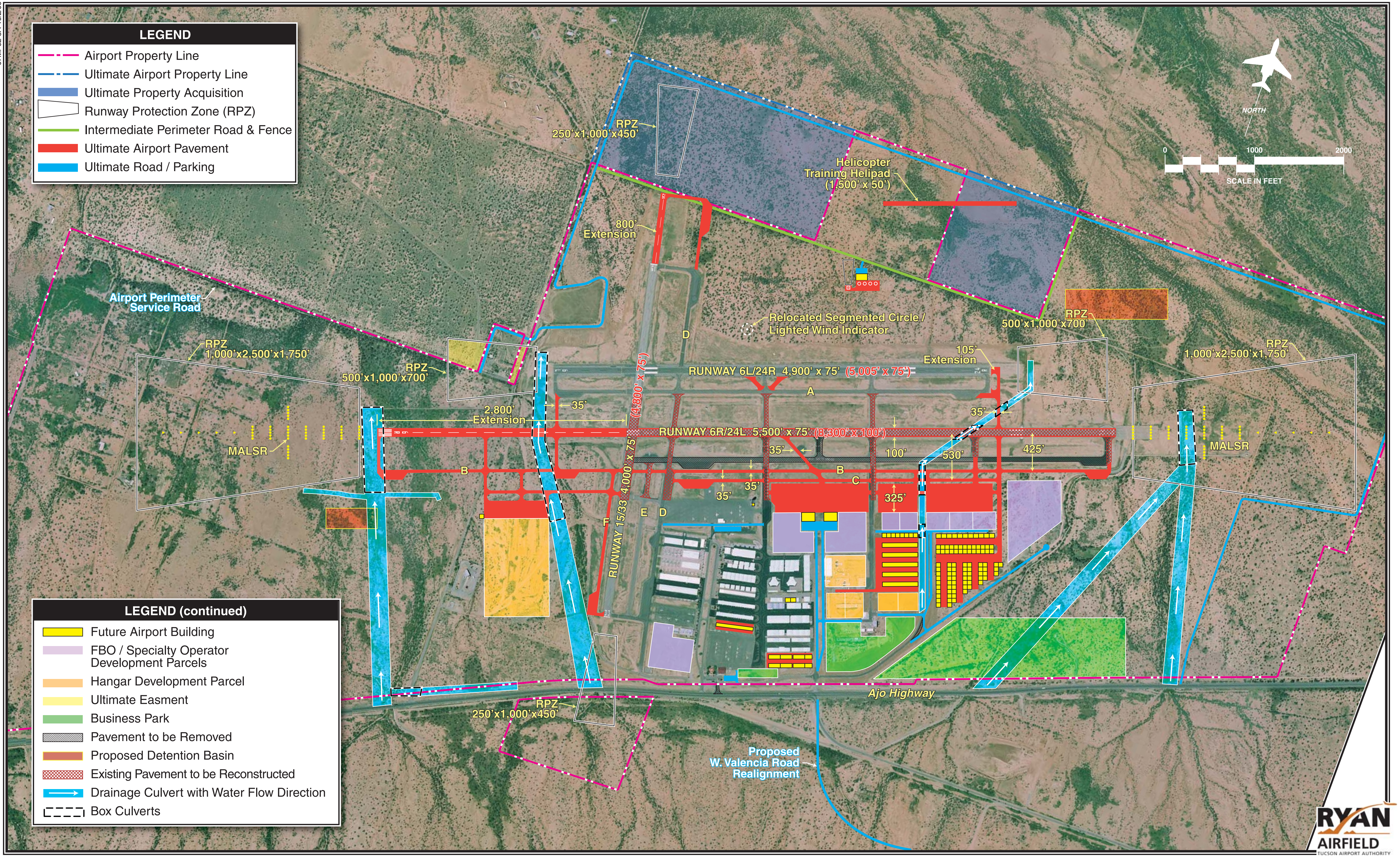

Exhibit 5A
AIRFIELD DEVELOPMENT CONCEPT

iway and runway, creating pavement maintenance and aircraft operations issues. Due to the grade of the airfield, which slopes downward from the south to the northeast, and the limited grade from east to west, channeling the runoff around the runway is not possible. Therefore, drainage culverts need to be installed underneath Runway 6R-24L to provide a path for water flowage that will not damage infrastructure and endanger operations. According to Ryan Airfield's drainage master plan, which was prepared by Stantec in 2006 to properly install culverts, the full existing length of Runway 6R-24L will need to be raised over six feet.

TABLE 5A
Airfield Safety and Facility Dimensions (in feet)

	Ultimate Runway 6R-24L	Ultimate Runway 6L-24R	Ultimate Runway 15-33
Airport Reference Code (ARC)	D-II	B-II	B-I (small aircraft)
Approach Visibility Minimums	½ Mile Each End	One Mile Each End	One Mile Each End
Runway			
Length	8,300	5,005	4,800
Width	100	75	75
Runway Safety Area (RSA)			
Width	500	150	150
Length Beyond Runway End	1,000	300	300
Object Free Area (OFA)			
Width	800	500	500
Length Beyond Runway End	1,000	300	300
Obstacle Free Zone (OFZ)			
Width	400	400	250
Length Beyond Runway End	200	200	200
Precision Obstacle Free Zone (POFZ)			
Width	800	N/A	N/A
Length Beyond Runway End	200	N/A	N/A
Runway Centerline To:			
Hold Line	275	200	125
Parallel Taxiway Centerline	425	240	240
Edge of Aircraft Parking Apron	500	250	250
Runway Protection Zone (RPZ)			
Inner Width	1,000	500	250
Outer Width	1,750	700	450
Length	2,500	1,000	1,000
Obstacle Clearance	50:1	20:1	20:1
Taxiways			
Width	35	35	35
Safety Area Width	79	79	79
Object Free Area Width	131	131	131
Taxiway Centerline To:			
Parallel Taxiway/Taxilane	105	105	105
Fixed or Moveable Object	65.5	65.5	65.5
Taxilanes			
Taxilane Centerline To:			
Parallel Taxilane Centerline	97	97	97
Fixed or Moveable Object	57.5	57.5	57.5
Taxilane Object Free Area	115	115	115

Source: FAA Advisory Circular (AC) 150/5300-13, *Airport Design, Change 14*; 14 CFR Part 77, *Objects Affecting Navigable Airspace*

The project to raise the primary runway will present the opportunity to set up the airport to meet ARC D-II design standards. The existing 300-foot centerline separation distance between Taxiway B and Runway 6R-24L does not meet the ultimate 425-foot ARC D-II design standard. Instead of reconstructing Taxiway B for drainage purposes at its present separation distance, the existing Taxiway B pavement will be removed and reconstructed at the appropriate 425-foot separation standard. This reconstruction will include proper drainage channels underneath the pavement.

Raising the primary runway and relocating Taxiway B will result in the need to raise portions of Runway 15-33 and other associated taxiways. FAA Advisory Circular 150/5300-13, *Airport Design*, states that the longitudinal grade limitations for airfield surfaces designed for approach categories C and D is from zero percent to 1.5 percent. To meet this grade limitation, 450-foot sections of Runway 15-33, Taxiway D, and Taxiway E south of Taxiway B will need to be raised. Additionally, 450-foot sections of Runway 15-33 and Taxiway D north of Runway 6R-24L will also need to be raised.

In conjunction with the runway raising project, the primary runway and associated taxiways will be strengthened to 75,000 pounds dual wheel loading (DWL). Strengthening the runway will allow it to be used by larger business jet aircraft such as the Gulfstream IV.

Once the drainage and strengthening projects have been completed, the Runway 6R end is planned to be extended by 800 feet to the west. This will relocate the threshold to the west of the crosswind runway, which will improve airfield capacity and safety. The primary runway is planned to an ultimate length of 8,300 feet and a width of 100 feet. A dual-partial parallel Taxiway C is planned to be located 530 feet from the Runway 6R-24L centerline. This taxiway will improve airfield circulation and will meet ARC D-II runway and taxiway centerline separation standards.

A high-speed exit and right-angled exits are planned for the primary runway to reduce runway occupancy time and to improve airfield capacity. Each extension to the runway will also involve extending the relocated Taxiway B and additional holding aprons.

Runway 6L-24R is ultimately planned to be extended by 105 feet to the east for a length of 5,005 feet. A length greater than 5,000 feet will help with airfield capacity and backup capability when the primary runway is closed. It will also allow the existing and ultimate Runway 24R threshold access taxiways to meet separation standards. Ultimately, a taxiway is planned to provide access from the Runway 24R threshold south to a hangar development area and north to a potential third parallel runway.

Crosswind Runway 15-33 will remain designed exclusively for small airplanes. The runway is planned for an ultimate length of 4,800 feet to meet the FAA recommended runway length for this type of aircraft usage. An extension is planned 800 feet to the north along with parallel Taxiway D and a new holding apron. A partial parallel taxiway is planned at the southwest end of Runway 15-33. This partial parallel taxiway will have a runway centerline separation distance of 150 feet, which meets the ARC B-I (small airplane exclusive) design standard.

A full-service general aviation heliport is planned to the north of the airfield. This heliport would be equipped with a full-stop helipad and adjoining helicopter parking spaces. The heliport is not intended to be used for helicopter training operations, but as an itinerant operations area for helicopters to park and receive fixed base operator (FBO) services. This site would segregate itinerant helicopter operations from fixed-wing operations to the greatest extent possible, improving airfield capacity and safety.

A helicopter training touchdown and lift-off area (TLOF) is planned adjacent to the heliport. This training TLOF is planned for a length of 1,500 feet and a width of 50 feet and would serve as a location for helicopters to conduct auto rotations and other training operations. This will relieve the crosswind runway of this type of use and improve airfield capacity and safety.

Runway 6R-24L is currently equipped with medium intensity runway lighting (MIRL). Runways 6R-24L and 15-33 are planned to have MIRL installed on existing and ultimate pavement. Medium intensity taxiway lighting (MITL) is installed on entrance/exit taxiways B2, B3, B4, B5, and B6. The remainder of the taxiway system is not equipped with a lighting system. All existing and planned taxiways without MITL are planned to be equipped with MITL.

The extension of Runway 15 and the construction of the helicopter training TLOF and the airport perimeter service road will necessitate the acquisition of land north of the airport. A total of approximately 119.3 acres of land is proposed for acquisition divided between two parcels. Both parcels of land are presently privately owned and are recommended to be acquired by the TAA via fee simple acquisition. These parcels are identified on **Exhibit 5A** with blue shading.

The segmented circle and lighted wind indicator are currently located within the Runway 6R-24L object free area (OFA) and in an area planned for a future high-speed exit taxiway. Therefore, both should be relocated to an area outside of any proposed runway safety area and development. The airfield development concept relocates the segmented circle and lighted wind indicator to the north between Runway 6L-24R and the ultimate third parallel runway.

A paved airport perimeter service road is planned to allow public access to the heliport and to provide service and emergency vehicles access to all areas of the airfield. The initial and ultimate design of this perimeter road is depicted on **Exhibit 5A**. The perimeter road should remain clear of all runway safety areas where possible.

LANDSIDE PLAN

The landside plan for Ryan Airfield has been devised to safely, securely, and efficiently accommodate potential aviation demand. The landside plan provides for the development of the flight line to the east of the existing landside facilities area. The Landside Development Concept includes locations for FBO development, hangar development, and business development. The landside development concept is shown in detail on **Exhibit 5B**.

The primary focus of the landside development concept is to provide adequate hangar and apron facilities while utilizing existing airport lands and utilities to the extent possible. This includes maintaining proper drainage channels and planning for future drainage facilities.

The flight line, parallel to the proposed Taxiway C and existing Taxiway B, is planned for the development of a total of approximately 88,200 square yards of apron. The easternmost apron is split into two separate aprons to allow for a drainage channel running from the south to the north. The access road to this area is also planned to allow for the drainage channel to run parallel on the west side of the road.

The westerly proposed apron serves two 15,000 square-foot conventional hangars planned for potential FBO development. Adjacent to these FBO hangars are two 4.0 acre parcels for similar FBO/specialty operator developments. These facilities will be served by a 4,444 square-yard automobile parking lot. The parking lot would be accessible via a new airport entrance intersection at Ajo Highway and Airfield Drive. Airfield Drive itself is planned to be developed into a "boulevard" style roadway.

Several hangar development parcels ranging in size from 1.0 acres to 3.6 acres are planned to the east of Airfield Drive. These parcels will be leased by the TAA to developers for the purpose of constructing hangar facilities. These parcels will serve as a valuable revenue source for the TAA. Five T-hangar facilities and a set of eight 2,500 square foot box hangars are planned in this area as well providing an additional 93 individual storage units. Five FBO/specialty operator development parcels ranging in size from 0.9 acres to 1.2 acres are planned south of the expanded apron areas. These parcels are ideal for an aviation-related business that would need direct access to the apron and the airfield. These parcels would also serve as a revenue source for the TAA. An additional 92 box hangars are planned to the south of the FBO/specialty operator parcels. These box hangars vary in size from 2,500 square feet to 3,000 square feet and can provide storage for multiple aircraft. A large 9.3 acre FBO/specialty operator parcel is planned at the far east end of the landside development area. This parcel will be reserved for an aviation-related business that would need direct airfield access and a large area for development to conduct its operations.

Several box/conventional style hangars are planned to the northwest of

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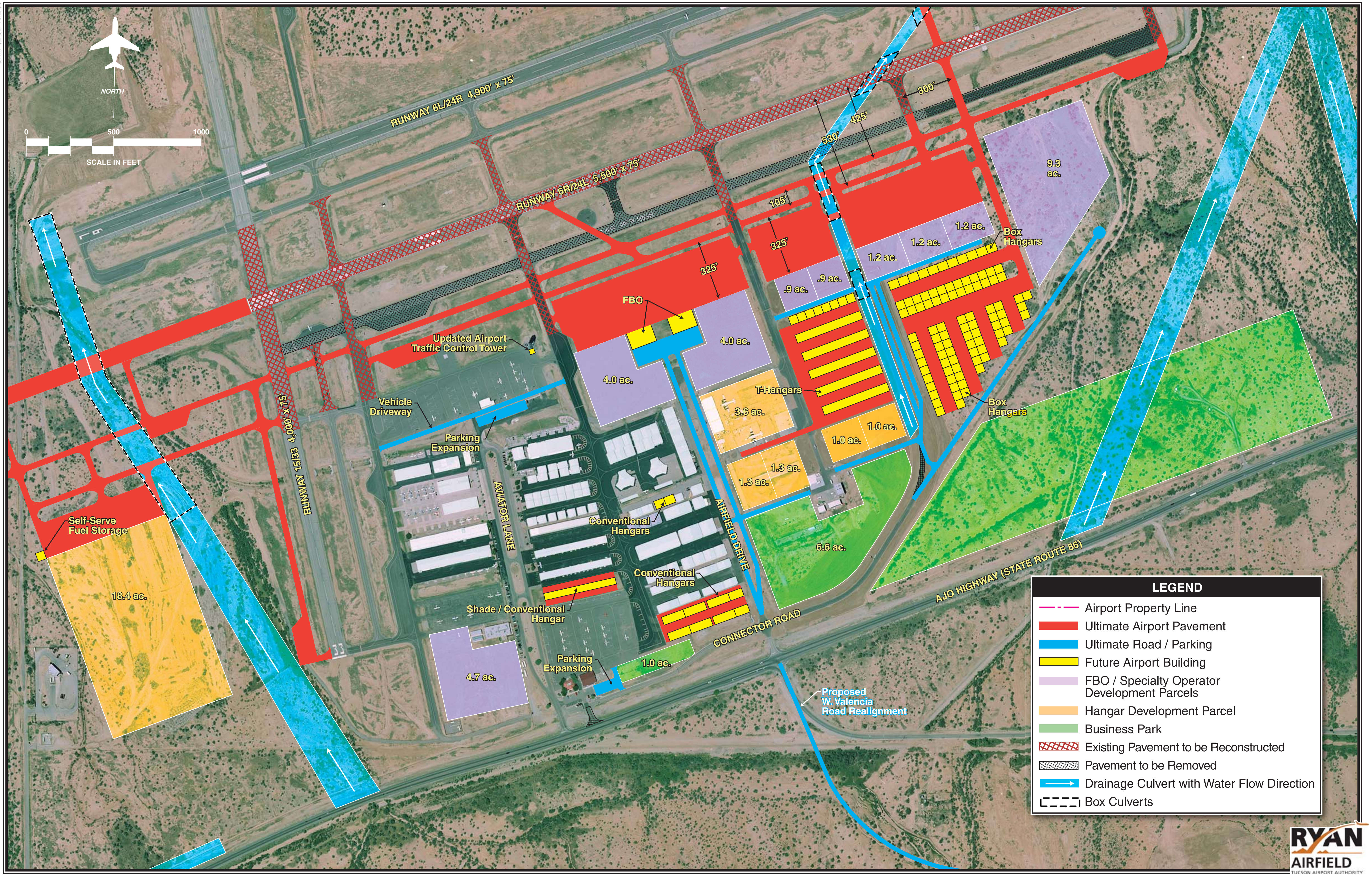


Exhibit 5B
LANDSIDE DEVELOPMENT CONCEPT

the intersection of Airfield Drive and Connector Road. An additional shade hangar facility is planned to the north of the existing apron adjacent to the administration building. A new access road is planned to extend from Connector Road north to the apron to allow fuel trucks access to the self-service fuel facility. The administration building parking lot would be expanded east to this access road.

A 4.7 acre parcel of land adjacent to the flight school facility is planned to be reserved for any future expansion of the flight school facility. This could include the expansion of the apron, office/classroom facilities, and automobile parking.

The existing airport traffic control tower (ATCT) does not meet the space and functional needs of the airport traffic controllers. Therefore, a new ATCT is planned to be constructed on the same site as the existing ATCT. A temporary tower would be needed in the interim while the new ATCT is constructed. This temporary tower could be located adjacent to the existing tower. The new tower will be constructed to a higher elevation to allow for greater visibility of the airfield and taxiway areas and with increased area to allow for all needed equipment and office space.

The automobile parking lot immediately south of the north apron is planned to be expanded to the west. An airside automobile access road is planned to extend from Taxiway D across the north apron to Taxiway B2. This designated roadway provides a clear path for vehicles on the apron reducing chances for potential incursions.

A 6.6 acre parcel of land northeast of the Airfield Drive and Connector Road intersection, a 1.0 acre parcel east of the airport administration building, and a 37.0 acre parcel along Ajo Highway are planned for the development of a business park. This land would be leased by the TAA to aviation or non-aviation related businesses that would not need access to the airfield. This type of development can generate a significant revenue source for the TAA. The airport's maintenance facilities would be maintained in their present location with an additional access road extending to the east.

In time it may become necessary for the development of land on the west side of Runway 15-33. This plan provides for a partial parallel taxiway to the southern portion of Runway 15-33 and a 16,225 square yard apron. An 18.4 acre parcel of land is reserved for ultimate hangar development. A self-service fuel storage facility is also planned in the west landside development area to eliminate the need for aircraft to taxi across an active runway to fuel.

AIRPORT LAYOUT PLAN DRAWINGS

Per FAA and Arizona Department of Transportation (ADOT) requirements, an official Airport Layout Plan (ALP) has been developed for Ryan Airfield. The "Draft" ALP drawing set (Sheets 1, through 18) can be found at the end of this chapter. The airport layout drawing (ALD) (**Sheet 1**) graphically presents the existing and ultimate airport layout. The ALP is used, in part by the FAA and ADOT, to determine funding eligibility for future development projects. The ALP was prepared on a computer-aided drafting system for future ease of use. The computerized plan set provides detailed information of existing and future facility layout on multiple layers that permits the user to focus in on any section of the airport at a desirable scale. The plan can be used as base information for design and can be easily updated in the future to reflect new development and more detail concerning existing conditions as made available through design surveys.

A number of related drawings, which depict the ultimate airspace and landside development, are included with the ALP. The following provides a brief discussion of the additional drawings included with the "Draft" ALP:

Data Sheet (Sheet 2) – The data sheet provides tables, which present specific information for the airport including dimensions of airfield facilities and building uses.

Terminal Area/Airport Landside Facilities Drawing (Sheet 3) – The terminal area drawing provides greater detail concerning landside improvements on the east and west sides of the runway and at a larger scale than on the ALP.

Airport Airspace Drawing (Sheets 4 and 5) – The Airport Airspace Drawing is a graphic depiction of the Title 14 Code of Federal Regulations (CFR) Part 77, *Objects Affecting Navigable Airspace*, regulatory criterion. The Airport Airspace Drawing is intended to aid local authorities in determining if proposed development could present a hazard to the airport and obstruct the approach path to a runway end. This plan should be coordinated with local land use planners.

Airport Airspace Profile Drawing (Sheets 6 through 10) – These drawings provide both plan and profile views of the 14 CFR Part 77 approach surfaces for each runway end. A composite profile of the extended ground line is depicted. Obstructions and clearances over terrain are shown as appropriate. The ultimate 40:1 precision approach surface for Runway 24L is shown to be obstructed by terrain.

Inner Portion of the Approach Surface Drawings (Sheets 11 through 16) – The Inner Portion of the Approach Surface Drawings are scaled drawings of the runway protection zone (RPZ) for each runway end. A plan and profile view of each RPZ is provided to facilitate identification of obstructions that lie within these safety areas. Detailed obstruction and facility data is provided to identify planned improvements and the disposition of obstructions (as appropriate).

Airport Property Map/Exhibit A (Sheet 17) – The Airport Property Map provides information on the acquisition and identification of all land tracts under the control of the airport. Both existing and future property holdings are identified on the "Exhibit A" Property Map.

On-Airport Land Use Drawing (Sheet 18) – The On-Airport Land Use Drawing is a graphic depiction of the land use recommendations. When development is proposed, it should be directed to the appropriate land use area depicted on this plan.

There are five primary land use designations, they are:

- Airfield Operations
- General Aviation
- Revenue Support Aviation Related
- Commercial Industrial
- Open Space

These designations are defined in the glossary section of the Master Plan. The land use plan also delineates areas that have a mixed land use designation (denoted by contrasting stripes). The mixed land use designation provides a greater degree of flexibility in guiding future development by allowing a range of uses that reflect the market condition and development patterns prevalent at the time of development.

The ALP set has been developed in accordance with accepted FAA and Arizona Department of Transportation (ADOT) – Aeronautics Division standards. The ALP set has not been approved by the FAA and is subject to FAA airspace review. Land use and other changes may result.

SUMMARY

The Master Plan for Ryan Airfield has been developed in cooperation with the PAC, interested citizens, and the TAA. It is designed to assist the TAA in making decisions relative to the future use of Ryan Airfield as it is maintained and developed to meet its role as defined in Chapter Two.

Flexibility will be a key to the plan, since activity may not occur exactly as forecast. The Master Plan provides the TAA with options to pursue in marketing the assets of the airport for community development. Following the general recommendations of the plan, the airport can maintain its viability and continue to provide air transportation services to the region.

RYAN AIRFIELD
AIRPORT LAYOUT PLANS

PREPARED FOR THE
TUCSON AIRPORT AUTHORITY

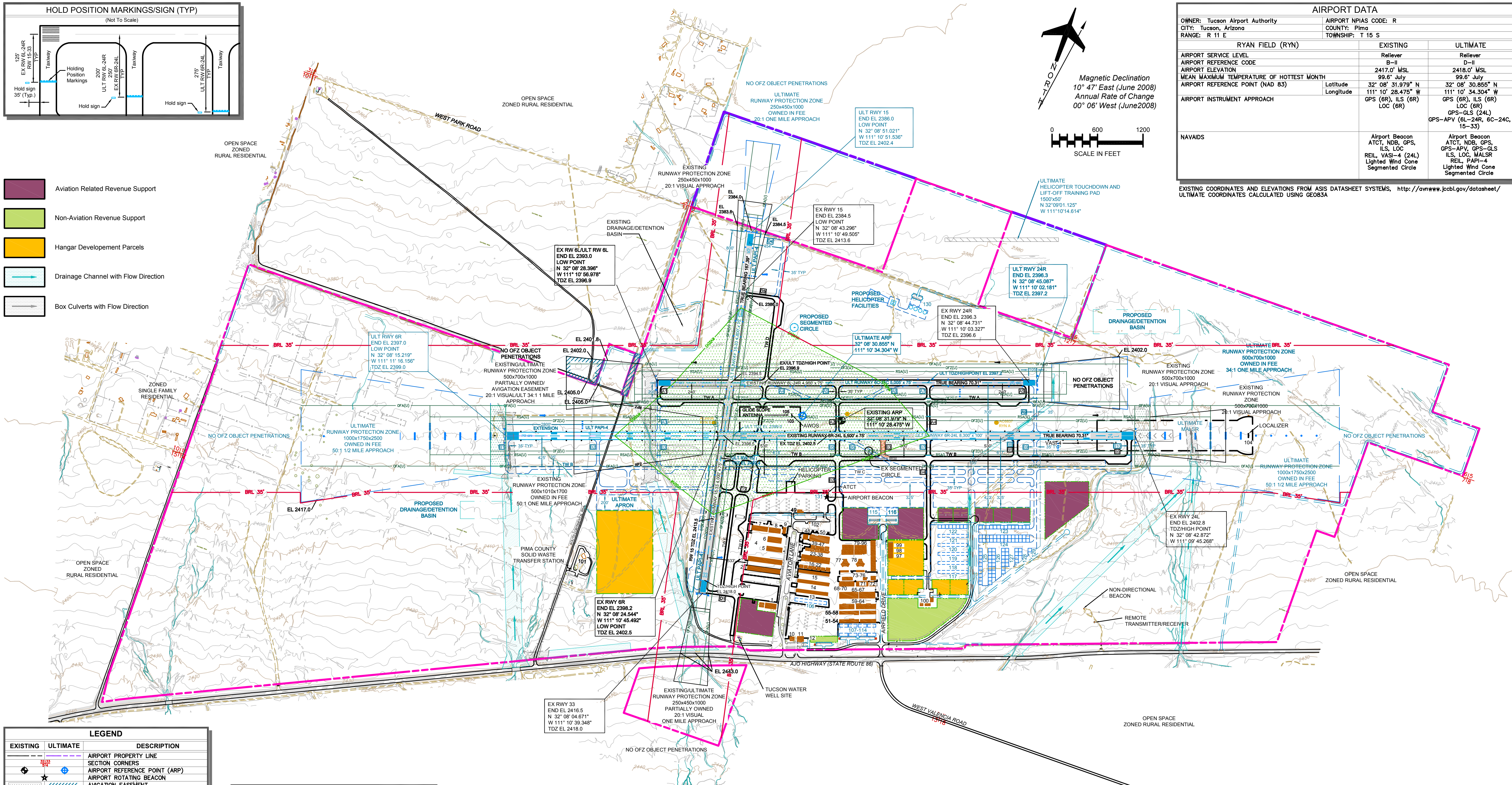
DRAWING INDEX

TUCSON AIRPORT AUTHORITY
TUCSON INTERNATIONAL AIRPORT • RYAN AIRFIELD

DRAFT

Coffman Associates
Airport Consultants

March 18, 2010



AIRPORT DATA

OWNER: Tucson Airport Authority	AIRPORT NPIAS CODE: R
CITY: Tucson, Arizona	COUNTY: Pima
RANGE: R 11 E	TOWNSHIP: T 15 S

RYAN FIELD (RYN)		EXISTING	ULTIMATE
AIRPORT SERVICE LEVEL		Reliever	Reliever
AIRPORT REFERENCE CODE		B-II	D-II
AIRPORT ELEVATION		2417.0' MSL	2418.0' MSL
MEAN MAXIMUM TEMPERATURE OF HOTTEST MONTH		99.6° July	99.6° July
AIRPORT REFERENCE POINT (NAD 83)	Latitude	32° 08' 31.979" N	32° 08' 30.855" N
	Longitude	111° 10' 28.475" W	111° 10' 34.304" W
AIRPORT INSTRUMENT APPROACH		GPS (6R), ILS (6R) LOC (6R)	GPS (6R), ILS (6R) LOC (6R) GPS-GLS (24L) GPS-APV (6L-24R, 6C-24C, 15-33)
NAVAIDS		Airport Beacon ATCT, NDB, GPS, ILS, LOC REIL, VASI-4 (24L) Lighted Wind Cone Segmented Circle	Airport Beacon ATCT, NDB, GPS, GPS-APV, GPS-GLS ILS, LOC, MALSR REIL, PAPI-4 Lighted Wind Cone Segmented Circle

EXISTING COORDINATES AND ELEVATIONS FROM ASIS DATASHEET SYSTEMS, http://avnwww.jccbi.gov/datasheet/
ULTIMATE COORDINATES CALCULATED USING GEO83A

LEGEND

EXISTING	ULTIMATE	DESCRIPTION
		AIRPORT PROPERTY LINE
		SECTION CORNERS
		AIRPORT REFERENCE POINT (ARP)
		AIRPORT ROTATING BEACON
		AVIGATION EASEMENT
BRL		BUILDING RESTRICTION LINE
		STRUCTURES ON AIRPORT
		STRUCTURE OFF AIRPORT
		AIRPORT PAVEMENT
		FENCING
		GLIDESLOPE ANTENNA
		GLIDESLOPE CRITICAL AREA
N/A		ABANDON PAVEMENT
		HELICOPTER PARKING
N/A		HELICOPTER TRAINING PAD
		HOLD MARKING
		LIGHTED WINDSOCK
		EXISTING LOCALIZER
		MEDIUM INTENSITY RUNWAY LIGHTING
OFA	OFA(U)	OBJECT FREE AREA
RSA	RSA(U)	RUNWAY SAFETY AREA
OFZ	OFZ(U)	OBSTACLE FREE ZONE
		PRECISION OBSTACLE FREE ZONE
		RUNWAY PROTECTION ZONE
RVZ		ULTIMATE RUNWAY VISIBILITY ZONE
		ULTIMATE PAPI
		RUNWAY END IDENTIFIER LIGHTS (REILS)
RYN		SURVEY MONUMENT WITH IDENTIFIER
B2	B2	TAXIWAY DESIGNATION
T		TIE DOWN
2400	2400	TOPOGRAPHY
		VGSI
		MALSR

RUNWAY END COORDINATES (NAD 83)

RUNWAY	LATITUDE	LONGITUDE
EXISTING RUNWAY 6R	32° 08' 24.544" N	111° 10' 45.492" W
ULTIMATE RUNWAY 6R	32° 08' 15.219" N	111° 11' 16.156" W
EXISTING RUNWAY 24L	32° 08' 42.872" N	111° 09' 45.268" W
EXISTING RUNWAY 6L	32° 08' 28.396" N	111° 10' 56.978" W
EXISTING RUNWAY 24R	32° 08' 44.731" N	111° 10' 03.327" W
ULTIMATE RUNWAY 24R	32° 08' 45.087" N	111° 10' 02.181" W
EXISTING RUNWAY 15	32° 08' 43.296" N	111° 10' 49.505" W
ULTIMATE RUNWAY 15	32° 08' 51.021" N	111° 10' 51.536" W
EXISTING RUNWAY 33	32° 08' 04.671" N	111° 10' 39.348" W

EXISTING RUNWAY END COORDINATES NOTED IN ABOVE TABLE FROM ASIS DATASHEET SYSTEMS, http://avnwww.jccbi.gov/datasheet/

SURVEY CONTROL STATIONS

ID	PERMANENT IDENTIFIER	LATITUDE	LONGITUDE
RYN A	AC6837	32° 08' 38.421" N	111° 10' 05.924" W
RYN B	AC6838	32° 08' 25.977" N	111° 10' 46.733" W
RYN C	AC6836	32° 08' 32.919" N	111° 10' 27.932" W

RYN A SETTING: IN TOP OF CONCRETE MONUMENT FLUSH WITH GROUND
RYN B SETTING: IN PREFABRICATED CONCRETE POST IMBEDDED IN GROUND
RYN C SETTING: STAINLESS STEEL ROD W/O SLEEVE (10' +)

GENERAL NOTES:

1. HORIZONTAL DATUM: NORTH AMERICAN DATUM 1983 – NAD83, STATE PLANE, ARIZONA CENTRAL, FIPS 0202; VERTICAL DATUM: NORTH AMERICAN DATUM 1988 – NAVD88.
2. ALL EXISTING RUNWAY END ELEVATIONS, COORDINATES, AND BEARINGS NOTED IN THIS ALP FROM ASIS DATASHEET SYSTEMS, http://avnwww.jccbi.gov/datasheet/ PER STANTEC CONSULTING
3. SURVEY OF ON AIRPORT ENVIRONS PROVIDED BY STANTEC CONSULTING.
4. ALL ULTIMATE COORDINATES CALCULATED WITH GEO83A
5. NO OFZ PENETRATIONS
6. SEE AIRPORT LAND USE DRAWING, SHEET 18 OF 18 FOR RECOMMENDED LAND USES WITHIN THE AIRPORT ENVIRONS.

FAA APPROVAL STAMP

FOR APPROVAL BY
Tucson Airport Authority
DATE:

No.	REVISIONS	BY		DATE
4	UPDATED AIRPORT MASTER PLAN	K.L.W.	M.F.J.	12/07/00
3	UPDATED AIRPORT MASTER PLAN	R.A.L.	S.G.B.	02/29/00
2	UPDATED FOR REVALIDATION	M.E.S.	M.F.J.	10/29/96
1	REVISED/UPDATED ALP (FAA/ADOT APPROVAL)	W.E.H.	J.M.H.	08/02/96

"THE PREPARATION OF THESE DOCUMENTS WAS FINANCED IN PART THROUGH A PLANNING GRANT FROM THE FEDERAL AVIATION ADMINISTRATION AS PROVIDED UNDER SECTION 505 OF THE AIRPORT AND AIRWAY IMPROVEMENT ACT OF 1982, AS AMENDED. THE CONTENTS DO NOT NECESSARILY REFLECT THE OFFICIAL VIEWS OR POLICY OF THE FAA. ACCEPTANCE OF THESE DOCUMENTS BY THE FAA DOES NOT IN ANY WAY CONSTITUTE A COMMITMENT ON THE PART OF THE UNITED STATES TO PARTICIPATE IN ANY DEVELOPMENT DEPICTED HEREIN NOR DOES IT INDICATE THAT THE PROPOSED DEVELOPMENT IS ENVIRONMENTALLY ACCEPTABLE IN ACCORDANCE WITH APPROPRIATE PUBLIC LAWS."

TUCSON AIRPORT AUTHORITY
TUCSON INTERNATIONAL AIRPORT • RYAN AIRFIELD

RYAN AIRFIELD

AIRPORT LAYOUT DRAWING

DRAFT

Tucson, Arizona

PLANNED BY: Eric S. Pfeifer
DETAILED BY: Diana L. Hopkins
APPROVED BY: James M. Harris

March 18, 2010 SHEET 1 OF 18

Coffman Associates
Airport Consultants
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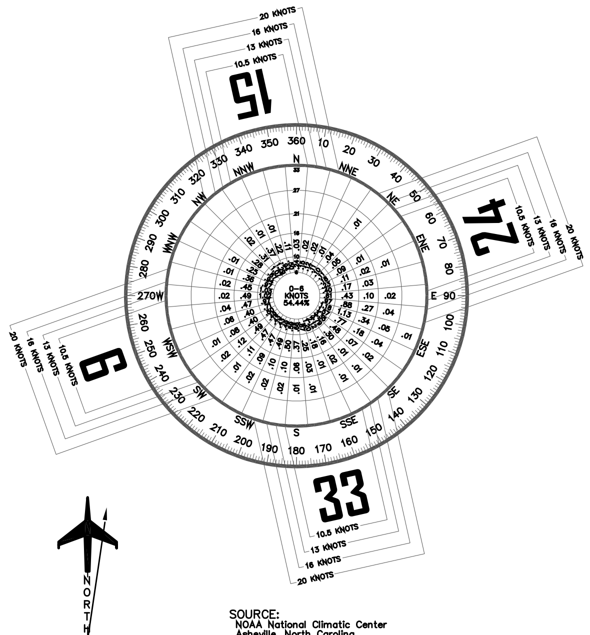
ALL WEATHER WIND COVERAGE

Runways	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 6–24	94.47%	97.36%	99.43%	99.88%
Runway 15–33	92.10%	95.65%	98.72%	99.75%
Combined	98.47%	99.58%	99.92%	99.99%



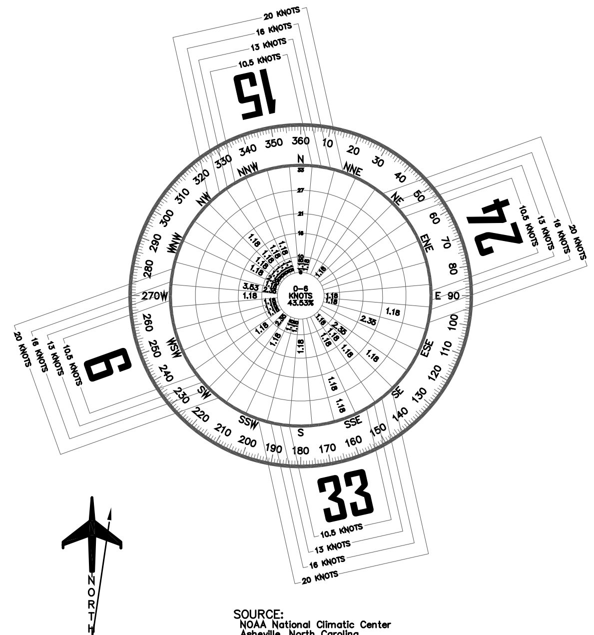
Magnetic Declination
10° 47' East (June 2008)
Annual Rate of Change
00° 06' West (June2008)

SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
Tucson International Airport (TUS)
Tucson, Arizona

OBSERVATIONS:
78,630 All Weather Observations
1997–2006

IFR CAT–I WIND COVERAGE

Runways	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 6–24	78.50%	85.93%	91.79%	95.09%
Runway 15–33	87.96%	91.54%	96.10%	97.70%
Combined	93.74%	96.81%	98.54%	98.82%



Magnetic Declination
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SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
Tucson International Airport (TUS)
Tucson, Arizona

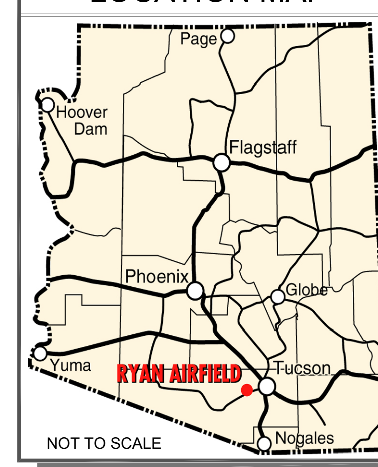
OBSERVATIONS:
85 IFR CAT–I Observations
1997–2006

RUNWAY DATA

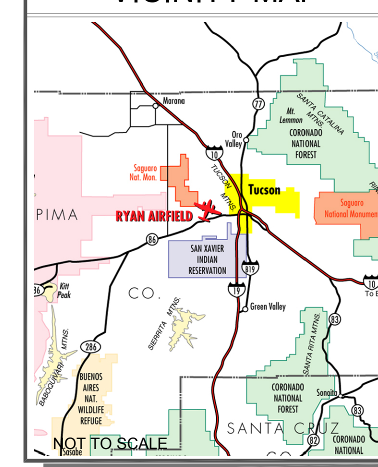
RUNWAY DATA	RUNWAY 6R-24L				RUNWAY 6L-24R				RUNWAY 15-33			
	EXISTING		ULTIMATE		EXISTING		ULTIMATE		EXISTING		ULTIMATE	
	6R	24L	6R	24L	6L	24R	6L	24R	15	33	15	33
AIRCRAFT APPROACH CATEGORY–DESIGN GROUP	B–II		D–II		B–II		B–II		B–I (Small Aircraft)		B–I (Small Aircraft)	
FAR PART 77 CATEGORY	Precision	Visual	Precision	Precision	Visual	Visual	Nonprecision	Nonprecision	Visual	Visual	Nonprecision	Nonprecision
APPROACH VISIBILITY MINIMUMS	1 Mile	Visual	1/2 Mile	1/2 Mile	Visual	Visual	1 Mile	1 Mile	Visual	Visual	1 Mile	1 Mile
DESIGN CRITICAL AIRCRAFT	Citation 560 EXCEL		Gulfstream IV		King Air 100		Citation 560 EXCEL		King Air 100		King Air 100	
WINGSPAN OF DESIGN AIRCRAFT	55.7'		77.83'		45.8'		55.7'		45.8'		45.8'	
UNDERCARRIAGE WIDTH OF DESIGN AIRCRAFT	25.2'		18.6'		13'		25.2'		13'		13'	
APPROACH SPEED (KNOTS) OF DESIGN AIRCRAFT	107		145		111		107		111		111	
MAXIMUM CERTIFIED TAKEOFF WEIGHT (LBS) OF DESIGN AIRCRAFT	20,000		71,780		11,800		20,000		11,800		11,800	
RUNWAY EFFECTIVE GRADIENT	0.08%		0.07%		0.1%		0.07%		0.8%		0.6%	
RUNWAY MAXIMUM GRADIENT	0.08%		0.07%		0.2%		0.07%		0.8%		0.6%	
PAVEMENT DESIGN STRENGTH (in thousand lbs.)	12.5 (S), 30 (DW)		30 (S), 75 (DW)		12.5 (S), 30 (DW)		12.5 (S), 30 (DW)		12.5 (S)		12.5 (S)	
RUNWAY APPROACH SLOPE	50:1	20:1	50:1	50:1	20:1	20:1	34:1	34:1	20:1	20:1	20:1	20:1
RUNWAY END ELEVATION (MSL)	2398.2'	2402.8'	2397.0'	2402.8'	2393.0'	2396.3'	2393.0'	2396.3'	2384.5'	2416.5'	2386.0'	2416.5'
RUNWAY TOUCHDOWN ZONE ELEVATION (MSL)	2402.5'	2402.8'	2399.0'	2402.8'	2396.9'	2397.2'	2396.9'	2397.2'	2413.5'	2418.0'	2402.4'	2418.0'
RUNWAY HIGH POINT ELEVATION (MSL)	2402.8'		2402.8'		2396.9'		2397.2'		2418.0'		2418.0'	
RUNWAY LOW POINT ELEVATION (MSL)	2398.2'		2397.0'		2393.0'		2393.0'		2384.5'		2384.5'	
LINE OF SIGHT REQUIREMENT MET	YES		YES		YES		YES		YES		YES	
RUNWAY LENGTH	5500'		8300'		4900'		5005'		4000'		4800'	
RUNWAY WIDTH	75'		100'		75'		75'		75'		75'	
RUNWAY BEARING (TRUE)	70.31°	250.32°	70.31°	250.32°	70.31°	250.32°	70.31°	250.32°	167.39°	347.39°	167.39°	347.39°
RUNWAY SAFETY AREA LENGTH BEYOND RUNWAY END	300'	300'	1000'	1000'	300'	300'	300'	300'	240'	240'	240'	240'
RUNWAY SAFETY AREA WIDTH	150'		500'		150'		150'		120'		120'	
RUNWAY OBJECT FREE AREA LENGTH BEYOND RUNWAY END	300'	300'	1000'	1000'	300'	300'	300'	300'	240'	240'	240'	240'
RUNWAY OBJECT FREE AREA WIDTH	500'		800'		500'		500'		250'		250'	
RUNWAY OBSTACLE FREE ZONE LENGTH BEYOND RUNWAY END	200'	200'	200'	200'	200'	200'	200'	200'	200'	200'	200'	200'
RUNWAY OBSTACLE FREE ZONE WIDTH	400'		400'		400'		400'		250'		250'	
DISTANCE FROM RUNWAY CENTERLINE TO HOLD BARS AND SIGNS	250'		275'		125'		200'		125'		125'	
RUNWAY MARKING	Precision	Visual	Precision	Precision	Visual	Visual	Nonprecision	Nonprecision	Visual	Visual	Nonprecision	Nonprecision
STANDARD SEPARATION – RUNWAY CL TO PARALLEL TAXIWAY CL	240'		425'		240'		240'		150'		150'	
STANDARD SEPARATION – RUNWAY CL TO AIRCRAFT PARKING AREA	250'		525'		250'		250'		125'		125'	
STANDARD SEPARATION – TAXIWAY CL TO FIXED OR MOVABLE OBJECT	65.5'		65.5'		65.5'		65.5'		44.5'		44.5'	
RUNWAY THRESHOLD DISPLACEMENT	0'	0'	0'	0'	0'	0'	0'	0'	0'	0'	0'	0'
RUNWAY SURFACE MATERIAL	Asphalt		Asphalt		Asphalt		Asphalt		Asphalt		Asphalt	
RUNWAY PAVEMENT SURFACE TREATMENT	NO		NO		NO		NO		NO		NO	
RUNWAY LIGHTING	MIRL		MIRL		NO		MIRL		NO		MIRL	
TAXIWAY WIDTH	Varies (35' Standard)		Varies (35' Standard)		35'		35'		35'		35'	
TAXIWAY SURFACE MATERIAL	Asphalt		Asphalt		Asphalt		Asphalt		Asphalt		Asphalt	
TAXIWAY OBJECT FREE AREA WIDTH	131'		131'		131'		131'		89'		89'	
TAXIWAY SAFETY AREA WIDTH	79'		79'		79'		79'		49'		49'	
TAXIWAY WING TIP CLEARANCE	26'		26'		26'		26'		20'		20'	
TAXIWAY MARKING	Centerline		Centerline		Centerline		Centerline		Centerline		Centerline	
TAXIWAY LIGHTING	MITL		MITL		NONE		MITL		NO		MITL	
RUNWAY NAVIGATIONAL AIDS	NDB/GPS (6R) ILS (6R)		NDB/GPS (6R) ILS (6R), GLS (6R, 24L)		NO		GPS (APV)		NO		GPS (APV)	
RUNWAY VISUAL AIDS	Rotating Beacon REIL (6R) VASI–4 (24L) Lighted Wind Cone Segmented Circle		Rotating Beacon MALSR (6R,24L) REIL (6R, 24L) PAPI–4 (6R,24L) Lighted Wind Cone Segmented Circle		Rotating Beacon Lighted Wind Cone Segmented Circle		Rotating Beacon PAPI–4 (6L,24R) Lighted Wind Cone Segmented Circle REIL (6L,24R)		Rotating Beacon Segmented Circle Lighted Wind Cone		Rotating Beacon PAPI–4 (15,33) Lighted Wind Cone Segmented Circle REIL (15,33)	

EXISTING COORDINATE AND ELEVATIONAL DATA DERIVED FROM ASIS DATASHEET SYSTEMS, http://avnwww.jccbi.gov/datasheet/

LOCATION MAP



VICINITY MAP



EXISTING AIRPORT BUILDING TABLE

NO.	DESCRIPTION	TOP ELEV
1	FLIGHT SCHOOL	2435.8
2	T–HANGARS	2434.4
3	CLEARSPAN HANGARS	2434.8
4	NOSE SHADE HANGAR	
5	EXECUTIVE HANGAR	2428.5
6	EXECUTIVE HANGAR	2429.0
7	EXECUTIVE HANGAR	2426.2
8	EXECUTIVE HANGAR	2430.2
9	OFFICE BUILDING	2432.6
10	RESTAURANT	2442.0
11	TAA ADMINISTRATION BUILDING	2443.1
12	SELF–SERVE FUELING FACILITY	
13	SHADE HANGARS	2431.7
14	SHADE HANGARS	2432.9
15	T–HANGARS	2440.7
16	CONVENTIONAL HANGAR	2433.1
17	CONVENTIONAL HANGAR	2433.0
18	CONVENTIONAL HANGAR	2433.1
19	CONVENTIONAL HANGAR	2433.1
20	CONVENTIONAL HANGAR	2432.9
21	CONVENTIONAL HANGAR	2433.2
22	CONVENTIONAL HANGAR	2233.4
23	CONVENTIONAL HANGAR	2429.7
24	CONVENTIONAL HANGAR	2430.1
25	CONVENTIONAL HANGAR	2430.1
26	CONVENTIONAL HANGAR	2430.3
27	CONVENTIONAL HANGAR	2430.1
28	CONVENTIONAL HANGAR	2430.1
29	CONVENTIONAL HANGAR	2430.0
30	CONVENTIONAL HANGAR	2430.3
31	CONVENTIONAL HANGAR	2429.0
32	CONVENTIONAL HANGAR	2429.5
33	CONVENTIONAL HANGAR	2429.6
34	CONVENTIONAL HANGAR	2429.2
35	CONVENTIONAL HANGAR	2429.3
36	CONVENTIONAL HANGAR	2429.1
37	CONVENTIONAL HANGAR	2429.1
38	CONVENTIONAL HANGAR	2429.2
39	CONVENTIONAL HANGAR	2431.8
40	CONVENTIONAL HANGAR	2431.9
41	CONVENTIONAL HANGAR	2431.7
42	CONVENTIONAL HANGAR	2432.0
43	CONVENTIONAL HANGAR	2432.1
44	CONVENTIONAL HANGAR	2432.0
45	CONVENTIONAL HANGAR	2431.6
46	CONVENTIONAL HANGAR	2431.5
47	CONVENTIONAL HANGAR	2430.8

EXISTING AIRPORT BUILDING TABLE

NO.	DESCRIPTION	TOP ELEV
48	CONVENTIONAL HANGAR	2438.1
49	WASH RACK	2437.3
50	EXECUTIVE HANGAR	2445.7
51	CONVENTIONAL HANGAR	2447.1
52	CONVENTIONAL HANGAR	2444.0
53	CONVENTIONAL HANGAR	2446.0
54	CONVENTIONAL HANGAR	2445.8
55	CONVENTIONAL HANGAR	2447.0
56	CONVENTIONAL HANGAR	2444.1
57	CONVENTIONAL HANGAR	2445.4
58	CONVENTIONAL HANGAR	2443.4
59	CONVENTIONAL HANGAR	2442.0
60	EXECUTIVE HANGAR	2442.8
61	CONVENTIONAL HANGAR	2443.0
62	CONVENTIONAL HANGAR	2443.2
63	CONVENTIONAL HANGAR	2442.7
64	CONVENTIONAL HANGAR	2441.1
65	CONVENTIONAL HANGAR	2446.2
66	CONVENTIONAL HANGAR	2443.8
67	CONVENTIONAL HANGAR	2440.1
68	EXECUTIVE HANGAR	2440.6
69	EXECUTIVE HANGAR	2440.5
70	EXECUTIVE HANGAR	2445.8
71	CONVENTIONAL HANGAR	2441.8
72	EXECUTIVE HANGAR	2440.1
73	EXECUTIVE HANGAR	2440.2
74	EXECUTIVE HANGAR	2434.2
75	EXECUTIVE HANGAR	2439.6
76	EXECUTIVE HANGAR	2436.4
77	T–HANGARS	2436.0
78	T–HANGARS	2436.1
79	CONVENTIONAL HANGAR	2433.4
80	CONVENTIONAL HANGAR	2434.3
81	CONVENTIONAL HANGAR	2434.1
82	CONVENTIONAL HANGAR	2434.5
83	CONVENTIONAL HANGAR	2434.0
84	CONVENTIONAL HANGAR	2432.3
85	CONVENTIONAL HANGAR	2432.1
86	CONVENTIONAL HANGAR	2431.9
87	CONVENTIONAL HANGAR	2431.7
88	CONVENTIONAL HANGAR	2431.6
89	CONVENTIONAL HANGAR	2434.1
90	CONVENTIONAL HANGAR	2438.9
91	CONVENTIONAL HANGAR	2438.9
92	CONVENTIONAL HANGAR	2439.0
93	CONVENTIONAL HANGAR	2436.7
94	CONVENTIONAL HANGAR	2435.2

EXISTING AIRPORT BUILDING TABLE

NO.	DESCRIPTION	TOP ELEV
95	CONVENTIONAL HANGAR	2434.4
96	CONVENTIONAL HANGAR	2433.9
97	EXECUTIVE HANGAR	2433.4
98	EXECUTIVE HANGAR	2432.5
99	EXECUTIVE HANGAR	2438.8
100	MAINTENANCE FACILITIES	2442.0
101	SOLID WASTE TRANSFER STATION	NA
102	ELECTRICAL VAULT	NA
103	AWOS	2427.0*
104	LOCALIZER	2409.0*
105	GLIDESLOPE ANTENNA	2426.0*

NA – NOT AVAILABLE; * ESTIMATED

ULTIMATE AIRPORT BUILDING TABLE

NO.	DESCRIPTION	TOP ELEV*
106	SHADE HANGARS	2430.9
107	CONVENTIONAL HANGAR	2448.0
108	CONVENTIONAL HANGAR	2450.0
109	CONVENTIONAL HANGAR	2448.0
110	CONVENTIONAL HANGAR	2449.0
111	CONVENTIONAL HANGAR	2448.0
112	CONVENTIONAL HANGAR	2450.0
113	CONVENTIONAL HANGAR	2448.0
114	CONVENTIONAL HANGAR	2448.0
115	CONVENTIONAL HANGAR	2432.0
116	CONVENTIONAL HANGAR	2432.0
117	T–HANGARS	2436.0
118	T–HANGARS	2436.0
119	T–HANGARS	2436.0
120	T–HANGARS	2436.0
121	T–HANGARS	2436.0
122	CONVENTIONAL HANGAR	2436.0
123	CONVENTIONAL HANGAR	2436.0
124	CONVENTIONAL HANGAR	2434.0
125	CONVENTIONAL HANGAR	2436.0
126	CONVENTIONAL HANGAR	2436.0
127	CONVENTIONAL HANGAR	2435.0
128	CONVENTIONAL HANGAR	2435.0
129	CONVENTIONAL HANGAR	2435.0
130	HELICOPTER FBO	2446.0
131	ELECTRICAL VAULT	2418.0

* – ESTIMATED

TUCSON AIRPORT AUTHORITY
TUCSON INTERNATIONAL AIRPORT • RYAN AIRFIELD

No.	REVISIONS	BY		DATE
4	UPDATED AIRPORT MASTER PLAN	K.L.W.	M.F.J.	12/07/00
3	UPDATED AIRPORT MASTER PLAN	R.A.L.	S.G.B.	02/29/00
2	UPDATED FOR REVALIDATION	M.E.S.	M.F.J.	10/29/96
1	REVISED/UPDATED ALP (FAA/ADOT APPROVAL)	W.E.H.	J.M.H.	08/02/96

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RYAN AIRFIELD
AIRPORT DATA
DRAFT
Tucson, Arizona

PLANNED BY: Eric S. Pfeifer
DETAILED BY: Diana L. Hopkins
APPROVED BY: James M. Harris

March 18, 2010

SHEET 2 OF 18

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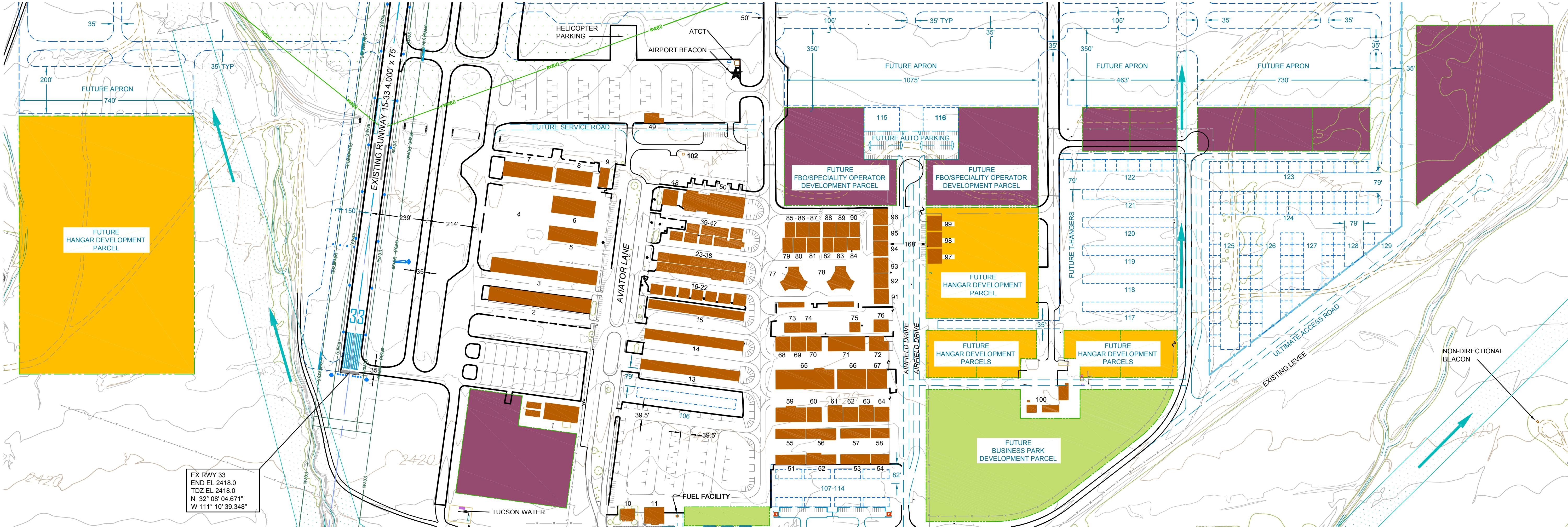


EXISTING AIRPORT BUILDING TABLE

NO.	DESCRIPTION	TOP ELEV
1	FLIGHT SCHOOL	2435.8
2	T-HANGARS	2434.4
3	CLEARSPAN HANGARS	2434.8
4	NOSE SHADE HANGAR	
5	EXECUTIVE HANGAR	2428.5
6	EXECUTIVE HANGAR	2429.0
7	EXECUTIVE HANGAR	2426.2
8	EXECUTIVE HANGAR	2430.2
9	OFFICE BUILDING	2432.6
10	RESTAURANT	2442.0
11	TAA ADMINISTRATION BUILDING	2443.1
12	SELF-SERVE FUELING FACILITY	
13	SHADE HANGARS	2431.7
14	SHADE HANGARS	2432.9
15	T-HANGARS	2440.7
16	CONVENTIONAL HANGAR	2433.1
17	CONVENTIONAL HANGAR	2433.0
18	CONVENTIONAL HANGAR	2433.1
19	CONVENTIONAL HANGAR	2433.1
20	CONVENTIONAL HANGAR	2432.9
21	CONVENTIONAL HANGAR	2433.2
22	CONVENTIONAL HANGAR	2233.4
23	CONVENTIONAL HANGAR	2429.7
24	CONVENTIONAL HANGAR	2430.1
25	CONVENTIONAL HANGAR	2430.1
26	CONVENTIONAL HANGAR	2430.3
27	CONVENTIONAL HANGAR	2430.1
28	CONVENTIONAL HANGAR	2430.1
29	CONVENTIONAL HANGAR	2430.0
30	CONVENTIONAL HANGAR	2430.3
31	CONVENTIONAL HANGAR	2429.0
32	CONVENTIONAL HANGAR	2429.5
33	CONVENTIONAL HANGAR	2429.6
34	CONVENTIONAL HANGAR	2429.2
35	CONVENTIONAL HANGAR	2429.3
36	CONVENTIONAL HANGAR	2429.1
37	CONVENTIONAL HANGAR	2429.1
38	CONVENTIONAL HANGAR	2429.2
39	CONVENTIONAL HANGAR	2431.8
40	CONVENTIONAL HANGAR	2431.9
41	CONVENTIONAL HANGAR	2431.7
42	CONVENTIONAL HANGAR	2432.0
43	CONVENTIONAL HANGAR	2432.1
44	CONVENTIONAL HANGAR	2432.0
45	CONVENTIONAL HANGAR	2431.6
46	CONVENTIONAL HANGAR	2431.5
47	CONVENTIONAL HANGAR	2430.8

EXISTING AIRPORT BUILDING TABLE

NO.	DESCRIPTION	TOP ELEV
48	CONVENTIONAL HANGAR	2438.1
49	WASH RACK	2437.3
50	EXECUTIVE HANGAR	2445.7
51	CONVENTIONAL HANGAR	2447.1
52	CONVENTIONAL HANGAR	2444.0
53	CONVENTIONAL HANGAR	2446.0
54	CONVENTIONAL HANGAR	2445.8
55	CONVENTIONAL HANGAR	2447.0
56	CONVENTIONAL HANGAR	2444.1
57	CONVENTIONAL HANGAR	2445.4
58	CONVENTIONAL HANGAR	2443.4
59	CONVENTIONAL HANGAR	2442.0
60	EXECUTIVE HANGAR	2442.8
61	CONVENTIONAL HANGAR	2443.0
62	CONVENTIONAL HANGAR	2443.2
63	CONVENTIONAL HANGAR	2442.7
64	CONVENTIONAL HANGAR	2441.1
65	CONVENTIONAL HANGAR	2446.2
66	CONVENTIONAL HANGAR	2443.8
67	CONVENTIONAL HANGAR	2440.1
68	EXECUTIVE HANGAR	2440.6
69	EXECUTIVE HANGAR	2440.5
70	EXECUTIVE HANGAR	2445.8
71	CONVENTIONAL HANGAR	2441.8
72	EXECUTIVE HANGAR	2440.1
73	EXECUTIVE HANGAR	2440.2
74	EXECUTIVE HANGAR	2434.2
75	EXECUTIVE HANGAR	2439.6
76	EXECUTIVE HANGAR	2436.4
77	T-HANGARS	2436.0
78	T-HANGARS	2436.1
79	CONVENTIONAL HANGAR	2433.4
80	CONVENTIONAL HANGAR	2434.3
81	CONVENTIONAL HANGAR	2434.1
82	CONVENTIONAL HANGAR	2434.5
83	CONVENTIONAL HANGAR	2434.0
84	CONVENTIONAL HANGAR	2432.3
85	CONVENTIONAL HANGAR	2432.1
86	CONVENTIONAL HANGAR	2431.9
87	CONVENTIONAL HANGAR	2431.7
88	CONVENTIONAL HANGAR	2431.6
89	CONVENTIONAL HANGAR	2434.1
90	CONVENTIONAL HANGAR	2438.9
91	CONVENTIONAL HANGAR	2438.9
92	CONVENTIONAL HANGAR	2439.0
93	CONVENTIONAL HANGAR	2436.7
94	CONVENTIONAL HANGAR	2435.2

EXISTING AIRPORT BUILDING TABLE

NO.	DESCRIPTION	TOP ELEV
95	CONVENTIONAL HANGAR	2434.4
96	CONVENTIONAL HANGAR	2433.9
97	EXECUTIVE HANGAR	2433.4
98	EXECUTIVE HANGAR	2432.5
99	EXECUTIVE HANGAR	2438.8
100	MAINTENANCE FACILITIES	2442.0
101	SOLID WASTE TRANSFER STATION	NA
102	ELECTRICAL VAULT	NA
103	AWOS	2427.0*
104	LOCALIZER	2409.0*
105	GLIDESLOPE ANTENNA	2426.0*

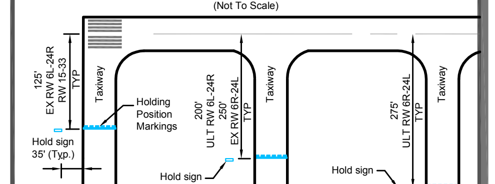
NA – NOT AVAILABLE; * ESTIMATED

ULTIMATE AIRPORT BUILDING TABLE

NO.	DESCRIPTION	TOP ELEV*
106	SHADE HANGARS	2430.9
107	CONVENTIONAL HANGAR	2448.0
108	CONVENTIONAL HANGAR	2450.0
109	CONVENTIONAL HANGAR	2448.0
110	CONVENTIONAL HANGAR	2449.0
111	CONVENTIONAL HANGAR	2448.0
112	CONVENTIONAL HANGAR	2450.0
113	CONVENTIONAL HANGAR	2448.0
114	CONVENTIONAL HANGAR	2448.0
115	CONVENTIONAL HANGAR	2432.0
116	CONVENTIONAL HANGAR	2432.0
117	T-HANGARS	2436.0
118	T-HANGARS	2436.0
119	T-HANGARS	2436.0
120	T-HANGARS	2436.0
121	T-HANGARS	2436.0
122	CONVENTIONAL HANGAR	2436.0
123	CONVENTIONAL HANGAR	2436.0
124	CONVENTIONAL HANGAR	2434.0
125	CONVENTIONAL HANGAR	2436.0
126	CONVENTIONAL HANGAR	2436.0
127	CONVENTIONAL HANGAR	2435.0
128	CONVENTIONAL HANGAR	2435.0
129	CONVENTIONAL HANGAR	2435.0

HOLD POSITION MARKINGS/SIGN (TYP)

(Not To Scale)



LEGEND

EXISTING	ULTIMATE	DESCRIPTION
		AIRPORT PROPERTY LINE
32 33 / 5 4		SECTION CORNERS
		AIRPORT REFERENCE POINT (ARP)
		AIRPORT ROTATING BEACON
		AVIGATION EASEMENT
BRL		BUILDING RESTRICTION LINE
		STRUCTURES ON AIRPORT
		STRUCTURE OFF AIRPORT
		AIRPORT PAVEMENT
		FENCING
		GLIDESLOPE ANTENNA
		GLIDESLOPE CRITICAL AREA
N/A		ABANDON PAVEMENT
	H	HELICOPTER PARKING
N/A		HELICOPTER TRAINING PAD
		HOLD MARKING
		LIGHTED WINDSOCK
		EXISTING LOCALIZER
		MEDIUM INTENSITY RUNWAY LIGHTING
OFA	OFA(U)	OBJECT FREE AREA
RSA	RSA(U)	RUNWAY SAFETY AREA
OFZ	OFZ(U)	OBSTACLE FREE ZONE
		PRECISION OBSTACLE FREE ZONE
		RUNWAY PROTECTION ZONE
	RVZ	ULTIMATE RUNWAY VISIBILITY ZONE
		ULTIMATE PAPI
		RUNWAY END IDENTIFIER LIGHTS
RYN		SURVEY MONUMENT WITH IDENTIFIER
T		TIE DOWN
2400	2400	TOPOGRAPHY
		VGSI
		MALSR

(purple)	Aviation Related Revenue Support
(green)	Non-Aviation Revenue Support
(orange)	Hangar Developement Parcels

GENERAL NOTES:

1. HORIZONTAL DATUM: NORTH AMERICAN DATUM 1983 – NAD83, STATE PLANE, ARIZONA CENTRAL, FIPS 0202;
   VERTICAL DATUM: NORTH AMERICAN DATUM 1988 – NAVD88.
2. ALL EXISTING RUNWAY END ELEVATIONS, COORDINATES, AND BEARINGS NOTED IN THIS ALP FROM ASIS DATASHEET SYSTEMS, http: //avnwww.jccbi.gov/datasheet/ PER STANTEC CONSULTING
3. SURVEY MAPPING OF ON AIRPORT ENVIRONS PROVIDED BY STANTEC CONSULTING.
4. ALL ULTIMATE COORDINATES CALCULATED WITH GEO83A

NORTH

Magnetic Declination
10° 47' East (June 2008)
Annual Rate of Change
00° 06' West (June2008)

0 200 400
SCALE IN FEET

TUCSON AIRPORT AUTHORITY
TUCSON INTERNATIONAL AIRPORT • RYAN AIRFIELD

No.	REVISIONS	BY		DATE
4	UPDATED AIRPORT MASTER PLAN	K.L.W.	M.F.J.	12/07/00
3	UPDATED AIRPORT MASTER PLAN	R.A.L.	S.G.B.	02/29/00
2	UPDATED FOR REVALIDATION	M.E.S.	M.F.J.	10/29/96
1	REVISED/UPDATED ALP (FAA/ADOT APPROVAL)	W.E.H.	J.M.H.	08/02/96

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RYAN AIRFIELD

TERMINAL AREA DRAWING

DRAFT

Tucson, Arizona

PLANNED BY: Eric S. Pfeifer
DETAILED BY: Diana L. Hopkins
APPROVED BY: James M. Harris

March 18, 2010 — SHEET 3 OF 18

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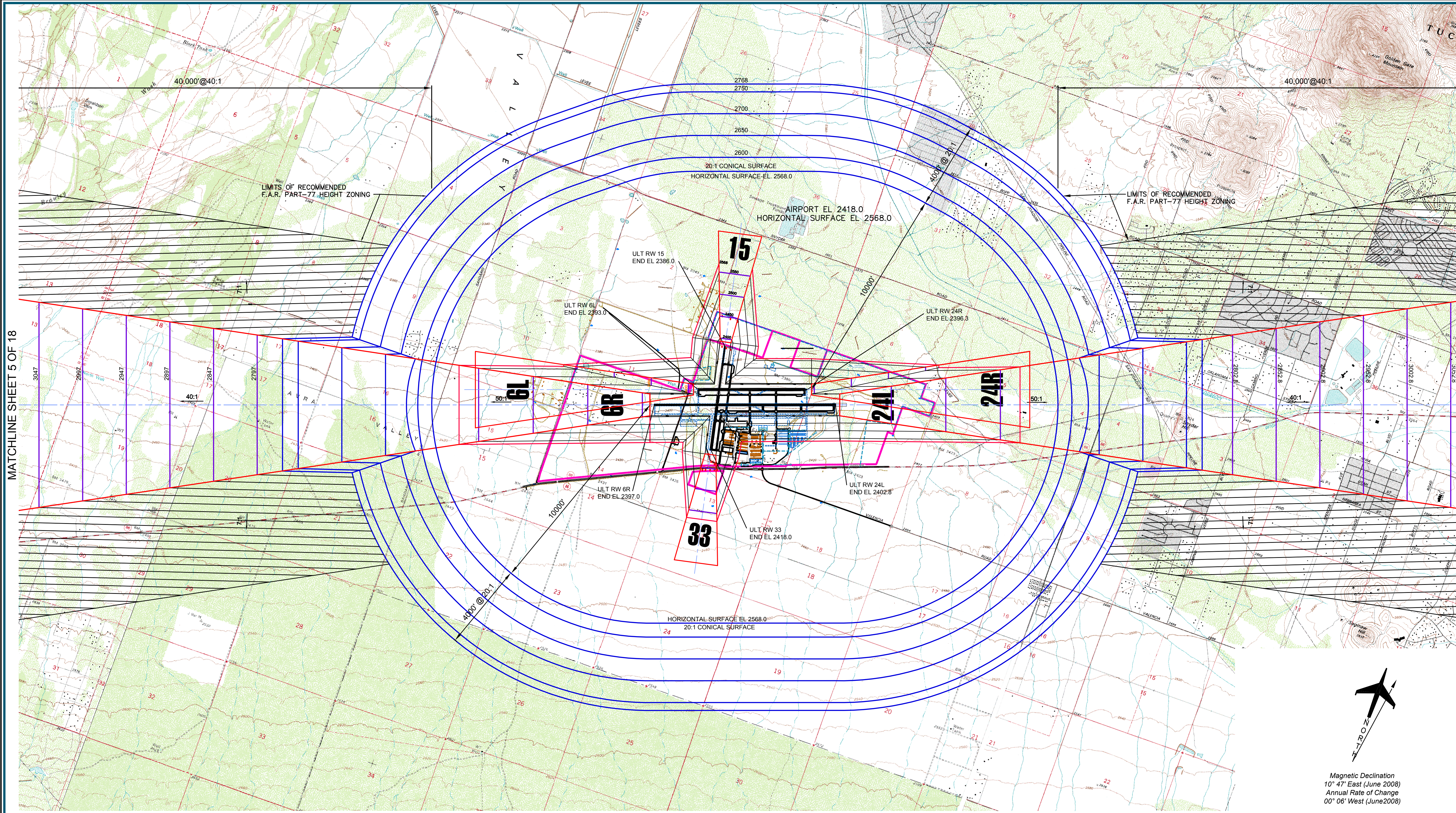

OBSTRUCTION TABLE

No.	Description	Top Elevation	Distance from Ult RW End	Offset from RW Centerline	Penetration	Surface Penetrated	Proposed Remediation

GENERAL NOTES:

1. THE FOLLOWING USGS QUAD MAPS APPLIED AS BACKGROUND: BROWN MOUNTAIN, CAT MOUNTAIN, COCORAQUE BUTTE, SAN XAVIER, SAN XAVIER MISSION SW, THREE POINTS, AND TUCSON.
2. SEE THE INNER PORTION OF THE APPROACH SURFACE DRAWINGS FOR CLOSE-IN OBSTRUCTION DETAILS.

No.	REVISIONS	BY		DATE
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3	UPDATED AIRPORT MASTER PLAN	R.A.L.	S.G.B.	02/29/00
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1	REVISED/UPDATED ALP (FAA/ADOT APPROVAL)	W.E.H.	J.M.H.	08/02/96

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TUCSON AIRPORT AUTHORITY
TUCSON INTERNATIONAL AIRPORT • RYAN AIRFIELD

RYAN AIRFIELD

AIRSPACE DRAWING I

DRAFT

Tucson, Arizona

PLANNED BY: Eric S. Pfeifer
DETAILED BY: Diana L. Hopkins
APPROVED BY: James M. Harris

March 18, 2010

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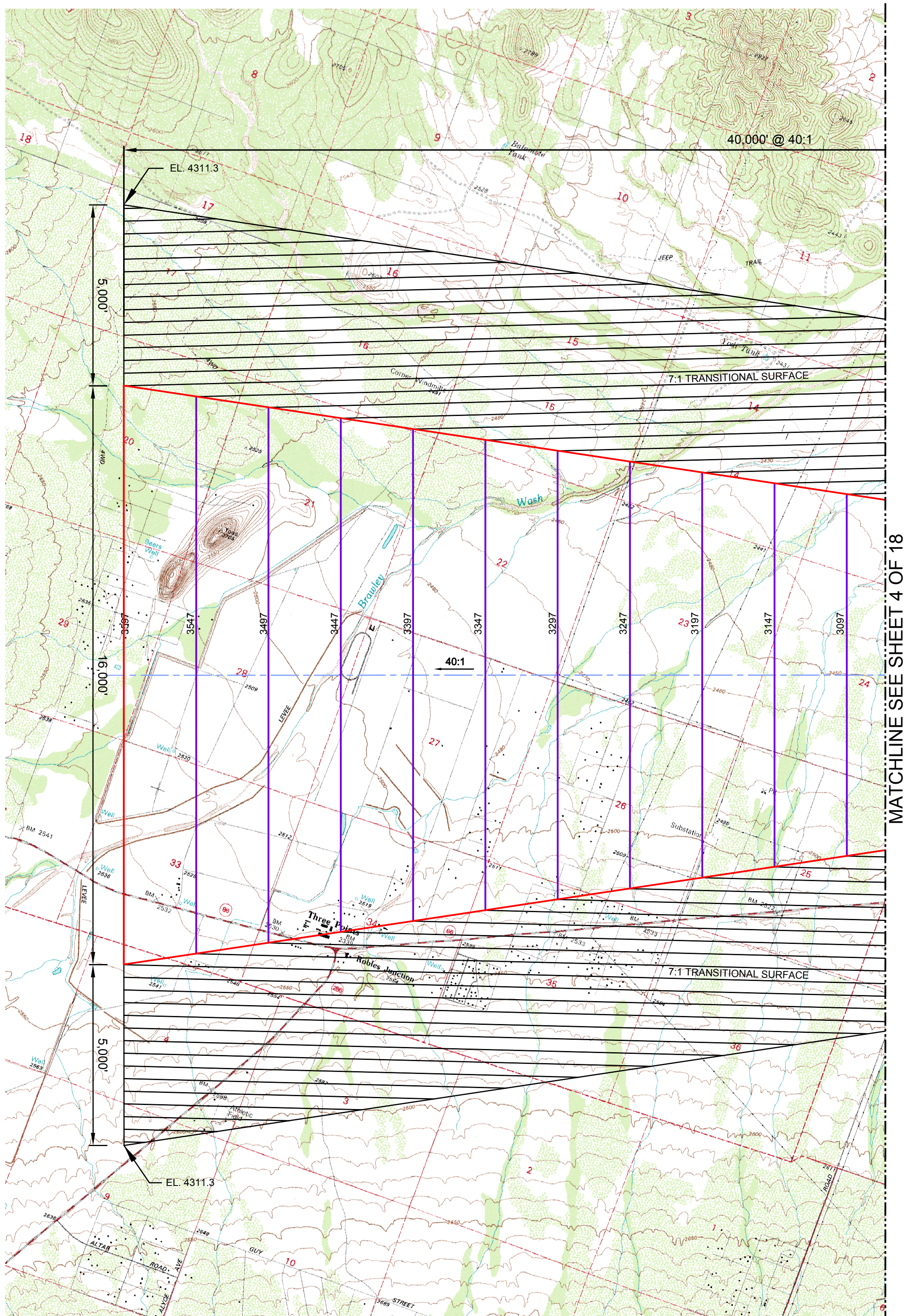

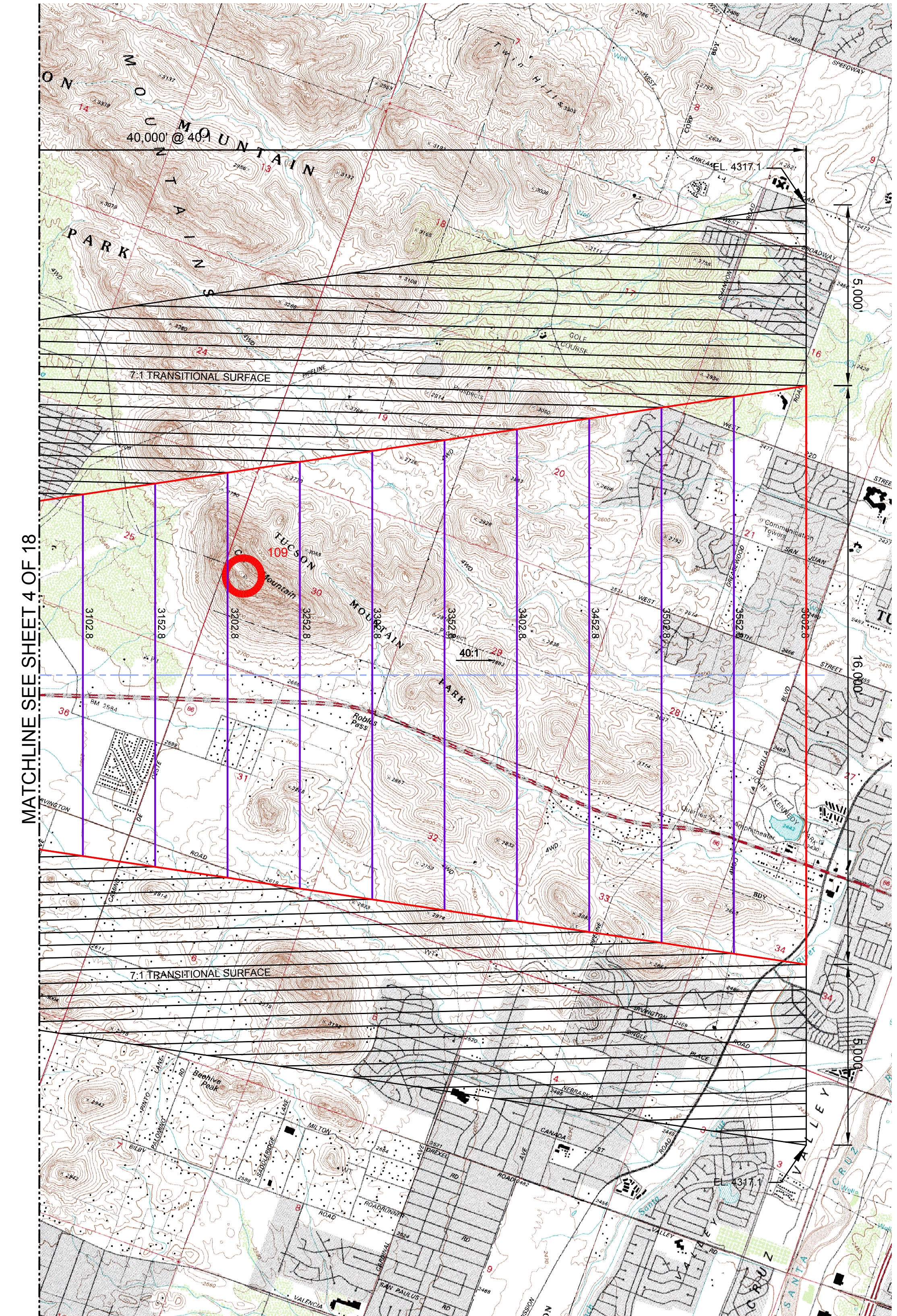

Magnetic Declination
10° 47' East (June 2008)
Annual Rate of Change
00° 06' West (June2008)

0 2000 4000
SCALE IN FEET

TUCSON AIRPORT AUTHORITY
TUCSON INTERNATIONAL AIRPORT • RYAN AIRFIELD

RUNWAY OBSTRUCTION TABLE

No.	Description	Top Elevation	Distance from Ult RW End	Offset from RW Centerline	Penetration	Surface Penetrated	Proposed Remediation
109	CAT MOUNTAIN	3840'	34654'	2739' R	626'	RW 24L APPROACH	REQUEST AERONAUTICAL STUDY

GENERAL NOTES:

1. THE FOLLOWING USGS QUAD MAPS APPLIED AS BACKGROUND: BROWN MOUNTAIN, CAT MOUNTAIN, COCORAQUE BUTTE, SAN XAVIER, SAN XAVIER MISSION SW, THREE POINTS, AND TUCSON.
2. SEE THE INNER PORTION OF THE APPROACH SURFACE DRAWINGS FOR CLOSE-IN OBSTRUCTIONS.

No.	REVISIONS	BY		DATE
4	UPDATED AIRPORT MASTER PLAN	K.L.W.	M.F.J.	12/07/00
3	UPDATED AIRPORT MASTER PLAN	R.A.L.	S.G.B.	02/29/00
2	UPDATED FOR REVALIDATION	M.E.S.	M.F.J.	10/29/96
1	REVISED/UPDATED ALP (FAA/ADOT APPROVAL)	W.E.H.	J.M.H.	08/02/96

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RYAN AIRFIELD

AIRSPACE DRAWING II

DRAFT

Tucson, Arizona

PLANNED BY: Eric S. Pfeifer
DETAILED BY: Diana L. Hopkins
APPROVED BY: James M. Harris

March 18, 2010

SHEET 5 OF 18

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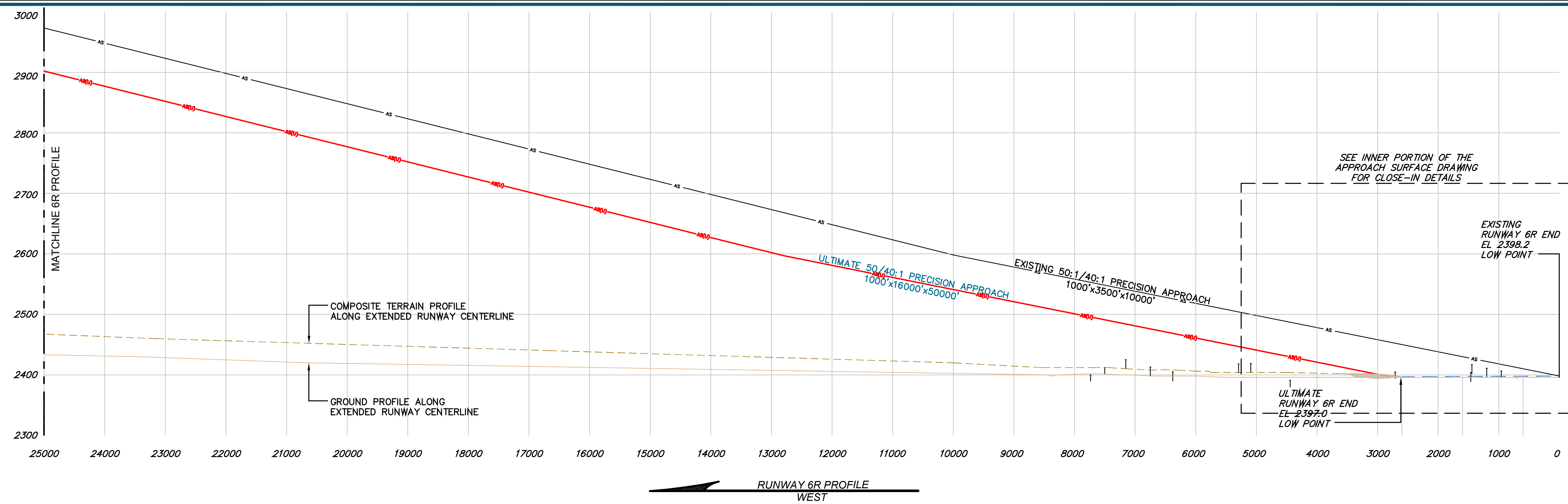

GENERAL NOTES:

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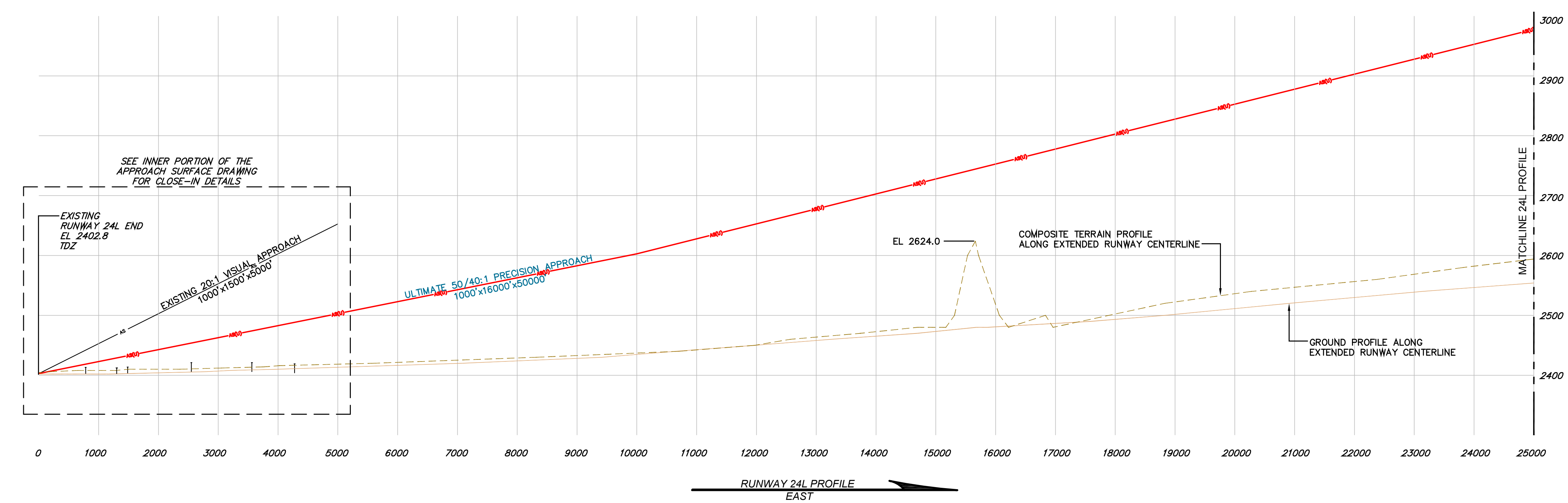
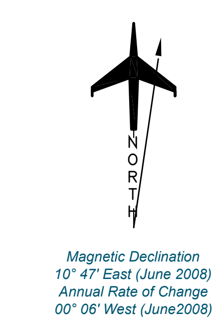
2. SEE THE INNER PORTION OF THE APPROACH SURFACE DRAWINGS FOR CLOSE–IN DETAILS.





HORIZONTAL SCALE IN FEET (0, 1000, 2000)

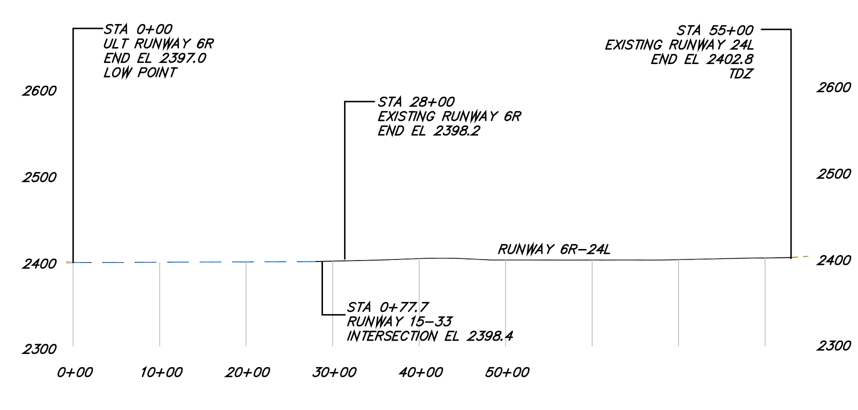
VERTICAL SCALE IN FEET (0, 100, 200)

ULTIMATE RUNWAY 6R-24L OBSTRUCTION TABLE

No.	Description	Top Elevation	Distance from RW End	Offset from Centerline	Penetration	Remediation
–	NONE FOUND	–	–	–	–	–

EXISTING RUNWAY 6R-24L OBSTRUCTION TABLE

No.	Description	Top Elevation	Distance from RW End	Offset from Centerline	Penetration	Remediation
–	NONE FOUND	–	–	–	–	–



RUNWAY 6R-24L PROFILE

No.	REVISIONS	BY		DATE
4	UPDATED AIRPORT MASTER PLAN	K.L.W.	M.F.J.	12/07/00
3	UPDATED AIRPORT MASTER PLAN	R.A.L.	S.G.B.	02/29/00
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TUCSON AIRPORT AUTHORITY
TUCSON INTERNATIONAL AIRPORT • RYAN AIRFIELD

RYAN AIRFIELD

AIRPORT AIRSPACE PROFILE I 6R-24L

DRAFT

Tucson, Arizona

PLANNED BY: Eric S. Pfeifer
DETAILED BY: Diana L. Hopkins
APPROVED BY: James M. Harris

March 18, 2010 — SHEET 6 OF 18

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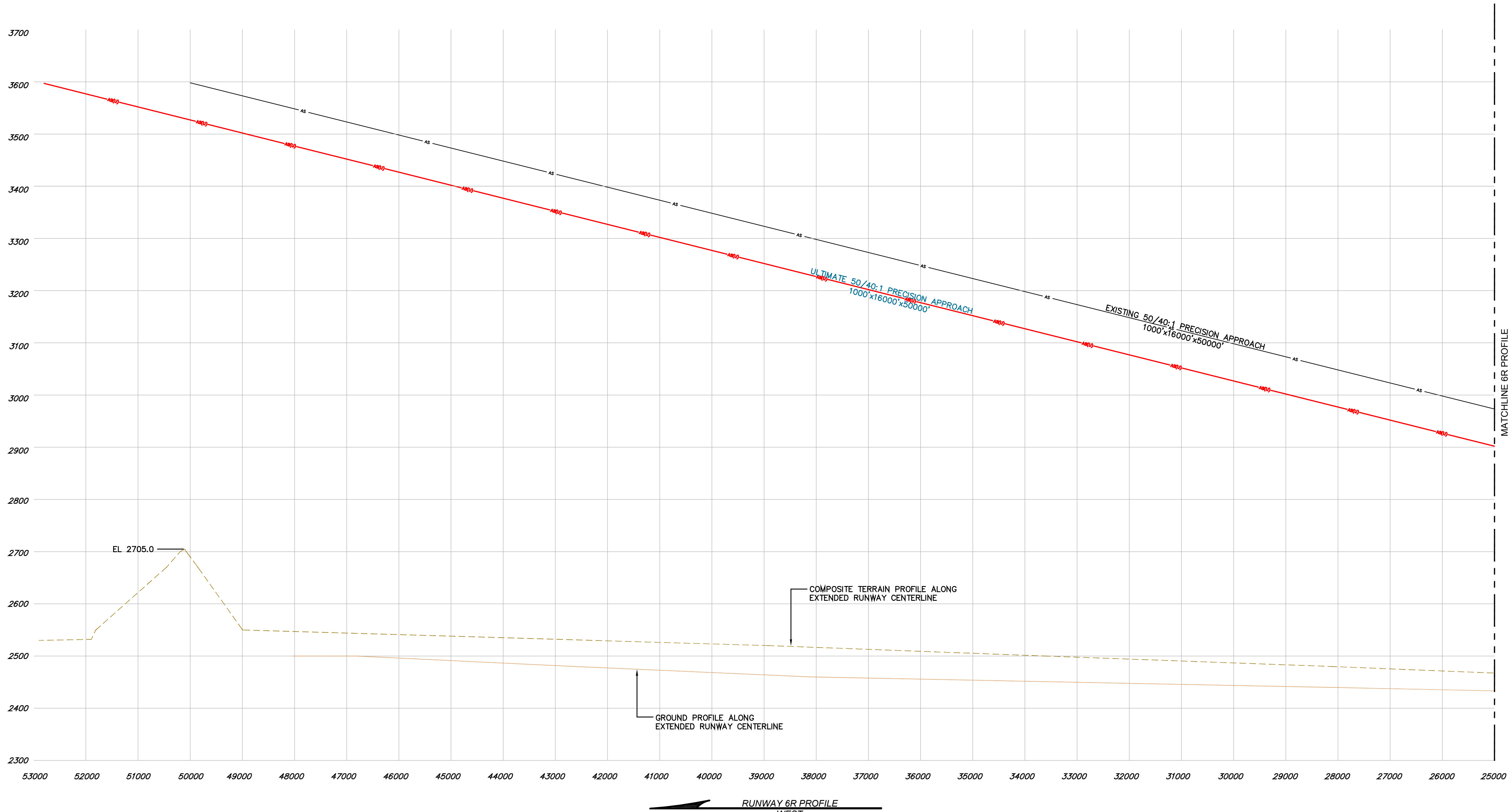

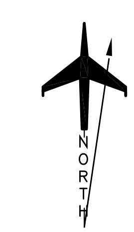

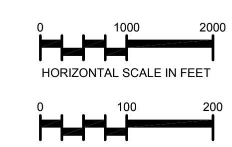

GENERAL NOTES:

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2. SEE THE INNER PORTION OF THE APPROACH SURFACE DRAWINGS FOR CLOSE–IN DETAILS.

RUNWAY 6R OBSTRUCTION TABLE

No.	Description	Top Elevation	Distance from RW End	Offset from Centerline	Penetration	Remediation
–	NONE FOUND	–	–	–	–	–

No.	REVISIONS	BY		DATE
4	UPDATED AIRPORT MASTER PLAN	K.L.W.	M.F.J.	12/07/00
3	UPDATED AIRPORT MASTER PLAN	R.A.L.	S.G.B.	02/29/00
2	UPDATED FOR REVALIDATION	M.E.S.	M.F.J.	10/29/96
1	REVISED/UPDATED ALP (FAA/ADOT APPROVAL)	W.E.H.	J.M.H.	08/02/96

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TUCSON AIRPORT AUTHORITY
TUCSON INTERNATIONAL AIRPORT • RYAN AIRFIELD

RYAN AIRFIELD
AIRPORT AIRSPACE PROFILE II
6R
DRAFT
Tucson, Arizona

PLANNED BY: Eric S. Pfeifer
DETAILED BY: Diana L. Hopkins
APPROVED BY: James M. Harris

March 18, 2010 | SHEET 7 OF 18

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Airport Consultants
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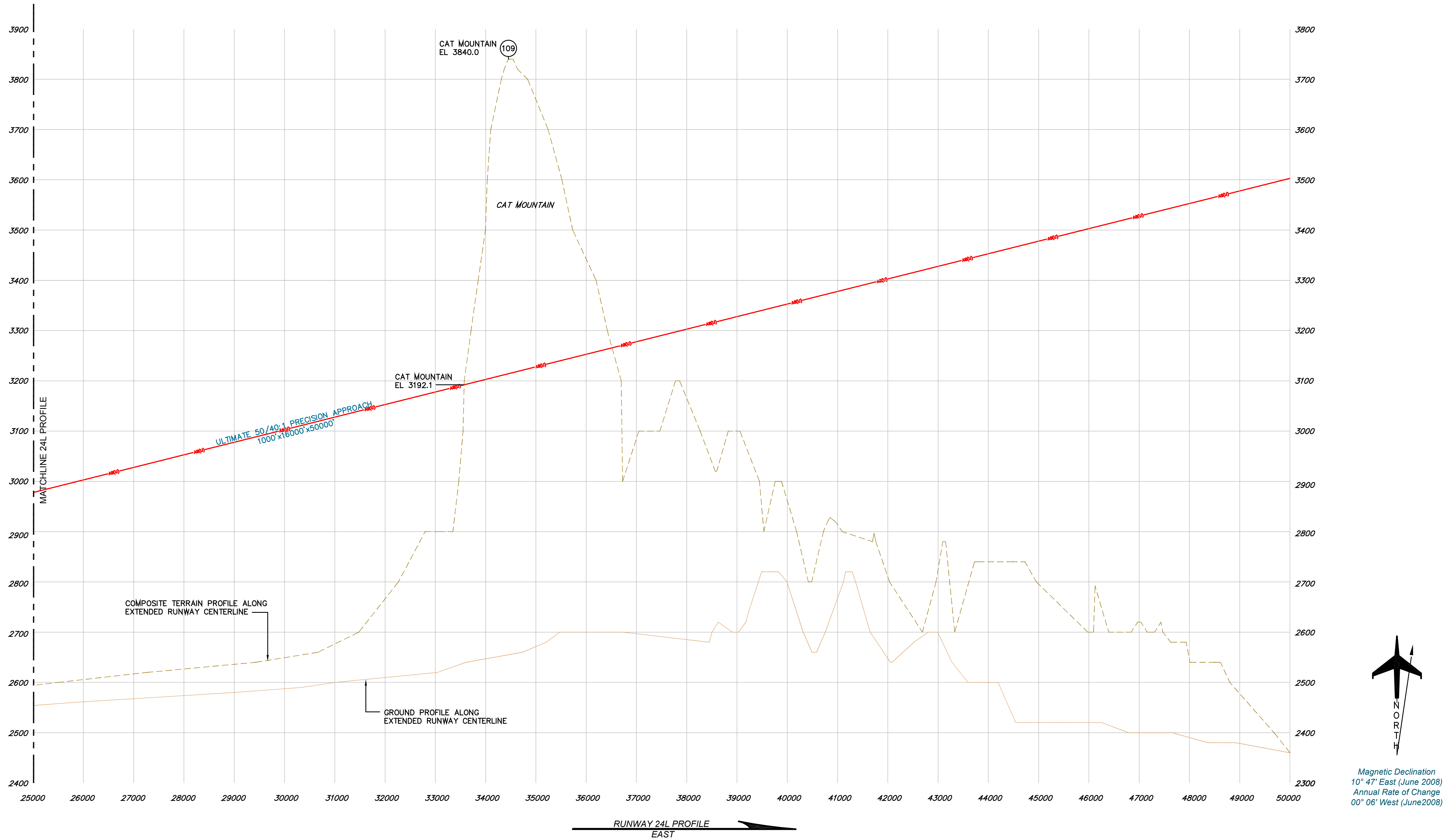

RUNWAY 24L OBSTRUCTION TABLE

No.	Description	Elevation	Distance from RW End	Offset from Centerline	Penetration	Remediation
109	CAT MOUNTAIN	3840'	34,654'	2,653' R	626'	REQUEST AERONAUTICAL STUDY

No.	REVISIONS	BY		DATE
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TUCSON AIRPORT AUTHORITY
TUCSON INTERNATIONAL AIRPORT • RYAN AIRFIELD

RYAN AIRFIELD
AIRPORT AIRSPACE PROFILE III
24L

DRAFT

Tucson, Arizona

PLANNED BY: Eric S. Pfeifer
DETAILED BY: Diana L. Hopkins
APPROVED BY: James M. Harris

March 18, 2010 SHEET 8 OF 18

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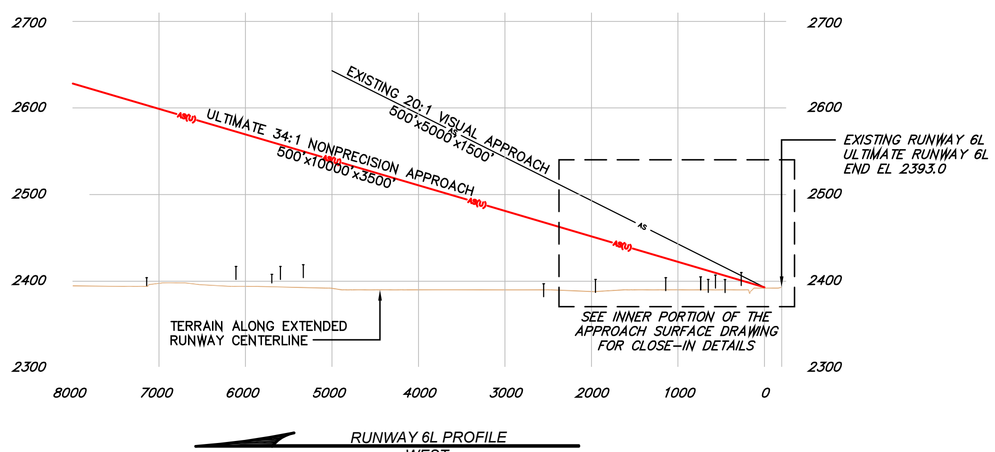
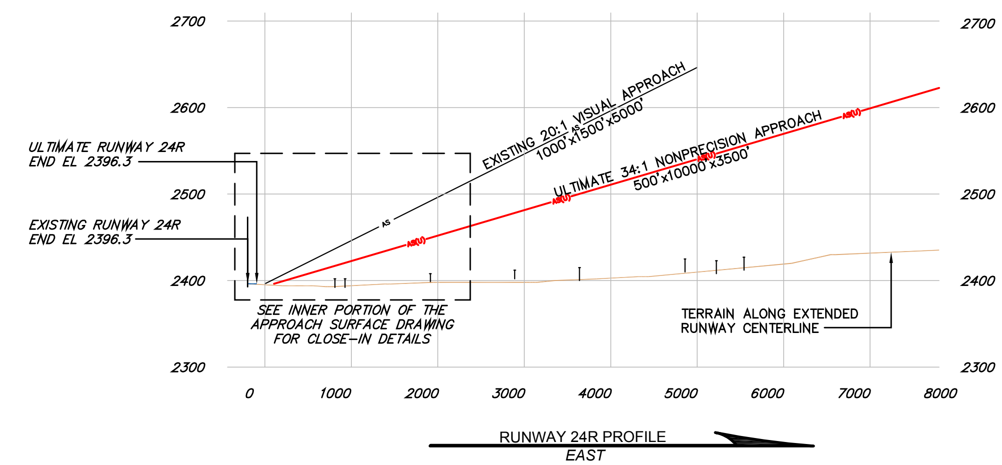
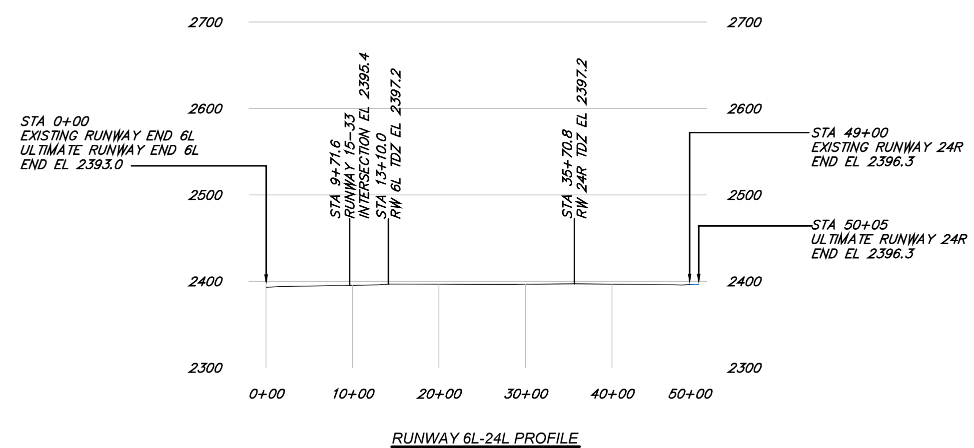


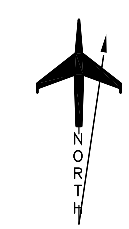
RUNWAY 6L PROFILE
WEST



RUNWAY 24R PROFILE
EAST



RUNWAY 6L-24L PROFILE



Magnetic Declination
10° 47' East (June 2008)
Annual Rate of Change
00° 06' West (June2008)

0 1000 2000
HORIZONTAL SCALE IN FEET

0 100 200
VERTICAL SCALE IN FEET

RUNWAY 6L OBSTRUCTION TABLE

No.	Description	Top Elevation	Distance from RW End	Offset from Centerline	Penetration	Remediation
–	NONE FOUND	–	–	–	–	–

RUNWAY 24R OBSTRUCTION TABLE

No.	Description	Top Elevation	Distance from RW End	Offset from Centerline	Penetration	Remediation
–	NONE FOUND	–	–	–	–	–

GENERAL NOTES:

1. ELEVATIONS ADJUSTED UPWARD 10' FOR A PRIVATE ROAD, 15' FOR A PUBLIC ROAD, 17' FOR AN INTERSTATE HIGHWAY, AND 23' FOR A RAILROAD PER PART 77–OBJECTS AFFECTING NAVIGABLE AIRSPACE, SUBPART C, SECTION 77.23.
2. SEE THE INNER PORTION OF THE APPROACH SURFACE DRAWINGS FOR CLOSE-IN OBSTRUCTION DETAILS.

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TUCSON AIRPORT AUTHORITY
TUCSON INTERNATIONAL AIRPORT • RYAN AIRFIELD

RYAN AIRFIELD

AIRPORT AIRSPACE PROFILE 6L-24R

DRAFT

Tucson, Arizona

PLANNED BY: Eric S. Pfeifer
DETAILED BY: Diana L. Hopkins
APPROVED BY: James M. Harris

March 18, 2010 SHEET 9 OF 18

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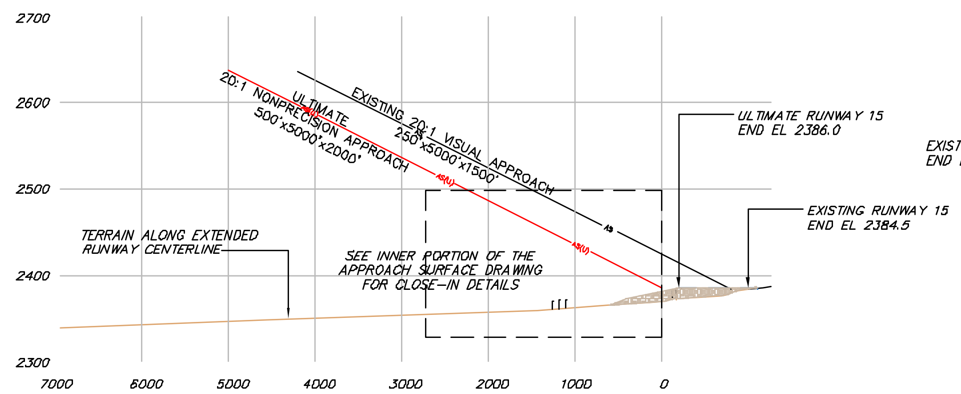
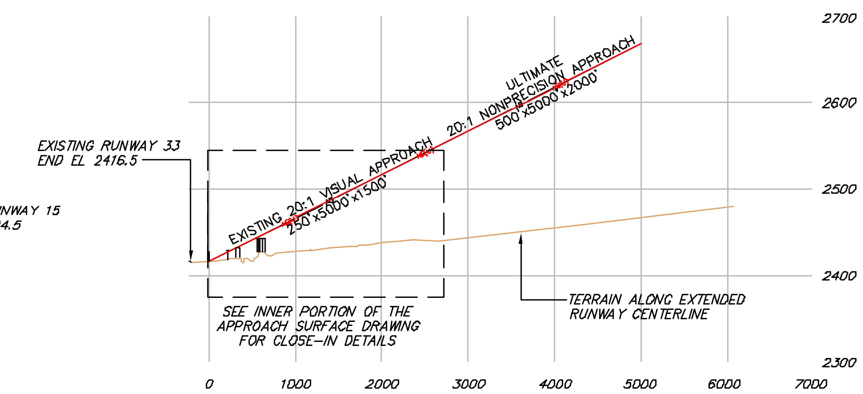
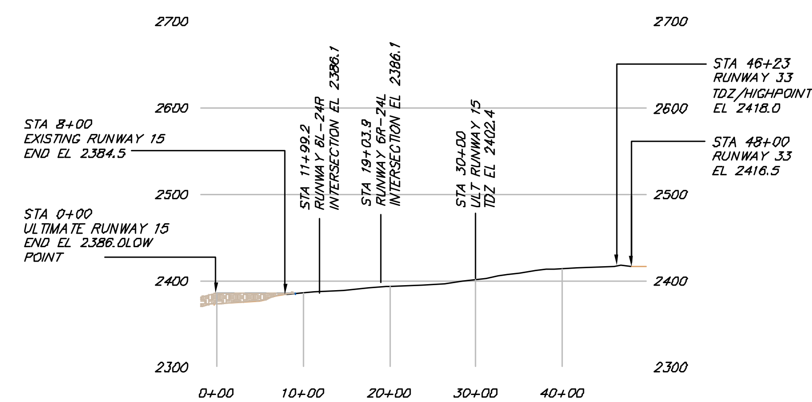
Coffman Associates R:\CAD\Hopkins\D\ALP\RYN\ALP\RYN ASP 6L 24R.dwg Printed Date: 6-15-10 08:53:05 AM dhopkins



RUNWAY 15 PROFILE
WEST



RUNWAY 33 PROFILE
EAST



RUNWAY 15-33 PROFILE

Magnetic Declination
10° 47' East (June 2008)
Annual Rate of Change
00° 06' West (June 2008)

HORIZONTAL SCALE IN FEET (0, 1000, 2000)

VERTICAL SCALE IN FEET (0, 100, 200)

RUNWAY 15 OBSTRUCTION TABLE

No.	Description	Top Elevation	Distance from RW End	Offset from Centerline	Penetration	Remediation
–	NONE FOUND	–	–	–	–	–

RUNWAY 33 OBSTRUCTION TABLE

No.	Description	Top Elevation	Distance from RW End	Offset from Centerline	Penetration	Remediation
–	NONE FOUND	–	–	–	–	–

GENERAL NOTES:

1. ELEVATIONS ADJUSTED UPWARD 10' FOR A PRIVATE ROAD, 15' FOR A PUBLIC ROAD, 17' FOR AN INTERSTATE HIGHWAY, AND 23' FOR A RAILROAD PER PART 77–OBJECTS AFFECTING NAVIGABLE AIRSPACE, SUBPART C, SECTION 77.23.
2. SEE THE INNER PORTION OF THE APPROACH SURFACE DRAWINGS FOR CLOSE-IN OBSTRUCTION DETAILS.
3. RUNWAY 15–33 IS DESIGNATED FOR SMALL AIRCRAFT ONLY.

No.	REVISIONS	BY		DATE
4	UPDATED AIRPORT MASTER PLAN	K.L.W.	M.F.J.	12/07/00
3	UPDATED AIRPORT MASTER PLAN	R.A.L.	S.G.B.	02/29/00
2	UPDATED FOR REVALIDATION	M.E.S.	M.F.J.	10/28/96
1	REVISED/UPDATED ALP (FAA/ADOT APPROVAL)	W.E.H.	J.M.H.	08/02/96

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TUCSON AIRPORT AUTHORITY

RYAN AIRFIELD

AIRPORT AIRSPACE PROFILE 15-33

DRAFT

Tucson, Arizona

PLANNED BY: Eric S. Pfeifer
DETAILED BY: Diana J. Hopkins
APPROVED BY: James M. Harris

March 18, 2010

SHEET 10 OF 18

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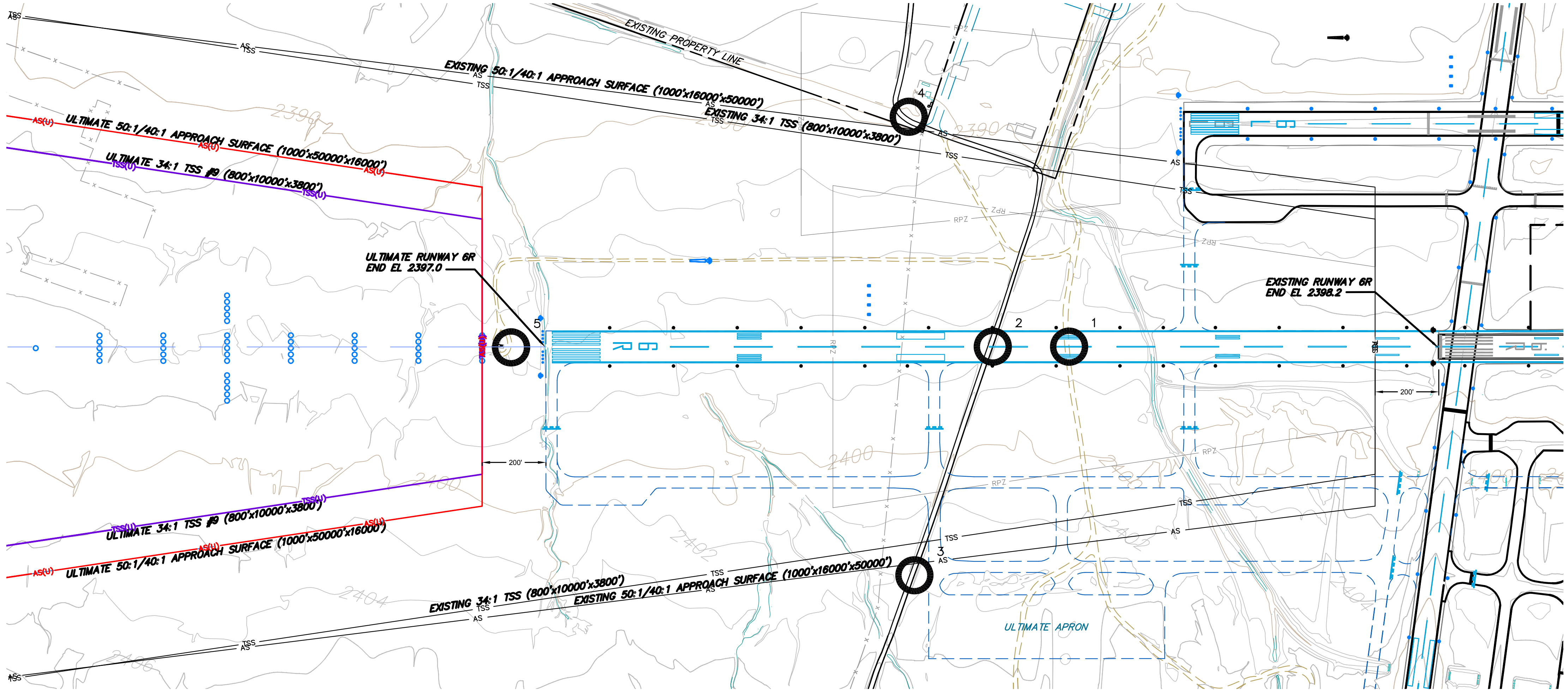
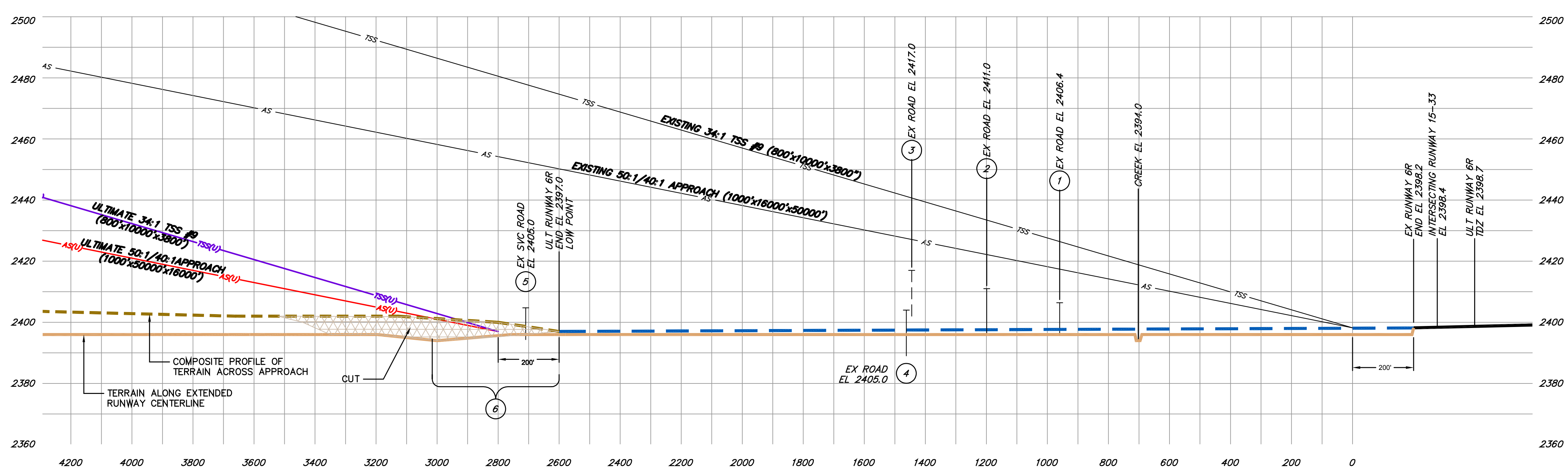
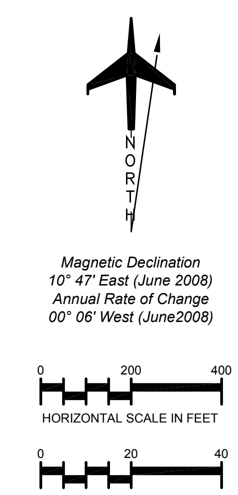


RUNWAY 6R PLAN
WEST



RUNWAY 6R PROFILE
WEST



Magnetic Declination
10° 47' East (June 2008)
Annual Rate of Change
00° 06' West (June2008)

EXISTING RUNWAY 6R OBSTRUCTION TABLE							
No.	Description	Top Elev	Distance from Exist RW End	Offset from Centerline	Approach Penetration	TSS Penetration	Remediation
	NONE FOUND						

ULTIMATE RUNWAY 6R OBSTRUCTION TABLE							
No.	Description	Top Elev	Distance from Ult RW End	Offset from Centerline	Approach Penetration	TSS Penetration	Remediation
6	TERRAIN	VARIES	VARIES	VARIES	> 0 TO >4	> 0 TO >3	TERRAIN TO BE CUT AND GRADED PER AC 150/5300-13 AS PART OF THE 1800' RUNWAY EXTENSION

No.	REVISIONS	BY		DATE
4	UPDATED AIRPORT MASTER PLAN	K.L.W.	M.F.J.	12/07/00
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1	REVISED/UPDATED ALP (FAA/ADOT APPROVAL)	W.E.H.	J.M.H.	08/02/96

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TUCSON AIRPORT AUTHORITY
TUCSON INTERNATIONAL AIRPORT • RYAN AIRFIELD

RYAN AIRFIELD
IPASD 6R
DRAFT
Tucson, Arizona

PLANNED BY: Eric S. Pfeifer
DETAILED BY: Diana L. Hopkins
APPROVED BY: James M. Harris

March 18, 2010
SHEET 11 OF 18

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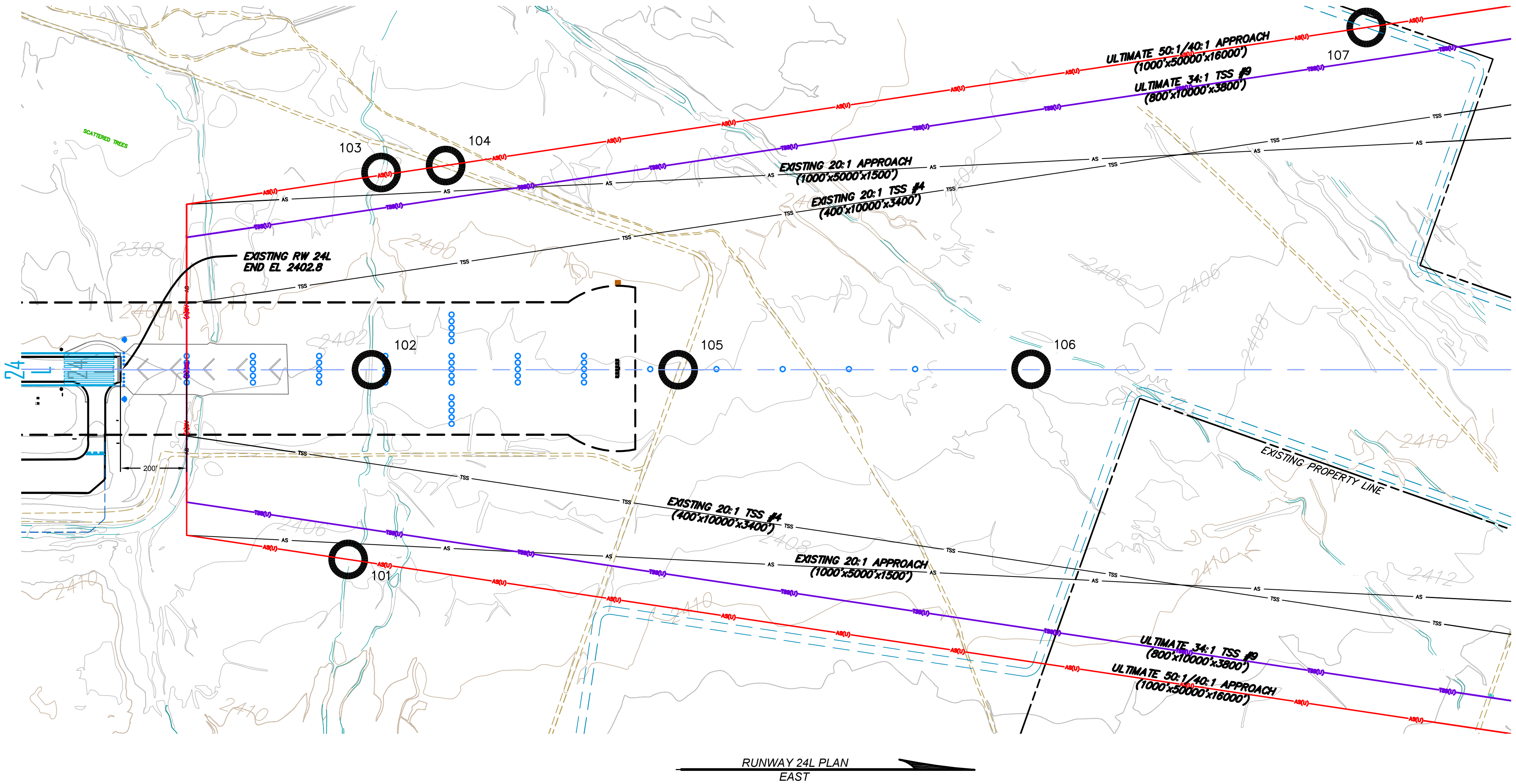
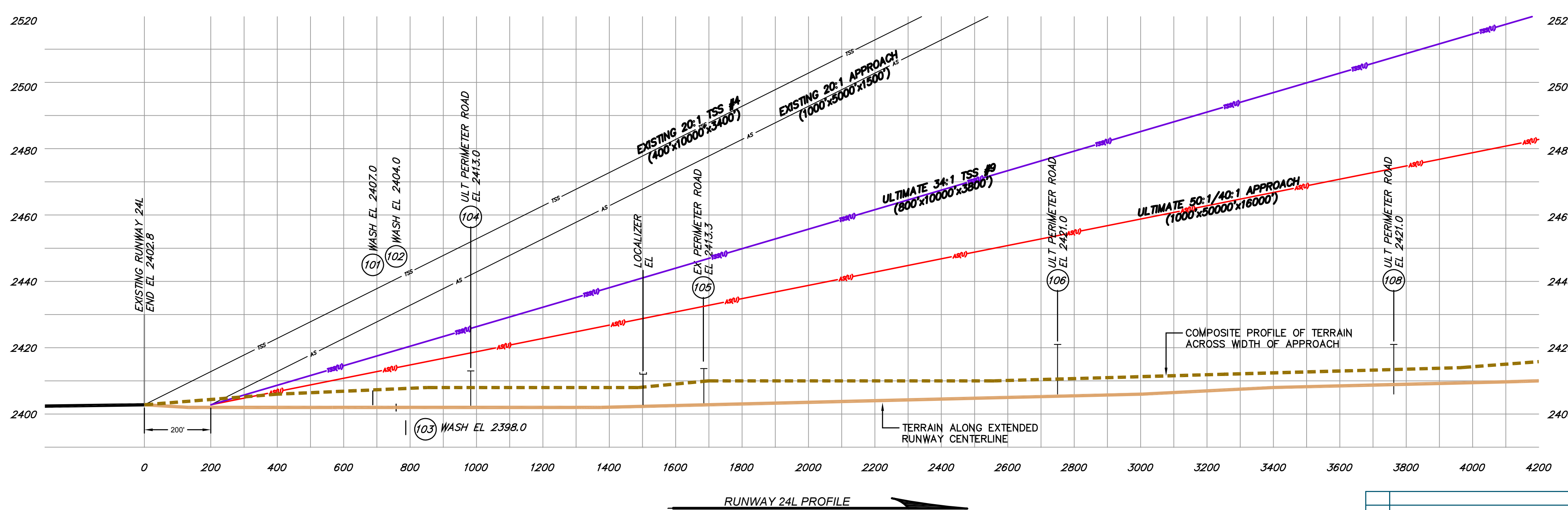
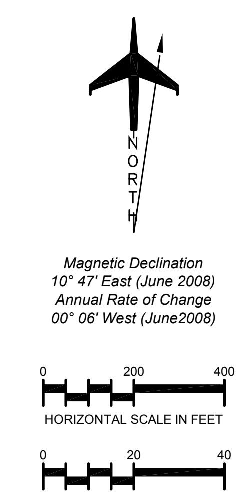




EXISTING RUNWAY 24L OBSTRUCTION TABLE							
No.	Description	Top Elevation	Distance from Exist RW End	Offset from Centerline	Approach Penetration	TSS Penetration	Remediation
	NONE FOUND						

ULTIMATE RUNWAY 24L OBSTRUCTION TABLE							
No.	Description	Top Elevation	Distance from Ult RW End	Offset from Centerline	Approach Penetration	TSS Penetration	Remediation
105	EXISTING PERIMETER ROAD	2413	184	0	11	1	TO BE RELOCATED



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TUCSON AIRPORT AUTHORITY
TUCSON INTERNATIONAL AIRPORT • RYAN AIRFIELD

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RYAN AIRFIELD

IPASD 24L

DRAFT

Tucson, Arizona

PLANNED BY: Eric S. Pfeifer
DETAILED BY: Diana L. Hopkins
APPROVED BY: James M. Harris

March 18, 2010 SHEET 12 OF 18

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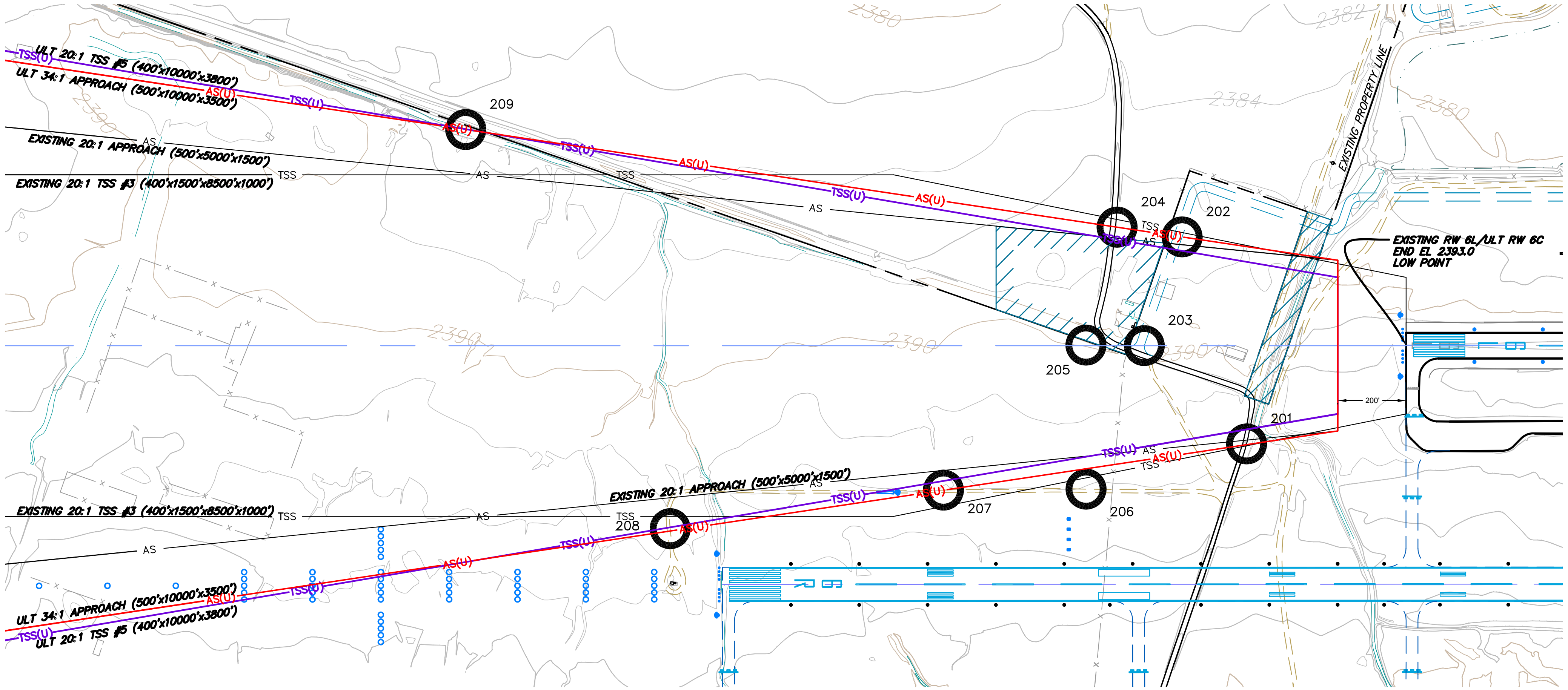


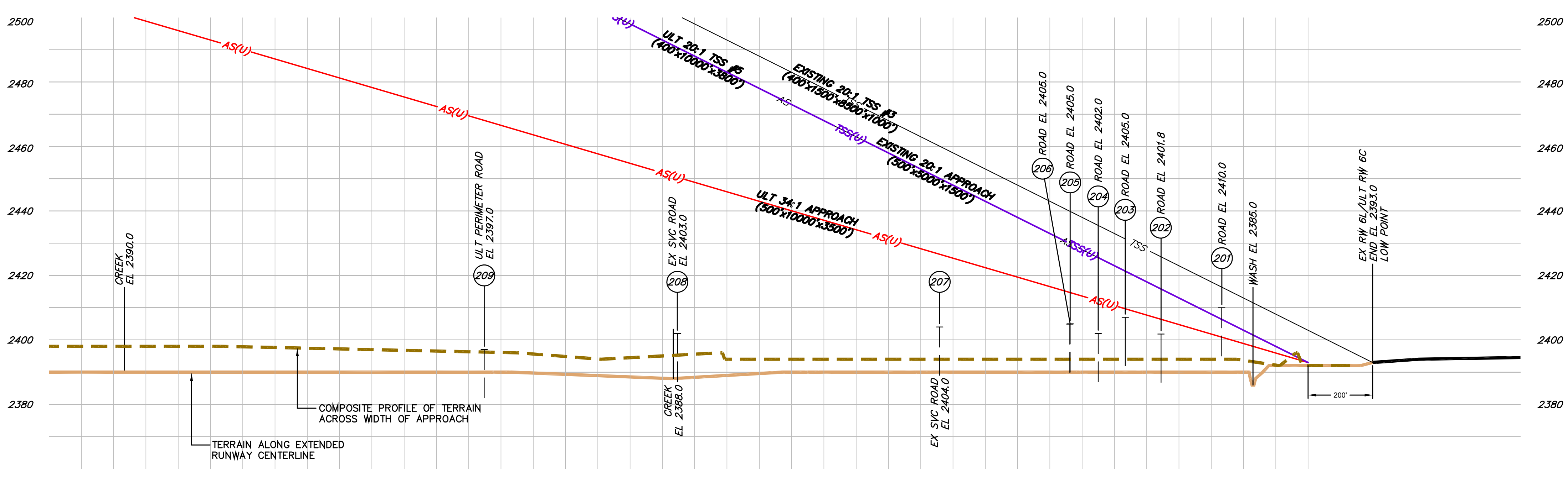
RUNWAY 6L PLAN
WEST

No.	Description	Top Elevation	Distance from Exist RW End	Offset from Centerline	Approach Penetration	TSS Penetration	Remediation
201	ACCESS ROAD	2410	467	288 R	4	4	RELOCATE ROAD

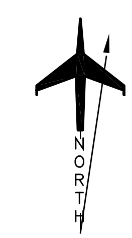
EXISTING RUNWAY 6L OBSTRUCTION TABLE

No.	Description	Top Elevation	Distance from Ult RW End	Offset from Centerline	Approach Penetration	TSS Penetration	Remediation
201	ACCESS ROAD	2410	467	288 R	4	0	RELOCATE ROAD

ULTIMATE RUNWAY 6L OBSTRUCTION TABLE



RUNWAY 6L PROFILE
WEST



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10° 47' East (June 2008)
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00° 06' West (June2008)

0 200 400
HORIZONTAL SCALE IN FEET

0 20 40
VERTICAL SCALE IN FEET

TUCSON AIRPORT AUTHORITY
TUCSON INTERNATIONAL AIRPORT • RYAN AIRFIELD

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RYAN AIRFIELD

IPASD 6L

DRAFT

Tucson, Arizona

PLANNED BY: Eric S. Pfeifer
DETAILED BY: Diana L. Hopkins
APPROVED BY: James M. Harris

March 18, 2010 — SHEET 13 OF 18

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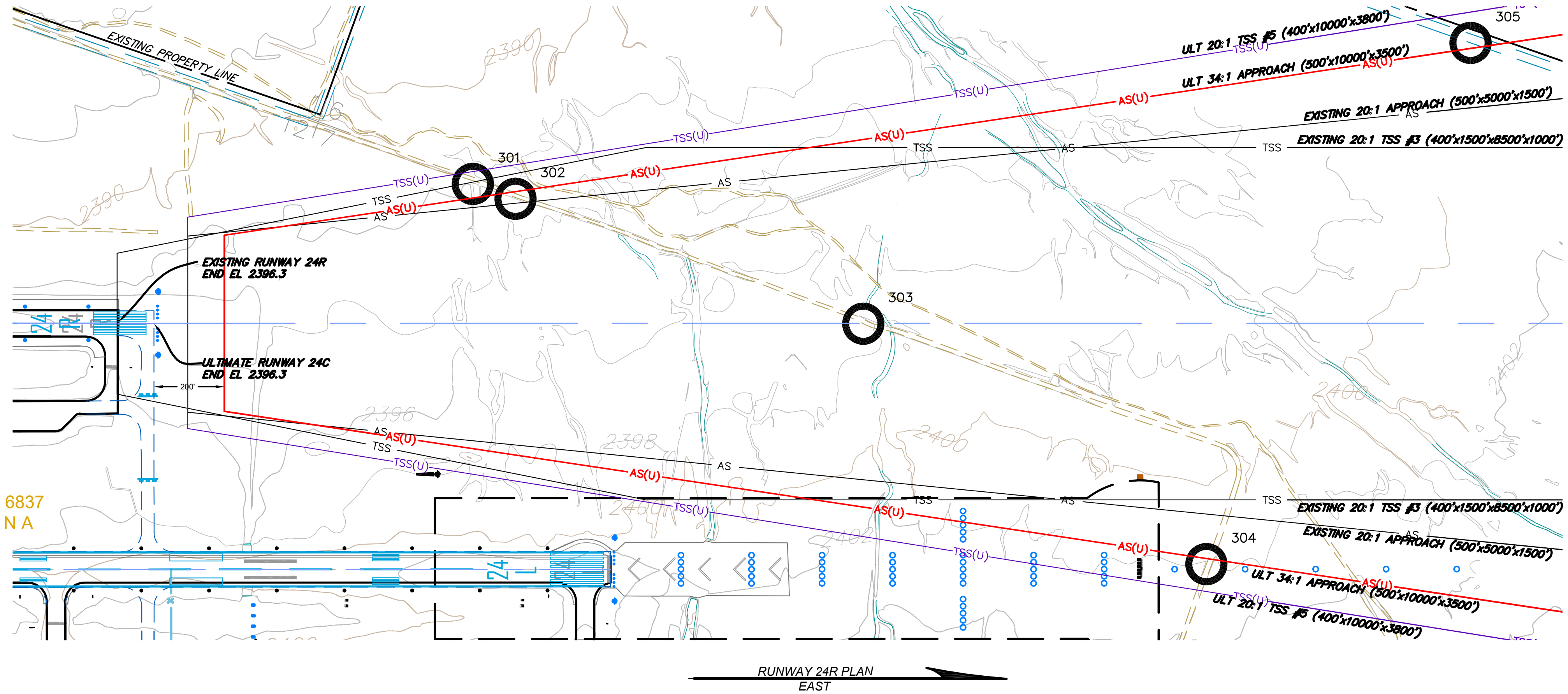
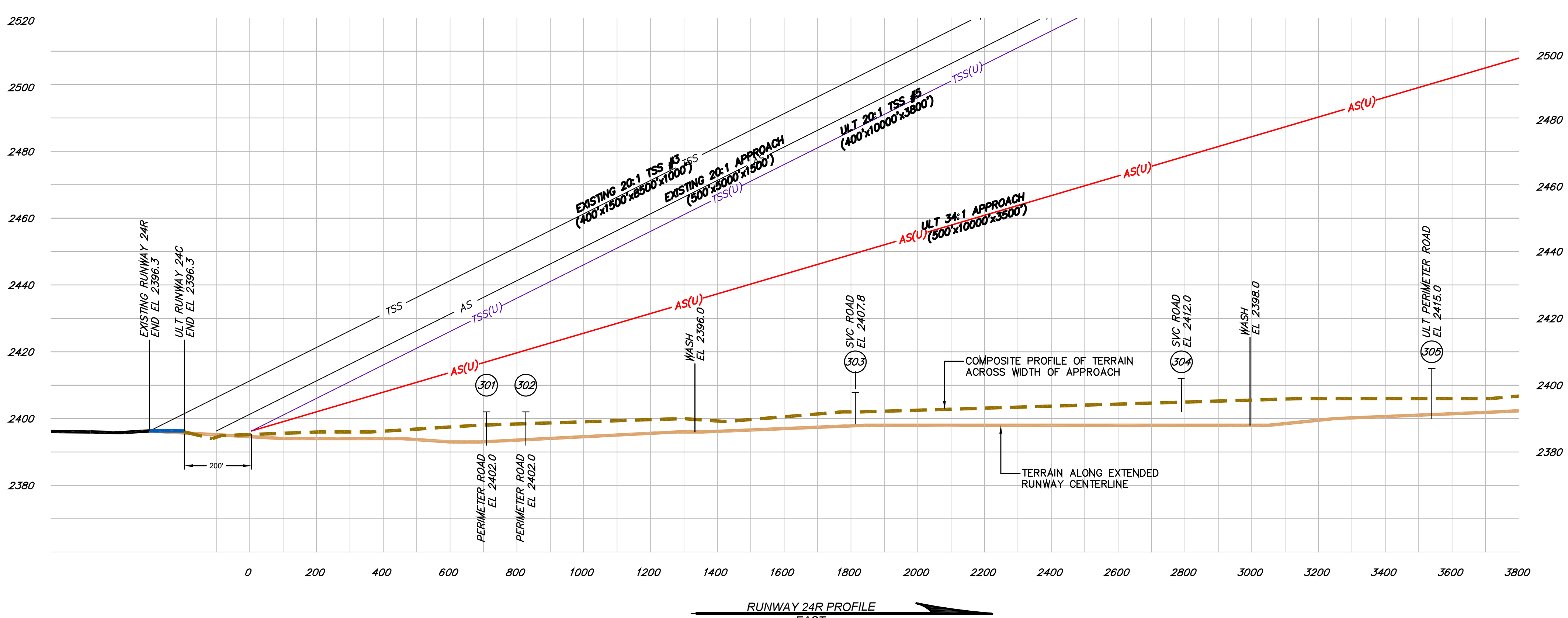


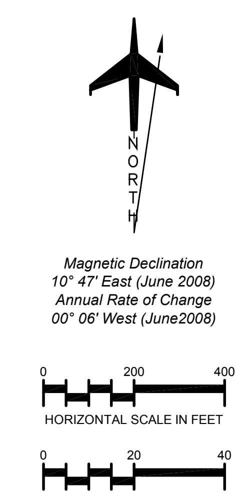


EXISTING RUNWAY 24R OBSTRUCTION TABLE

No.	Description	Top Elevation	Distance from Exist RW End	Offset from Centerline	Approach Penetration	TSS Penetration	Remediation
	NONE FOUND						

ULTIMATE RUNWAY 24R OBSTRUCTION TABLE

No.	Description	Top Elevation	Distance from Ult RW End	Offset from Centerline	Approach Penetration	TSS Penetration	Remediation
	NONE FOUND						



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RYAN AIRFIELD

IPASD 24R

DRAFT

Tucson, Arizona

PLANNED BY: Eric S. Pfeifer
DETAILED BY: Diana L. Hopkins
APPROVED BY: James M. Harris

March 18, 2010

SHEET 14 OF 18

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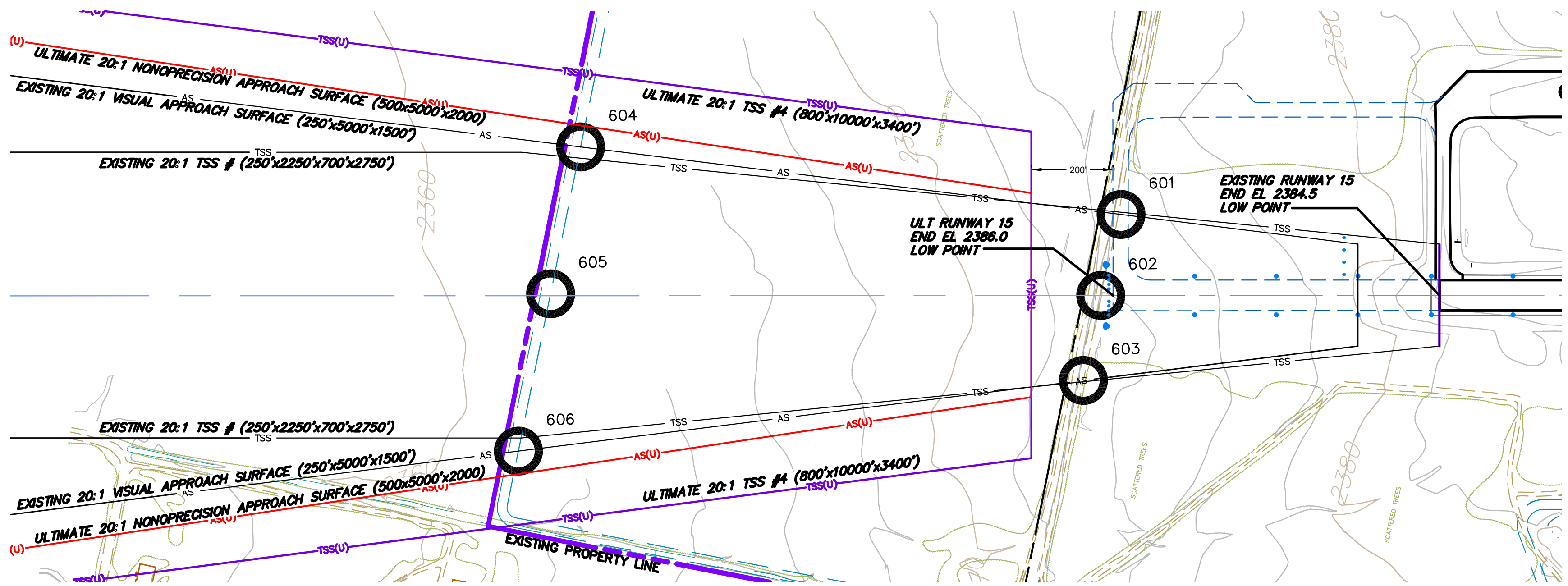
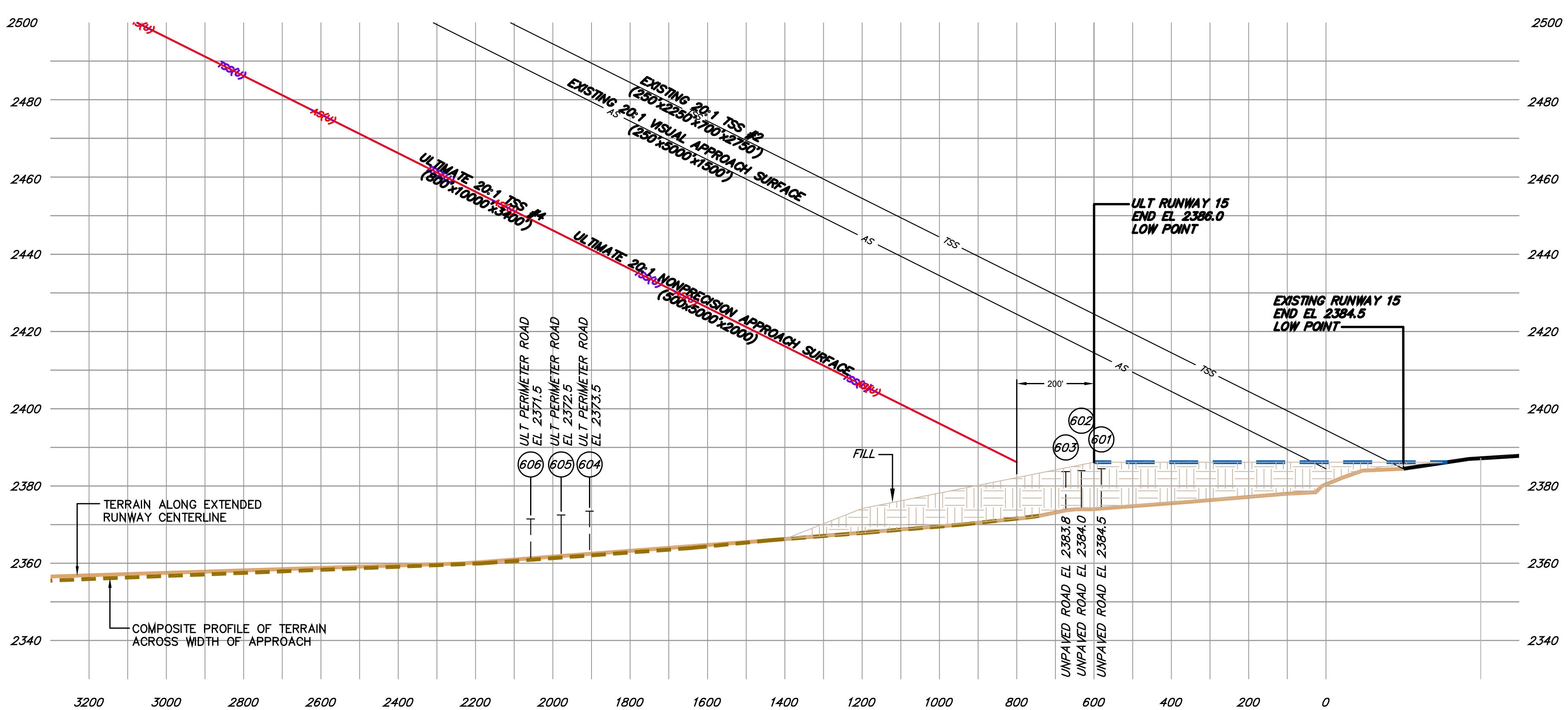
EXISTING RUNWAY 15 OBSTRUCTION TABLE							
No.	Description	Top Elevation	Distance from Exist RW End	Offset from Centerline	Approach Penetration	TSS Penetration	Remediation
	UNPAVED ROAD						

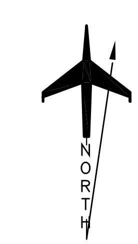
ULTIMATE RUNWAY 15 OBSTRUCTION TABLE							
No.	Description	Top Elevation	Distance from Ult RW End	Offset from Centerline	Approach Penetration	TSS Penetration	Remediation
601	UNPAVED ROAD	2384.5	−20	198 L	NA	NA	REROUTE OR CLOSE ROAD DURING CONSTRUCTION OF ULT RUNWAY AND TAXIWAY
602	UNPAVED ROAD	2384.0	30	0	NA	NA	REROUTE OR CLOSE ROAD DURING CONSTRUCTION OF ULT RUNWAY AND TAXIWAY
603	UNPAVED ROAD	2384.0	72	208 R	NA	NA	REROUTE OR CLOSE ROAD DURING CONSTRUCTION OF ULT RUNWAY AND TAXIWAY



RUNWAY 15 PLAN
WEST



RUNWAY 15 PROFILE
WEST



Magnetic Declination
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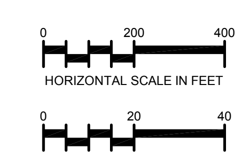

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RYAN AIRFIELD
IPASD 15
DRAFT
Tucson, Arizona

PLANNED BY: Eric S. Pfeifer
DETAILED BY: Diana L. Hopkins
APPROVED BY: James M. Harris

March 18, 2010 SHEET 15 OF 18

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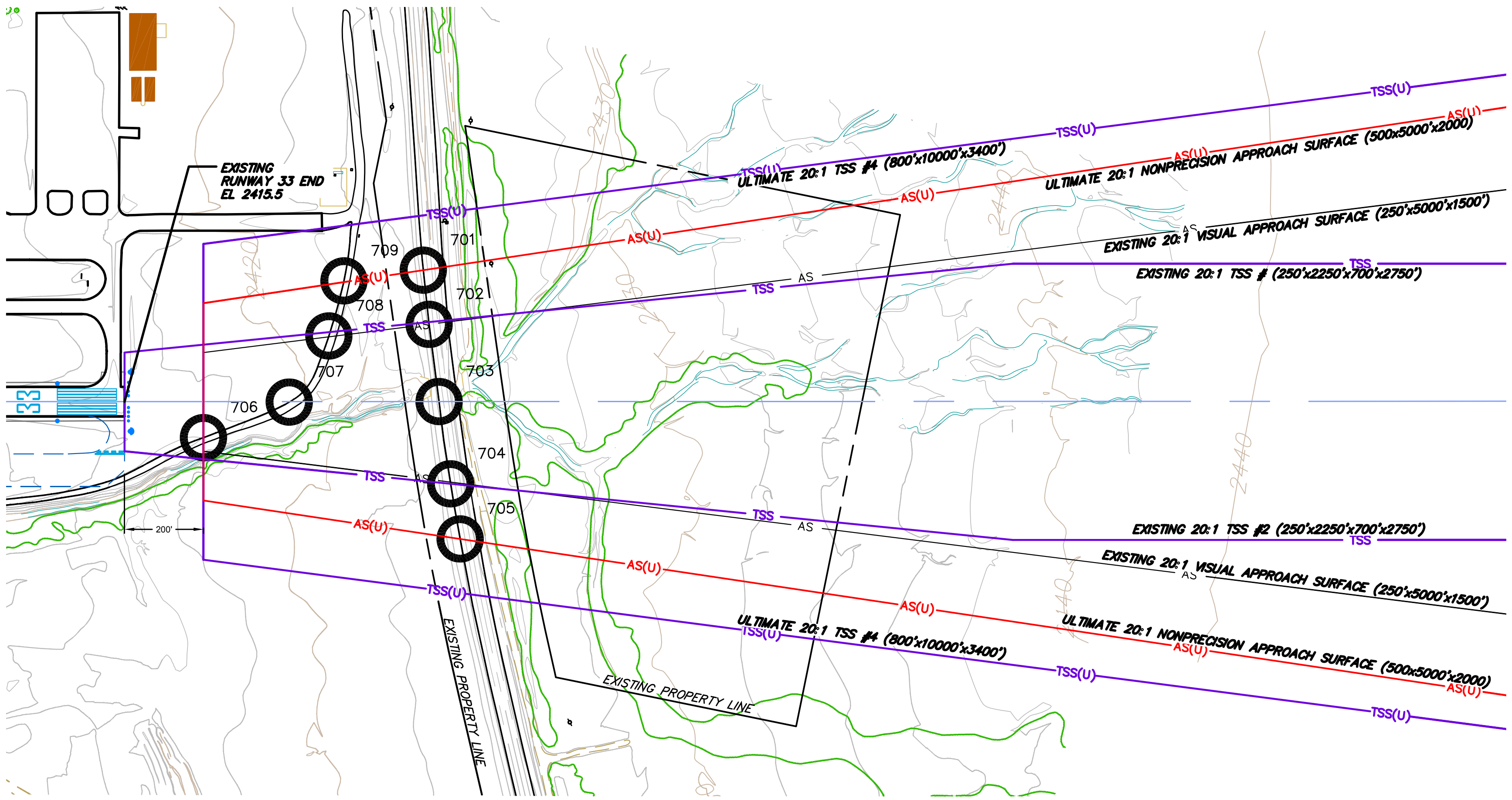
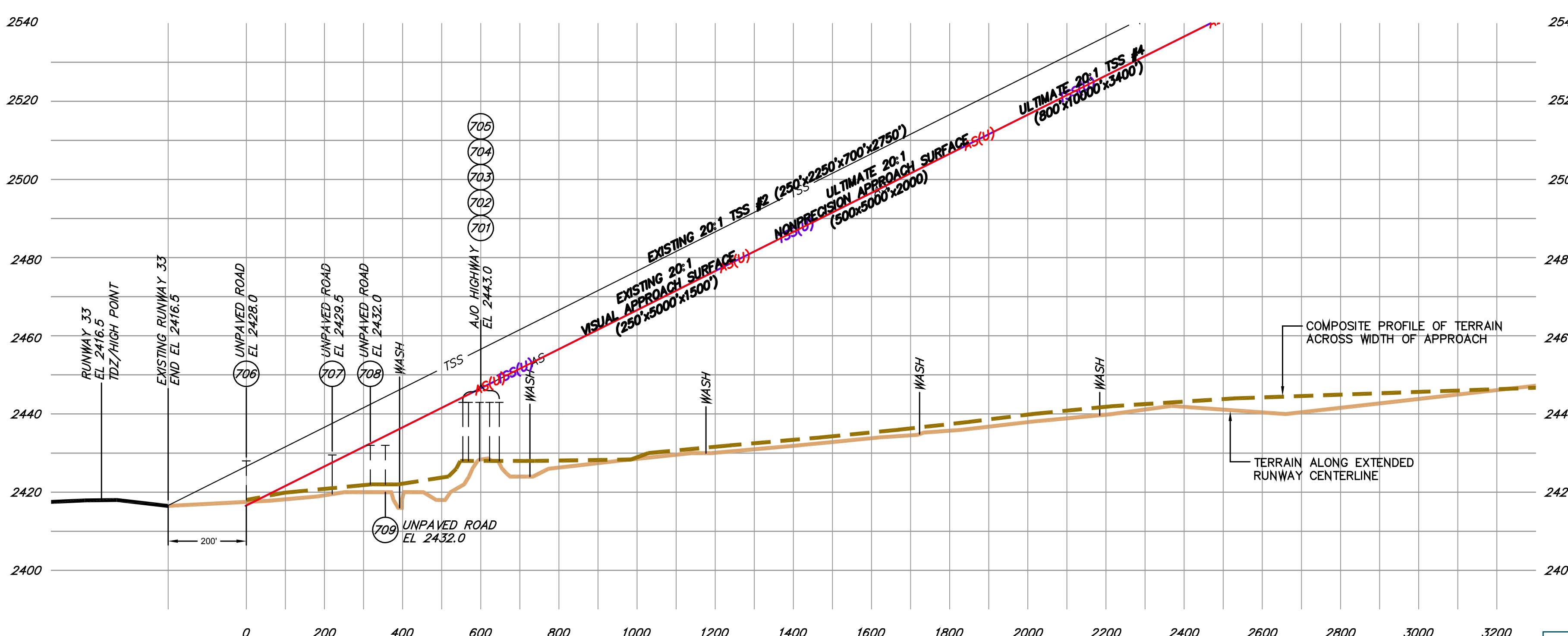


RUNWAY 33 PLAN
EAST

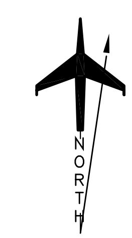


RUNWAY 33 PROFILE
EAST

EXISTING RUNWAY 33 OBSTRUCTION TABLE							
No.	Description	Top Elevation	Distance from Exist RW End	Offset from Centerline	Approach Penetration	TSS Penetration	Remediation
706	SERVICE ROAD	2428	200	91 L	12	2	REROUTE OR CLOSE SERVICE ROAD TO CLEAR TSS
707	SERVICE ROAD	2430	417	0	2	0	CLEARS TSS; NAR

NAR – NO ACTION REQUIRED

ULTIMATE RUNWAY 33 OBSTRUCTION TABLE							
No.	Description	Top Elevation	Distance from Ult RW End	Offset from Centerline	Approach Penetration	TSS Penetration	Remediation
706	SERVICE ROAD	2428	200	91 L	10	10	REROUTE OR CLOSE SERVICE ROAD TO CLEAR TSS
707	SERVICE ROAD	2430	417	0	1	1	REROUTE OR CLOSE SERVICE ROAD TO CLEAR TSS



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0 200 400
HORIZONTAL SCALE IN FEET

0 20 40
VERTICAL SCALE IN FEET

TUCSON AIRPORT AUTHORITY
TUCSON INTERNATIONAL AIRPORT • RYAN AIRFIELD

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RYAN AIRFIELD
IPASD 33
DRAFT
Tucson, Arizona

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March 18, 2010 SHEET 16 OF 18

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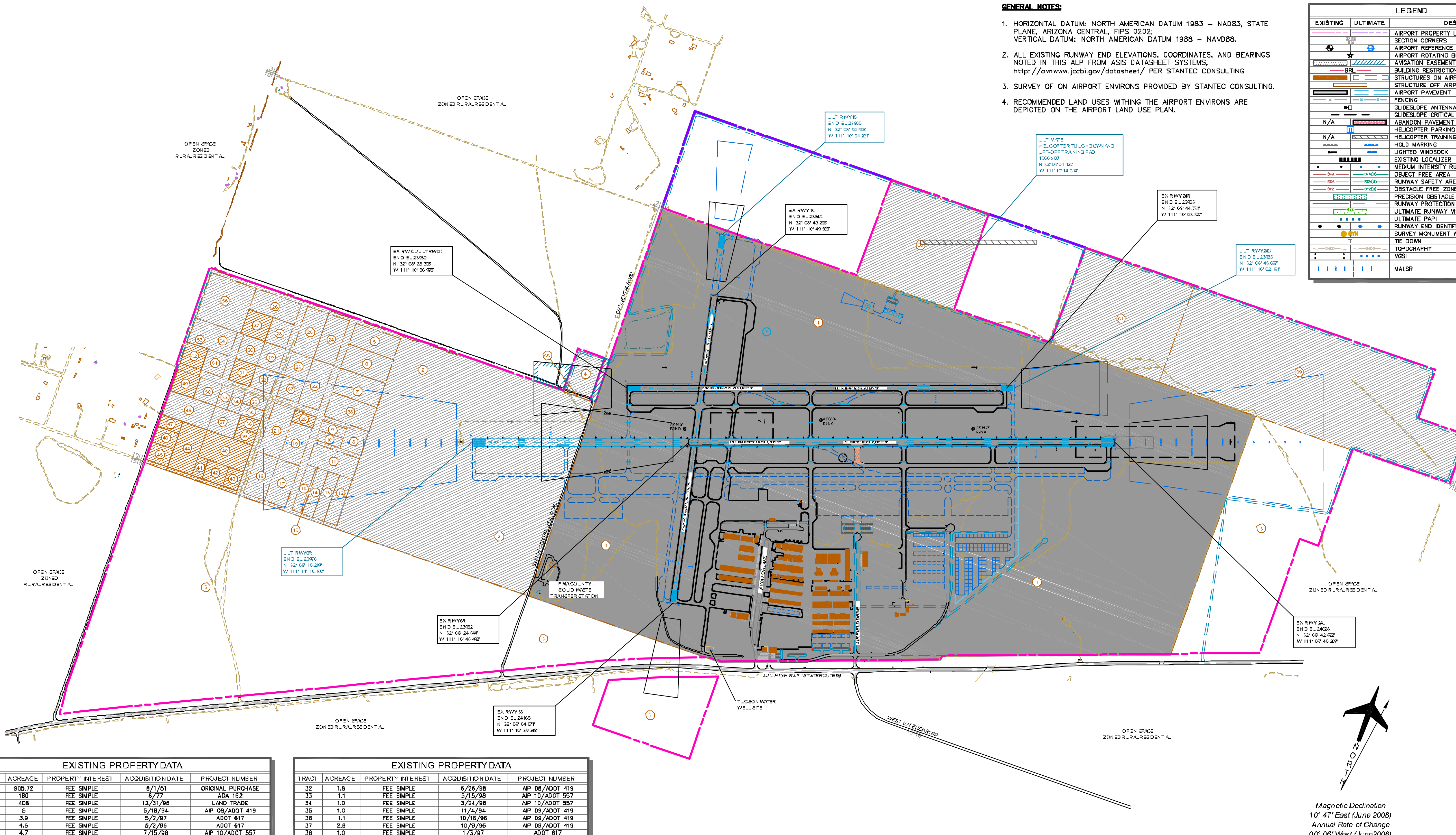

GENERAL NOTES:

1. HORIZONTAL DATUM: NORTH AMERICAN DATUM 1983 – NAD83, STATE PLANE, ARIZONA CENTRAL, FIPS 0202;
   VERTICAL DATUM: NORTH AMERICAN DATUM 1988 – NAVD88.
2. ALL EXISTING RUNWAY END ELEVATIONS, COORDINATES, AND BEARINGS NOTED IN THIS ALP FROM ASIS DATASHEET SYSTEMS, http://avnwww.jccbi.gov/datasheet/ PER STANTEC CONSULTING
3. SURVEY OF ON AIRPORT ENVIRONS PROVIDED BY STANTEC CONSULTING.
4. RECOMMENDED LAND USES WITHING THE AIRPORT ENVIRONS ARE DEPICTED ON THE AIRPORT LAND USE PLAN.

LEGEND

EXISTING	ULTIMATE	DESCRIPTION
		AIRPORT PROPERTY LINE
		SECTION CORNERS
		AIRPORT REFERENCE POINT (ARP)
		AIRPORT ROTATING BEACON
		AVIGATION EASEMENT
BRL		BUILDING RESTRICTION LINE
		STRUCTURES ON AIRPORT
		STRUCTURE OFF AIRPORT
		AIRPORT PAVEMENT
		FENCING
		GLIDESLOPE ANTENNA
		GLIDESLOPE CRITICAL AREA
N/A		ABANDON PAVEMENT
		HELICOPTER PARKING
N/A		HELICOPTER TRAINING PAD
		HOLD MARKING
		LIGHTED WINDSOCK
		EXISTING LOCALIZER
		MEDIUM INTENSITY RUNWAY LIGHTING
OFA	OFA(U)	OBJECT FREE AREA
RSA	RSA(U)	RUNWAY SAFETY AREA
OFZ	OFZ(U)	OBSTACLE FREE ZONE
		PRECISION OBSTACLE FREE ZONE
		RUNWAY PROTECTION ZONE
RVZ		ULTIMATE RUNWAY VISIBILITY ZONE
		ULTIMATE PAPI
		RUNWAY END IDENTIFIER LIGHTS (REILS)
RYN		SURVEY MONUMENT WITH IDENTIFIER
		TIE DOWN
2400	2400	TOPOGRAPHY
		VGSI
		MALSR

EXISTING PROPERTY DATA

TRACT	ACREAGE	PROPERTY INTEREST	ACQUISITION DATE	PROJECT NUMBER
1	905.72	FEE SIMPLE	8/1/51	ORIGINAL PURCHASE
2	160	FEE SIMPLE	6/77	ADA 162
3	408	FEE SIMPLE	12/31/96	LAND TRADE
4	5	FEE SIMPLE	5/18/94	AIP 08/ADOT 419
5	3.9	FEE SIMPLE	5/2/97	ADOT 617
6	4.6	FEE SIMPLE	5/2/96	ADOT 617
7	4.7	FEE SIMPLE	7/15/98	AIP 10/ADOT 557
8	2	FEE SIMPLE	1/19/95	AIP 07/ADOT 218/318
9	1.1	FEE SIMPLE	7/18/94	AIP 07/ADOT 218/318
10	1.1	FEE SIMPLE	11/19/93	AIP 07/ADOT 218/318
11	3.9	FEE SIMPLE	11/13/92	AIP 07/ADOT 218/318
12	2.1	FEE SIMPLE	9/29/93	AIP 08/ADOT 419
13	2.1	FEE SIMPLE	9/4/91	ADOT 915
14	1.5	FEE SIMPLE	1/19/94	AIP 07/ADOT 218/318
15	0.3	FEE SIMPLE	3/29/94	AIP 07/ADOT 218/318
16	1.8	FEE SIMPLE	3/29/94	AIP 07/ADOT 218/318
17	3.9	FEE SIMPLE	6/27/94	AIP 07/ADOT 218/318
18	3.7	FEE SIMPLE	12/2/98	AIP 10/ADOT 557
19	3.2	FEE SIMPLE	7/10/98	AIP 10/ADOT 557
20	1.0	FEE SIMPLE	12/24/91	ADOT 915
21	4.2	FEE SIMPLE	12/7/94	AIP 09/ADOT 419
22	4.2	FEE SIMPLE	2/24/95	AIP 09/ADOT 419
23	2.2	FEE SIMPLE	3/28/95	AIP 08/ADOT 419
24	4.2	FEE SIMPLE	10/27/97	ADOT 719
25	4.1	FEE SIMPLE	8/22/94	AIP 09/ADOT 419
26	4.0	FEE SIMPLE	11/29/95	AIP 08/ADOT 419
27	2.5	FEE SIMPLE	8/28/97	ADOT 719
28	2.2	FEE SIMPLE	9/16/94	AIP 09/ADOT 419
29	2.1	FEE SIMPLE	10/3/95	AIP 09/ADOT 419
30	2.1	FEE SIMPLE	6/3/94	AIP D9/ ADOT 419
31	1.8	FEE SIMPLE	6/4/92	ADOT 915

EXISTING PROPERTY DATA

TRACT	ACREAGE	PROPERTY INTEREST	ACQUISITION DATE	PROJECT NUMBER
32	1.8	FEE SIMPLE	6/26/98	AIP 08/ADOT 419
33	1.1	FEE SIMPLE	5/15/98	AIP 10/ADOT 557
34	1.0	FEE SIMPLE	3/24/98	AIP 10/ADOT 557
35	1.0	FEE SIMPLE	11/4/94	AIP D9/ADOT 419
36	1.1	FEE SIMPLE	10/16/96	AIP D9/ADOT 419
37	2.8	FEE SIMPLE	10/9/96	AIP D9/ADOT 419
38	1.0	FEE SIMPLE	1/3/97	ADOT 617
39	1.1	FEE SIMPLE	1/3/97	ADOT 617
40	4.6	FEE SIMPLE	9/19/97	ADOT 719
41	1.1	FEE SIMPLE	9/18/96	ADOT 617
42	1.7	FEE SIMPLE	5/6/97	ADOT 719
43	1.1	FEE SIMPLE	9/18/96	ADOT 617
44	1.4	FEE SIMPLE	3/10/98	ADOT 517
45	1.6	FEE SIMPLE	3/5/96	AIP 09/ADOT 419
46	1.0	FEE SIMPLE	8/31/92	AIP 07/ADOT 419
47	1.2	FEE SIMPLE	1/21/99	ADOT 719
48	4.7	FEE SIMPLE	10/3/94	AIP D7/ADOT 419
49	2.0	FEE SIMPLE	9/18/96	ADOT 617
50	2.1	FEE SIMPLE	7/27/95	AIP D9/ADOT 419
51	1.8	FEE SIMPLE	2/17/95	AIP 07/ADOT 218/318
52	1.8	FEE SIMPLE	9/4/98	ADOT 719
53	1.1	FEE SIMPLE	5/28/92	AIP 07/ADOT 218/318
54	3.2	FEE SIMPLE	5/28/92	AIP 07/ADOT 218/318
55	0.3	FEE SIMPLE	5/18/94	AIP D8/ADOT 419
56	8.7	FEE SIMPLE	9/3/99	AIP 10/ADOT 557
57	1.9	FEE SIMPLE	12/10/99	AIP 08/ADOT 419
58	4.7	FEE SIMPLE	5/26/00	AIP 08/ADOT 419
59	110	FEE SIMPLE	1/18/01	ADOT E1124
60	40	FEE SIMPLE	12/18/01	ADOT E2S21
61	45	FEE SIMPLE	11/21/02	ADOT E2S21

PROPERTY LEGEND

- Existing Property Boundary Line
- Future Property Boundary Line
- Tract Boundary Line
- Property Purchased Originally
- Property Purchased with Federal Funds
- Property Purchased with Non-Federal Funds

No.	REVISIONS	BY		DATE
4	UPDATED AIRPORT MASTER PLAN	K.L.W.	M.F.J.	12/07/00
3	UPDATED AIRPORT MASTER PLAN	R.A.L.	S.G.B.	02/29/00
2	UPDATED FOR REVALIDATION	N.E.S.	M.F.J.	10/29/96
1	REVISED/UPDATED ALP (FAA/ADOT APPROVAL)	W.E.H.	J.M.H.	08/02/96

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TUCSON AIRPORT AUTHORITY

RYAN AIRFIELD

AIRPORT PROPERTY MAP

DRAFT

Tucson, Arizona

PLANNED BY: Eric S. Pfeifer
DETAILED BY: Diana L. Hopkins
APPROVED BY: James M. Harris

March 18, 2010

SHEET 17 OF 18

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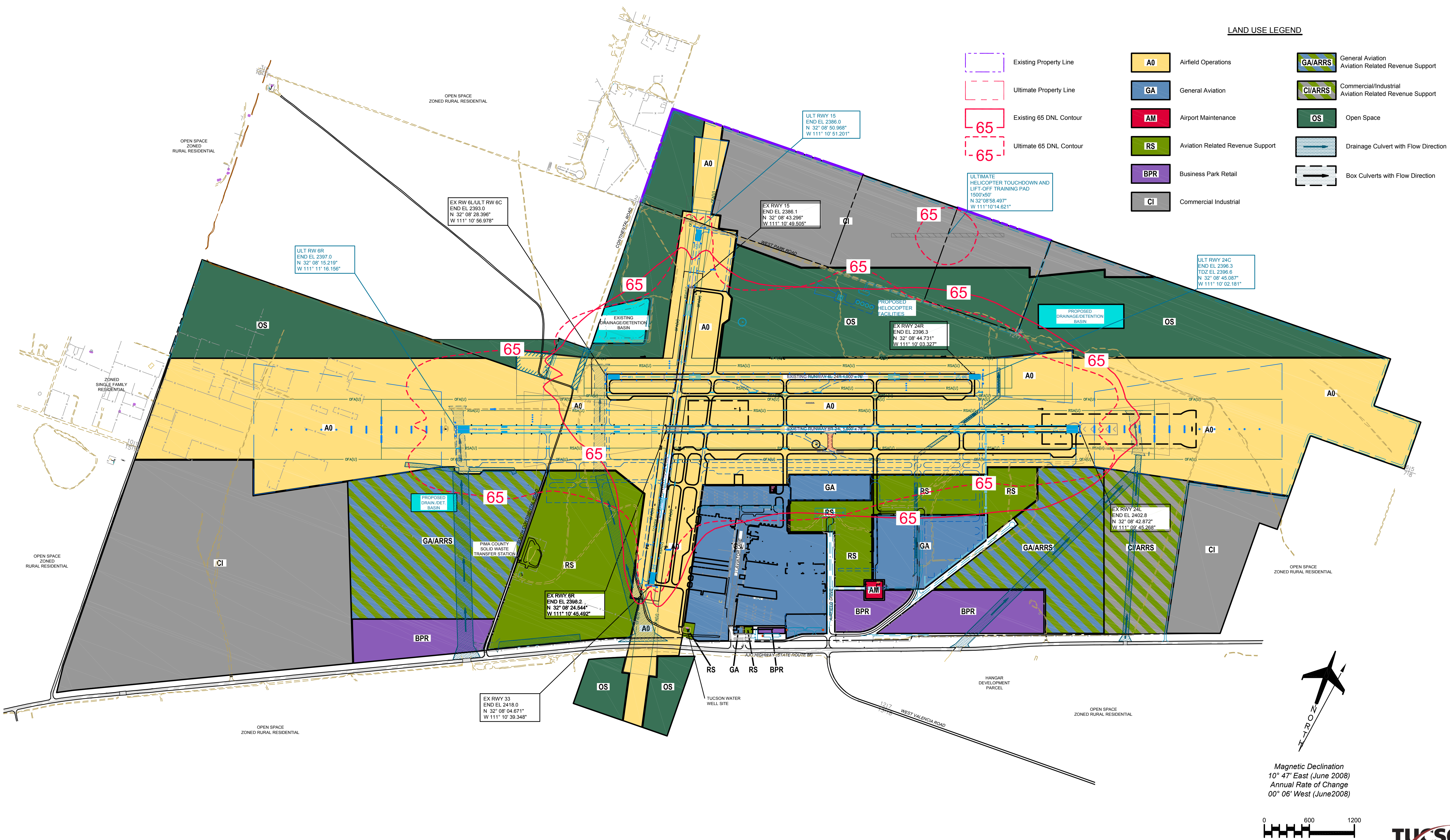

TUCSON AIRPORT AUTHORITY
TUCSON INTERNATIONAL AIRPORT • RYAN AIRFIELD

No.	REVISIONS	BY		DATE
4	UPDATED AIRPORT MASTER PLAN	K.L.W.	M.F.J.	12/07/00
3	UPDATED AIRPORT MASTER PLAN	R.A.L.	S.G.B.	02/29/00
2	UPDATED FOR REVALIDATION	M.E.S.	M.F.J.	10/29/96
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RYAN AIRFIELD

AIRPORT LAND USE DRAWING

DRAFT

Tucson, Arizona

PLANNED BY: Eric S. Pfeifer
DETAILED BY: Diana L. Hopkins
APPROVED BY: James M. Harris

March 18, 2010 — SHEET 18 OF 18

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Chapter 6

CAPITAL IMPROVEMENT PROGRAM

Chapter Six

Capital Improvement Program

The implementation of the Ryan Airfield Master Plan will require sound judgment on the part of airport management. Among the more important factors influencing decisions to carry out a recommendation is timing and airport activity. Both of these factors should be used as references in plan implementation.

Experience has indicated that problems can materialize from the standard time-based format of traditional planning documents. The problems typically center on inflexibility and an inability to deal with unforeseen changes that may occur.

While it is necessary for scheduling and budgeting purposes to consider timing of airport development, the actual need for facilities is established by airport activity. Proper master planning implementation suggests the use of airport activity levels, rather than time, as guidance for development.

This section of the Master Plan is intended to become one of the primary references for decision-makers responsible for implementing master plan recommendations. Consequently, the narrative and graphic presentations must provide understanding of each recommended development item. This understanding will be critical in maintaining a realistic and cost-effective program that provides maximum benefit to the community.

CAPITAL IMPROVEMENTS FUNDING

Financing capital improvements at the airport will not rely exclusively upon the financial resources of the TAA. Capital improvement funding is available through various grants-in-aid programs at both the federal and state levels. The following discussion outlines the key sources for capital improvement funding.

FEDERAL GRANTS

The United States Congress has long recognized the need to develop and maintain a system of aviation facilities across the nation for the purpose of national defense and promotion of interstate commerce. Various grants-in-aid programs to public airports have been established over the years for this purpose. The most recent legislation is the *Airport Improvement Program* (AIP) of 1982. The AIP has been reauthorized several times, with the most recent legislation enacted in 2003 and entitled the *Vision 100 – Century of Aviation Reauthorization Act.*

Fiscal year 2007 was the last year of the four-year program. That bill presented similar funding levels to the previous reauthorization – *AIR-21*. Funding was authorized at $3.7 billion in 2007. Vision 100 expired in September of 2007 and since this time Congress has not passed reauthorization legislation. However, Congress passed the FAA Extension Act of 2008 Part II, which was a continuation of funds through March 6, 2009. Funds available from October 1, 2008 to March 6, 2009 totaled $1.5 billion. On March 30th, 2009 the President signed another bill extending the AIP program through the end of September, 2009. Funds made available by this bill total $3.5 billion. The AIP Program was extended an additional three months at the end of September. This extension will fund FAA through the end of 2009.

The source for AIP funds is the Aviation Trust Fund. The Aviation Trust Fund was established in 1970 to provide funding for aviation capital investment programs (aviation development, facilities and equipment, and research and development). The Trust Fund also finances the operation of the FAA. It is funded by user fees, taxes on airline tickets, aviation fuel, and various aircraft parts. Funds are distributed each year by the FAA from appropriations by Congress. A portion of the annual distribution is to primary commercial service airports based upon enplanement levels. General aviation airports, however, also received entitlements under the last reauthorization. After all specific funding mechanisms are distributed, the remaining AIP funds are disbursed by the FAA, based upon the priority of the project for which they have requested federal assistance through discretionary apportionments. A national priority system is used to evaluate and rank each airport project. Those projects with the highest priority are given preference in funding.

Under the AIP program, examples of eligible development projects include the airfield, aprons, and access roads.

Passenger terminal building improvements (such as bag claim and public waiting lobbies) may also be eligible for FAA funding. Under the newest version of AIP, *Vision 100*, automobile parking at small hub airports can also be eligible. Improvements such as fueling facilities, utilities (with the exception of water supply for fire prevention), hangar buildings, airline ticketing, and airline operations areas are not typically eligible for AIP funds.

Under *Vision 100*, Ryan Airfield has been eligible for 95 percent funding assistance from AIP grants, as opposed to the previous *AIR-21* level of 90 percent. While similar programs have been in place for over 50 years, it will be up to Congress to either extend or draft new legislation authorizing and appropriating future federal funding.

STATE AID TO AIRPORTS

In support of the state airport system, the State of Arizona also participates in airport improvement projects. The source for state airport improvement funds is the Arizona Aviation Fund. Taxes levied by the state on aviation fuel, flight property, aircraft registration tax, and registration fees (as well as interest on these funds), are deposited in the Arizona Aviation Fund. The state transportation board (STB) establishes the policies for distribution of these state funds. To ensure proper project planning and eligibility of state funded projects, the STB requires airports to submit a five-year airport capital improvement program (ACIP). The ACIP is reviewed and approved annually by the STB so that funds are allocated appropriately to maintain safe and orderly development of the Arizona airport system.

Under the State of Arizona grant program, an airport can receive funding for one-half (2.5 percent) of the local share of projects receiving federal AIP funding. The state also provides 90 percent funding for projects which are typically not eligible for federal AIP funding or have not received federal funding.

State Airport Loan Program

The Arizona Department of Transportation - Aeronautics Division (ADOT) Airport Loan Program was established to enhance the utilization of state funds and provide a flexible funding mechanism to assist airports in funding improvement projects. Eligible projects include runway, taxiway, and apron improvements; land acquisition; planning studies; and the preparation of plans and specifications for airport construction projects; as well as revenue-generating improvements such as hangars and fuel storage facilities. Projects which are not currently eligible for the State Airport Loan Program are considered if the project would enhance the airport's ability to be financially self-sufficient.

There are two ways in which the loan funds can be used: Matching Funds or Revenue Generating Projects. The Matching Funds are provided to meet the local matching fund requirement for securing federal airport improvement grants or other federal or state grants. The Revenue Generating Projects' funds are provided for airport-related construction projects that are not eligible for funding under another program.

Pavement Maintenance Program

The airport system in Arizona is a multi-million dollar investment of public and private funds that must be protected and preserved. State aviation fund dollars are limited and the State Transportation Board recognizes the need to protect and extend to the maximum amount the useful life of the airport system's pavement. This program, the Arizona Pavement Preservation Program (APPP), is established to assist in the preservation of the Arizona airport system infrastructure. Ryan Airfield participates in this program.

Public Law 103-305 requires that airports requesting federal AIP funding for pavement rehabilitation or reconstruction have an effective pavement maintenance management system. To this end, ADOT-Aeronautics has completed and is maintaining an Airport Pavement Management System (APMS) which, coupled with monthly pavement evaluations by the airport sponsors, fulfills this requirement.

The Arizona Airport Pavement Management System uses the Army Corps of Engineers' "Micropaver" program as a basis for generating a Five-Year Airport Pavement Preservation Program (APPP). The APMS consists of visual inspections of all airport pavements. Evaluations are made of the types and severities observed and entered into a computer program database. Pavement Condition Index (PCI) values are determined through the visual assessment of pavement condition in accordance with the most recent FAA Advisory Circular 150/5380-6, and range from 0 (failed) to 100 (excellent). Every three years, a complete database update with new visual observations is conducted. Individual airport reports from the update are shared with all participating system airports. The Aeronautics Division ensures that the APMS database is kept current, in compliance with FAA requirements.

Every year, the Aeronautics Division, utilizing the APMS, will identify airport pavement maintenance projects eligible for funding for the upcoming five years. These projects will appear in the State's Five-Year ACIP. Once a project has been identified and approved for funding by the State Transportation Board, the airport sponsor may elect to accept a state grant for the project and not participate in the Airport Pavement Preservation Program (APPP), or the airport sponsor may sign an Inter Government Agreement (IGA) with the Aeronautics Division to participate in the APPP.

LOCAL FUNDING

The balance of project costs, after consideration has been given to grants, must be funded through airport resources. Assuming federal funding, this essentially equates to 2.5 percent of the project costs if all eligible FAA and state funds are available. If only ADOT grants are available, the airport share would be 10 percent of the project.

According to the capital improvement program depicted on **Exhibit 6A**, airport funding in the amount of $1.4 million will be needed for capital improvement projects through 2014, approximately $907,400 will be needed in the intermediate term, and almost $1.1 million will be needed in the long term. Airport funding is usually accomplished through the use of airport earnings and reserves, to the extent possible, with the remaining costs financed through revenue bonding.

Ryan Airfield is one of two airports managed and operated by the TAA. As a reliever airport for Tucson International Airport, Ryan Airfield's operation and development, in part, serves to provide a convenient and attractive alternative for general aviation in the Tucson area. As such, the TAA operates both airports as one fiscal entity. Thus it is difficult to break down the Ryan Airfield revenues and expenditures separately; therefore, a cash flow analysis cannot be done.

The following subsections, however, do provide a review of the sources of operating revenue that are available at Ryan Airfield to assist in meeting operating expenses and capital improvement program costs for the airport. These include land leases and fuel revenues and other income sources.

Land Leases

The TAA currently leases land to nine entities in the airport terminal area for aviation-related and non-aviation related uses. Ryan Airfield is fortunate compared to many airports in that there is additional land available for development to meet all future general aviation development needs. Sizeable areas will remain on the airport that is suitable for commercial and industrial development. The available land not only offers flexibility in the development of the airport, but also a source for operating revenue.

At Ryan Airfield, land leases are provided for developers to build and lease hangars. The TAA does not lease hangars to individuals, and virtually all existing hangar development has been provided by private sources. This is anticipated to continue in the future at Ryan Airfield, as long as private development demonstrates that it will meet the demand in an orderly and competitive manner.

Current land leases on the airport are in line with comparable lease rates at other general aviation airports. Lease clauses are also included which permit periodic adjustments for inflation.

Tie-downs are another source of revenue to the airport that is similar to a land lease. Local tie-downs are leased to individual aircraft owners on a monthly basis, while fees are charged for transient tie-downs on an overnight basis. Tie-down fees vary with the size and type of aircraft.

Fuel Revenues

Fuel sales at Ryan Airfield are provided by the TAA. A self-fueling facility is available on the south ramp next to the airport administration building. Aircraft operators fuel their own aircraft without the presence of TAA personnel, with the ability to pay-at-the pump with a credit card. Fuel is sold at going market rates. Jet fuel storage on the airport should be considered as turbine operations increase in the future. Jet fuel sales could generate large revenues due to the higher amounts of fuel used by turbine-powered aircraft.

Other Income

There are other smaller and less reliable sources of income that can be considered at the airport. Other income typically includes landing fees, automobile parking, concession income, and special events.

Landing fees and automobile parking are not typically charged on general aviation airports due to the low return for the cost of collection. Landing fees on larger aircraft that use the airport may be considered, but could also be a deterrent to the use of the airport. The trade off could be more significant losses in potential fuel revenues that could be gained from landing fees.

Fees from advertising and concessions in an airport-owned terminal building would be a means of helping to support the operating and construction costs of the facility. General aviation airports are often good locations for hosting special events such as air shows. While part of the interest in hosting special events is to draw attention to the airport's facilities, temporary use of available areas can also provide additional revenue.

AIRPORT DEVELOPMENT SCHEDULES AND COST SUMMARIES

Once the specific needs and improvements for the airport have been established, the next step is to determine a realistic schedule for implementing the plan. This section will present a development schedule.

Recommended improvements have been grouped by planning horizon: short term, intermediate term, and long term. **Table 6A** summarizes the key milestones for each of the three planning horizons.

TABLE 6A
Planning Horizon Summary
Ryan Airfield

	2008 Activity	Short Term	Intermediate Term	Long Term
Based Aircraft	242	266	296	369
General Aviation				
Itinerant	59,930	61,000	70,500	100,000
Local	104,262	107,000	119,500	150,000
Military	3,760	3,500	3,500	3,500
Total Operations	167,952	171,500	193,500	253,500

07MP02-6A-4/13/10

		Est. Project Cost	Federal Eligible	ADOT Eligible	Local Share
	Near Term Projects (2009-2014)				
1	Conduct Wildlife Study	$57,900	$55,005	$1,448	$1,448
2	Airfield Drainage Study	$105,300	$100,035	$2,633	$2,633
3	Rehabilitate Runway 6L-24R	$1,557,710	$1,479,824	$38,943	$38,943
4	Rehabilitate Taxiway A and Connecting Taxiways	$2,208,750	$0	$1,987,875	$220,875
5	FEMA Letter of Map Revision - Phase II	$65,000	$0	$0	$65,000
6	Runway Safety Area Drainage Improvements	$1,000,000	$910,600	$44,700	$44,700
7	Security Fencing and Perimeter Roadway	$2,681,700	$2,441,956	$119,872	$119,872
8	Reconstruction of Maintenance Yard Apron	$210,365	$0	$0	$210,365
9	Runway Sweeper	$181,912	$172,816	$4,548	$4,548
10	Fuel Farm / Apron Generator	$309,666	$0	$154,833	$154,833
11	Airfield Lighting Generator	$208,360	$0	$187,524	$20,836
12	Airport Lighting Control and Monitoring System	$625,450	$569,535	$27,958	$27,958
13	Pavement Preservation	$400,000	$0	$360,000	$40,000
14	Maintenance Generator	$144,550	$0	$0	$144,550
15	Replace 15-33 Signage and NAVAIDs (PAPI-4, MIRLS)	$582,000	$529,970	$26,015	$26,015
16	Upgrade Airfield Drainage System - Phase 1	$2,066,000	$0	$1,860,000	$206,000
17	Install MITL and replace signage on Taxiway D, E and Exits	$968,000	$919,600	$24,200	$24,200
18	Pavement Preservation	$400,000	$0	$360,000	$40,000
19	Expand Admin Building parking lot (1,000 yd²) and self-serve fuel access road	$100,500	$0	$90,450.0	$10,050
20	Construct Airside Automobile Service Road	$199,000	$189,050	$4,975	$4,975
	Subtotal Near Term	**$14,072,163**	**$7,368,391**	**$5,295,974**	**$1,407,801**
	Intermediate Term Projects (2015-2020)				
1	Runway 24R and Taxiway A Extension 105'	$915,568	$0	$824,011	$91,557
2	Pavement Preservation	$400,000	$0	$360,000	$40,000
3	Construct Taxiway 7 from Taxiway A to Taxiway B	$398,556	$378,628	$9,964	$9,964
4	Construct Apron North of Airfield Drive (39,700 yd²)	$3,060,114	$2,907,108	$76,503	$76,503
5	Waterline North of Airfield Drive	$297,505	$282,630	$7,438	$7,438
6	Construct West Auto Parking Lot Adjacent to Apron (4,444 yd²)	$194,425	$0	$0	$194,425
7	Add Floor to ATCT, Fire System Revamp	$500,000	$475,000	$12,500	$12,500
8	Master Plan Update	$400,000	$380,000	$10,000	$10,000
9	Pavement Preservation	$500,000	$475,000	$12,500	$12,500
10	Construct Access Road and Expand Utilities to Hangar Expansion Area	$2,915,000	$2,654,400	$130,300	$130,300
11	Construct East Apron (17,500 yd²)	$1,312,500	$1,246,875	$32,813	$32,813
12	Construct Heliport	$843,000	$800,850	$21,075	$21,075
13	Acquire 39.5 acres	$470,000	$446,500	$11,750	$11,750
14	Construct Taxiway 7 to Hangar Development Area from Taxiway B South	$515,000	$489,250	$12,875	$12,875
15	Construct Hangar Development Area (HDA) Apron east of H.D.A access road (31,000 yd²)	$2,325,000	$2,208,750	$58,125	$58,125
16	Acquire 79.8 Acres	$948,000	$900,600	$23,700	$23,700
17	Extend Runway 15 and Taxiway D - 800'	$2,558,000	$2,430,100	$63,950	$63,950
18	Pavement Preservation	$400,000	$380,000	$10,000	$10,000
19	Realign Permeter Road and Fencing	$3,518,000	$3,342,100	$87,950	$87,950
	Subtotal Intermediate Term	**$22,470,668**	**$19,797,791**	**$1,765,453**	**$907,424**

	Est. Project Cost	Federal Eligible	ADOT Eligible	Local Share
Long Term Projects				
EA for Upgrade Airfield Drainage System - Phase 2/Phase 3	$300,000	$285,000	$7,500	$7,500
Construct High-speed Exit Taxiways 6L-24R	$1,354,000	$1,286,300	$33,850	$33,850
Construct High-Speed Exit Taxiway 6R Between Taxiway B2 and B5	$677,000	$643,150	$16,925	$16,925
EA for Runway 6R-24L Extension and Raising	$200,000	$190,000	$5,000	$5,000
Upgrade Airfield Drainage System - Phase 2/ Phase 3	$3,900,000	$3,705,000	$97,500	$97,500
Construct Dual Parallel Taxiway C	$2,400,000	$2,280,000	$60,000	$60,000
Install MITL on Taxiway C and Exits	$653,666	$620,983	$16,342	$16,342
Construct Helicopter Training Helipad North of 24R	$565,000	$536,750	$14,125	$14,125
Pavement Preservation	$3,000,000	$2,850,000	$75,000	$75,000
Construct New ATCT	$4,500,000	$4,275,000	$112,500	$112,500
Relocate Segmented Cirlce and Lighted Wind Indicator	$13,750	$13,063	$344	$344
Raise 6R-24L and Taxiways and Strengthen to 75,000 lbs. DWL; Extend 6R and Taxiway B by 800'; Install PAPI-4	$22,617,000	$21,486,150	$565,425	$565,425
Construct Right-Angled Exit Taxiway (approach end of 6R)	$244,000	$231,800	$6,100	$6,100
Install MALSR 6R	$844,000	$801,800	$21,100	$21,100
Install MALSR 24L	$844,000	$801,800	$21,100	$21,100
Widen 6R-24L to 100'	$1,728,000	$1,641,600	$43,200	$43,200
Subtotal Long Term	**$43,840,416**	**$41,648,395**	**$1,096,010**	**$1,096,010**
Total Program Cost	**$80,383,247**	**$68,814,577**	**$8,157,437**	**$3,411,235**

All costs shown in 2009 dollars

RYAN AIRFIELD
TUCSON AIRPORT AUTHORITY

Exhibit 6A
CAPITAL IMPROVEMENT PROGRAM

A key aspect of this planning document is the use of demand-based planning milestones. The short term planning horizon contains items of highest priority. These items have been carefully selected with consideration of current activity levels and funding conditions. As short term horizon activity levels are reached, it will then be time to program for the intermediate term based upon the next activity milestones. Similarly, when the intermediate term milestones are reached, it will be time to program for the long term activity milestones.

Many development items included in the recommended concept will need to follow demand indicators. For example, the plan includes construction of hangar facilities. Based aircraft will be the indicator for additional hangar needs. If based aircraft growth occurs as projected, additional hangars will need to be constructed to meet the demand.

If growth slows or does not occur as projected, hangar development projects can be delayed. As a result, capital expenditures will be undertaken as needed, which leads to a responsible use of capital assets. Some development items do not depend on demand, such as pavement maintenance. These types of projects typically are associated with day-to-day operations and should be monitored and identified by airport management.

As a master plan is a conceptual document, implementation of these capital projects should only be undertaken after further refinement of their design through architectural and engineering analyses. Moreover, some projects, such as the runway extensions, will require further study at the time of implementation.

The cost estimates presented in this chapter have been increased to allow for contingencies that may arise on the project. Capital costs presented here should be viewed only as estimates subject to further refinement during design. Nevertheless, these estimates are considered sufficiently accurate for planning purposes. Cost estimates for each of the development projects listed in the capital improvement plan are listed in current (2009) dollars. **Exhibit 6A** presents the proposed needs based capital improvement program (CIP) for Ryan Airfield.

SHORT TERM IMPROVEMENTS

The short term improvement projects are depicted on **Exhibit 6B** with red shading. With recent decreased operational demand at the airport and the loss of the flight school, the primary focus of the short term CIP is on maintaining and securing existing facilities. This includes pavement rehabilitation and preservation projects, which account for approximately 34 percent of short term project costs.

Drainage, utility, and security improvements are also needed in the short term. This includes the construction of security fencing and perimeter roadway, conducting an airfield drainage study, upgrades to airfield drainage systems, and the acquisition of lighting generators. Projects in these categories account for approximately 42 percent of short term CIP funding needs.

Additional short term projects are included to improve airfield lighting systems and signage for safety and maintenance purposes, expand automobile parking capacity near the administration building, and to improve the safety of vehicle traffic on the north general aviation apron.

Hangar development is expected during each of the planning periods. Since hangars are expected to be developed either privately or by other self-funding means; their costs are not included in the capital improvement program. Hangar and other private development areas are depicted on **Exhibit 6B** with green shading.

The total investment necessary for the short term CIP is approximately $14.1 million. Of this total, $7.3 million is eligible for FAA grant funding, $5.3 million is eligible for state funds, with the airport sponsor responsible for $1.4 million.

INTERMEDIATE PLANNING HORIZON

Upon experiencing operational levels identified in the intermediate term planning horizon in **Table 6A**, the next phase of the CIP should be considered. Intermediate projects are depicted on **Exhibit 6B** with yellow shading. The implementation of many of the items in the intermediate term should be based upon actual demand. Those projects, such as the construction of additional apron should not be undertaken unless there is an existing demand for such facilities.

The focus of intermediate term projects is on improving airfield capacity, providing facilities to accommodate the addition of a full-service fixed base operator (FBO), expansion of infrastructure to allow for hangar development on the east side of the airport, and pavement preservation.

Runway 24R is planned to be extended by 105 feet. This extension will allow Runway 6L-24R to be capable of accommodating a wider range of aircraft and will improve airfield redundancy. A taxiway (Taxiway 7) from the extended Runway 24R end will extend south to the hangar development area.

Runway 15-33 is planned to be extended 800 feet in the intermediate term horizon to an ultimate length of 4,800 feet. This is the FAA recommended runway length for use by ARC B-I (small airplane exclusively) aircraft, which is the design aircraft for Runway 15-33.

A heliport is planned in the intermediate term on the north side of the airfield. This location has a separation distance of approximately 950 feet from the centerline of Runway 6L-24R, which would allow for simultaneous visual flight rule (VFR) operations. This separation will allow fixed-wing and itinerant rotorcraft to operate more independently of each other, thus improving airfield capacity and enhancing safety. The plan allows for helicopter parking and an FBO facility next to the heliport.

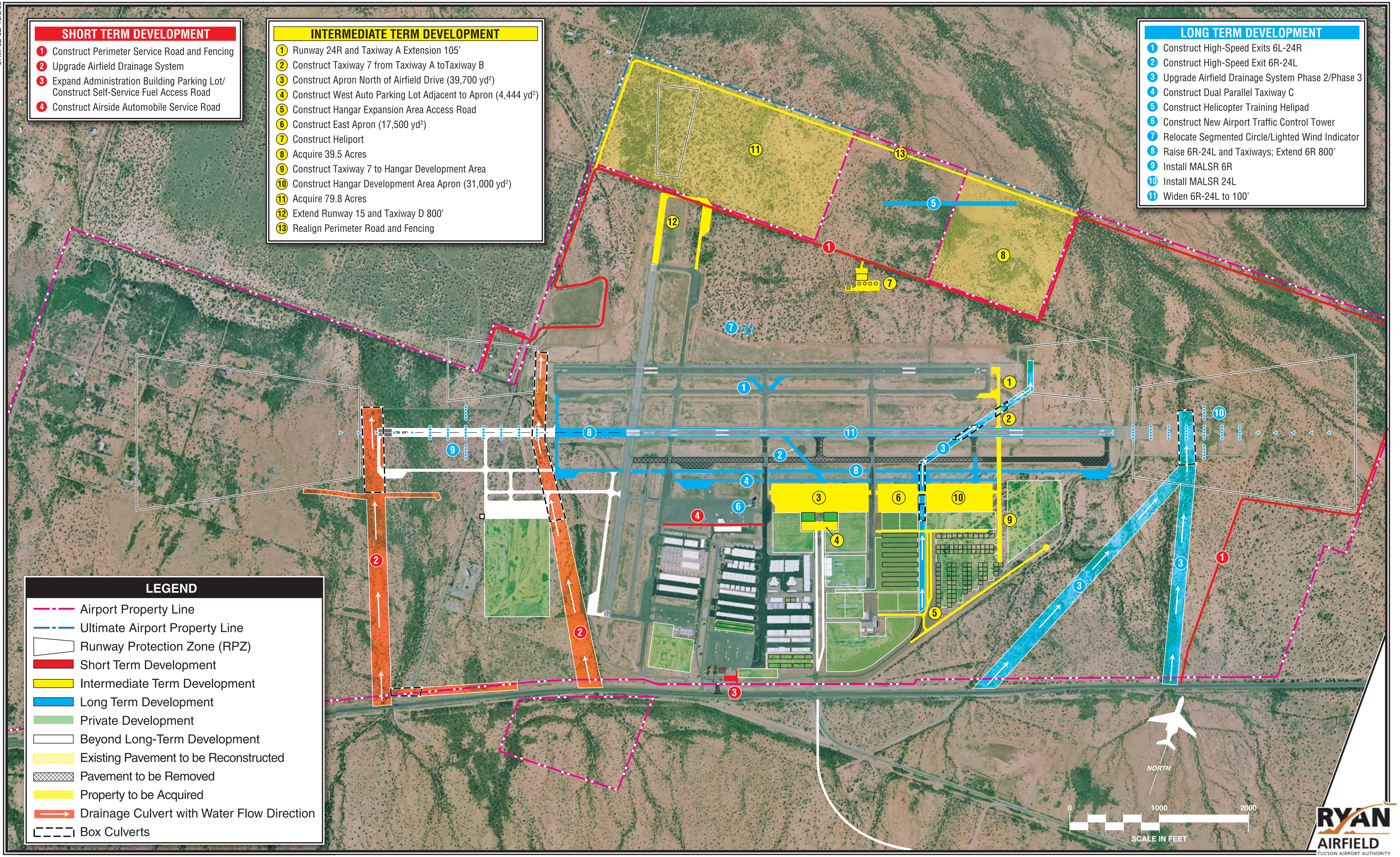


Exhibit 6B
AIRFIELD DEVELOPMENT STAGING

Intermediate term CIP planning includes landside facility improvements to accommodate a full-service FBO at Ryan Airfield. These improvements include the construction of a 39,700 square yard apron along the flight line and a 4,444 square yard automobile parking lot to be used by an FBO.

For the future development of the eastern portions of the landside area, utilities must first be installed. An intermediate term project is planned to be undertaken to provide this east side of the airport with water, sanitary sewer, electricity and gas, and telecommunication services.

Once private development of hangar facilities to the east of the landside area is planned, the construction of a new east side access road should be undertaken. A total of 48,500 square yards of apron is planned at the north end of the hangar development area along the Taxiway B flight line. This apron will serve aviation related businesses.

The purchase of a combined 119.3 acres of land from private entities is planned in the intermediate term horizon. The land acquisitions would provide runway approach protection and allow for future airside development. The land areas to be transferred are depicted on **Exhibit 6B** by yellow shading.

Additional CIP projects planned in the intermediate term horizon include adding an additional floor to the existing airport traffic control tower (ATCT) for increased office space and the installation of additional airfield lighting systems. A total of $1.3 million is included in this planning period for on-going pavement maintenance needs such as crack sealing, rejuvenating seal coats, and slab replacements as necessary.

The total investment necessary for the intermediate term CIP is approximately $22.5 million. Of this total, $19.8 million is eligible for FAA grant funding, $1.8 million is eligible for state funds, with the airport sponsor responsible for $907,424.

LONG TERM PLANNING HORIZON

Long term improvements, as presented on **Exhibit 6B** with blue shading, continue the expansion of airside facilities and aircraft aprons to accommodate a wider range of business jet aircraft and overall airport operational growth.

Over half of the long term CIP costs come from projects to improve the drainage, safety, and capacity of Runway 6R-24L and Taxiway B. Runway 6R-24L, a portion of Runway 15-33 and several associated taxiways need to be raised, in some locations over six feet, to allow for the installation of drainage culverts under the runway. Associated taxiways will be raised in conjunction to meet grading standards. Taxiway B will be relocated to meet the ARC D-II design separation standard of 425 feet, ultimately allowing for instrument approach visibility minimums to be lower than ¾-miles for the primary runway. An 800 foot extension of Runway 6R-24L and Taxiway B to the west is included in this project, which will shift the Runway 6R threshold so that it does not fall on the crosswind runway. This threshold shift will improve airfield capacity and reduce the potential for runway incursions. A separate project is planned in the long term to widen Runway 6R-24L to 100 feet to meet ARC D-II design standards.

Additional airfield capacity and safety improvements in the long term include the construction of dual parallel Taxiway C for Runway 6R-24L and the construction of high-speed exit taxiways on the primary and parallel runways.

Medium intensity approach lighting systems with runway alignment indicator lights (MALSRs) are planned for each end of Runway 6R-24L to achieve ½-mile instrument approach capability minimums.

A helicopter touchdown and lift-off area (TLOF) is planned to be constructed north of the heliport. This TLOF area will consist of a 1,500 foot long, 50 foot wide section of pavement where helicopters can perform training operations. This TLOF area will improve airfield capacity by segregating fixed-wing and rotorcraft operations.

Additional drainage improvements on the east side of the airport are planned to channel water around and under Runway 6R-24L towards the northeast end of the airfield.

A new ATCT is planned to be constructed in the long term. This new ATCT is planned to be located on the site of the existing ATCT.

A total of $3.0 million is included in this planning period for on-going pavement maintenance needs such as crack sealing, rejuvenating seal coats, and slab replacements as necessary.

The total investment necessary for the long term CIP is approximately $43.8 million. Of this total, $41.6 million is eligible for FAA grant funding; $1.1 million is eligible for state funds, with the airport sponsor responsible for $1.1 million.

POTENTIAL FUTURE PROJECTS

Once the high priority projects identified in the CIP have been addressed and operational levels identified in the long term planning horizons in **Table 6A** have been exceeded, future projects can be considered. The implementation of many of the potential future items should be based upon actual demand. Those projects, such as the extension of Runway 6R and the construction of additional apron should not be undertaken unless there is an existing demand for such facilities.

Potential future projects are listed in **Table 6B** without associated costs. Each project will need to be readdressed in the next master plan to determine its continued relevance to the efficient use of the airport and to establish cost estimates. These projects are depicted in white on **Exhibit 6B**.

TABLE 6B Potential Future Projects Ryan Airfield	
Project #	**Project Description**
1.	Construct Airfield Drive divided roadway.
2.	Extend Runway 6R and Taxiway B by 2,000 feet.
3.	Relocate Runway 6R MALSR
4.	Construct partial-parallel taxiways southwest of the intersection of Runways 6R-24L and 15-33.
5.	Construct general aviation apron on the west side of Runway 15-33 for general aviation use.
6.	Install self-service fuel facilities on west apron.

PLAN IMPLEMENTATION

The best means to begin implementation of the recommendations in this master plan is to first recognize that planning is a continuous process that does not end with completion and approval of this document. Rather, the ability to continuously monitor the existing and forecast status of airport activity must be provided and maintained. The issues upon which this master plan is based will remain valid for a number of years. The primary goal is for the airport to best serve the air transportation needs of the region, while continuing to be economically self-sufficient.

The actual need for facilities is most appropriately established by airport activity levels rather than a specified date. For example, projections have been made as to when additional hangars may be needed at the airport. In reality, however, the timeframe in which the development is needed may be substantially different. Actual demand may be slower to develop than expected. On the other hand, high levels of demand may establish the need to accelerate the development. Although every effort has been made in this master planning process to conservatively estimate when facility development may be needed, aviation demand will dictate when facility improvements need to be delayed or accelerated.

The real value of a usable master plan is in keeping the issues and objectives in the minds of the managers and decision-makers so that they are better able to recognize change and its effect. In addition to adjustments in aviation demand, decisions made as to when to undertake the improvements recommended in this master plan will impact the period that the plan remains valid. The format used in this plan is intended to reduce the need for formal and costly updates by simply adjusting the timing. Updating can be done by the TAA, thereby improving the plan's effectiveness.

In summary, the planning process requires that the TAA consistently monitor the progress of the airport in terms of aircraft operations and based aircraft. Analysis of aircraft demand is critical to the timing and need for new airport facilities. The information obtained from continually monitoring airport activity will provide the data necessary to determine if the development schedule should be accelerated or decelerated.

Appendix A

GLOSSARY OF TERMS

Glossary of Terms

A

ABOVE GROUND LEVEL: The elevation of a point or surface above the ground.

ACCELERATE-STOP DISTANCE AVAILABLE (ASDA): See declared distances.

ADVISORY CIRCULAR: External publications issued by the FAA consisting of nonregulatory material providing for the recommendations relative to a policy, guidance and information relative to a specific aviation subject.

AIR CARRIER: An operator which: (1) performs at least five round trips per week between two or more points and publishes flight schedules which specify the times, days of the week, and places between which such flights are performed; or (2) transports mail by air pursuant to a current contract with the U.S. Postal Service. Certified in accordance with Federal Aviation Regulation (FAR) Parts 121 and 127.

AIRCRAFT: A transportation vehicle that is used or intended for use for flight.

AIRCRAFT APPROACH CATEGORY: A grouping of aircraft based on 1.3 times the stall speed in their landing configuration at their maximum certificated landing weight. The categories are as follows:

- Category A: Speed less than 91 knots.
- Category B: Speed 91 knots or more, but less than 121 knots.
- Category C: Speed 121 knots or more, but less than 141 knots.
- Category D: Speed 141 knots or more, but less than 166 knots.
- Category E: Speed greater than 166 knots.

AIRCRAFT OPERATION: The landing, takeoff, or touch-and-go procedure by an aircraft on a runway at an airport.

AIRCRAFT OPERATIONS AREA (AOA): A restricted and secure area on the airport property designed to protect all aspects related to aircraft operations.

AIRCRAFT OWNERS AND PILOTS ASSOCIATION: A private organization serving the interests and needs of general aviation pilots and aircraft owners.

AIRCRAFT RESCUE AND FIRE FIGHTING: A facility located at an airport that provides emergency vehicles, extinguishing agents, and personnel responsible for minimizing the impacts of an aircraft accident or incident.

AIRFIELD: The portion of an airport which contains the facilities necessary for the operation of aircraft.

AIRLINE HUB: An airport at which an airline concentrates a significant portion of its activity and which often has a significant amount of connecting traffic.

AIRPLANE DESIGN GROUP (ADG): A grouping of aircraft based upon wingspan. The groups are as follows:

- Group I: Up to but not including 49 feet.
- Group II: 49 feet up to but not including 79 feet.
- Group III: 79 feet up to but not including 118 feet.
- Group IV: 118 feet up to but not including 171 feet.
- Group V: 171 feet up to but not including 214 feet.
- Group VI: 214 feet or greater.

AIRPORT AUTHORITY: A quasi-governmental public organization responsible for setting the policies governing the management and operation of an airport or system of airports under its jurisdiction.

AIRPORT BEACON: A navigational aid located at an airport which displays a rotating light beam to identify whether an airport is lighted.

AIRPORT CAPITAL IMPROVEMENT PLAN: The planning program used by the Federal Aviation Administration to identify, prioritize, and distribute funds for airport development and the needs of the National Airspace System to meet specified national goals and objectives.

AIRPORT ELEVATION: The highest point on the runway system at an airport expressed in feet above mean sea level (MSL).

AIRPORT IMPROVEMENT PROGRAM: A program authorized by the Airport and Airway

Improvement Act of 1982 that provides funding for airport planning and development.

AIRPORT LAYOUT DRAWING (ALD): The drawing of the airport showing the layout of existing and proposed airport facilities.

AIRPORT LAYOUT PLAN (ALP): A scaled drawing of the existing and planned land and facilities necessary for the operation and development of the airport.

AIRPORT LAYOUT PLAN DRAWING SET: A set of technical drawings depicting the current and future airport conditions. The individual sheets comprising the set can vary with the complexities of the airport, but the FAA-required drawings include the Airport Layout Plan (sometimes referred to as the Airport Layout Drawing (ALD), the Airport Airspace Drawing, and the Inner Portion of the Approach Surface Drawing, On-Airport Land Use Drawing, and Property Map.

AIRPORT MASTER PLAN: The planner's concept of the long-term development of an airport.

AIRPORT MOVEMENT AREA SAFETY SYSTEM: A system that provides automated alerts and warnings of potential runway incursions or other hazardous aircraft movement events.

AIRPORT OBSTRUCTION CHART: A scaled drawing depicting the Federal Aviation Regulation (FAR) Part 77 surfaces, a representation of objects that penetrate these surfaces, runway, taxiway, and ramp areas, navigational aids, buildings, roads and other detail in the vicinity of an airport.

AIRPORT REFERENCE CODE (ARC): A coding system used to relate airport design criteria to the operational (Aircraft Approach Category) to the physical characteristics (Airplane Design Group) of the airplanes intended to operate at the airport.

AIRPORT REFERENCE POINT (ARP): The latitude and longitude of the approximate center of the airport.

AIRPORT SPONSOR: The entity that is legally responsible for the management and operation of an airport, including the fulfillment of the requirements of laws and regulations related thereto.

AIRPORT SURFACE DETECTION EQUIPMENT: A radar system that provides air traffic controllers with a visual representation of the movement of aircraft and other vehicles on the ground on the airfield at an airport.

AIRPORT SURVEILLANCE RADAR: The primary radar located at an airport or in an air traffic control terminal area that receives a signal at an antenna and transmits the signal to air traffic control display equipment defining the location of aircraft in the air. The signal provides only the azimuth and range of aircraft from the location of the antenna.

AIRPORT TRAFFIC CONTROL TOWER (ATCT): A central operations facility in the terminal air traffic control system, consisting of a tower, including an associated instrument flight rule (IFR) room if radar equipped, using air/ground communications and/or radar, visual signaling and other devices to provide safe and expeditious movement of terminal air traffic.

AIR ROUTE TRAFFIC CONTROL CENTER: A facility which provides en route air traffic control service to aircraft operating on an IFR flight plan within controlled airspace over a large, multi-state region.

AIRSIDE: The portion of an airport that contains the facilities necessary for the operation of aircraft.

AIRSPACE: The volume of space above the surface of the ground that is provided for the operation of aircraft.

AIR TAXI: An air carrier certificated in accordance with FAR Part 121 and FAR Part 135 and authorized to provide, on demand, public transportation of persons and property by aircraft. Generally operates small aircraft "for hire" for specific trips.

AIR TRAFFIC CONTROL: A service operated by an appropriate organization for the purpose of providing for the safe, orderly, and expeditious flow of air traffic.

AIR ROUTE TRAFFIC CONTROL CENTER (ARTCC): A facility established to provide air traffic control service to aircraft operating on an IFR flight plan within controlled airspace and principally during the en route phase of flight.

AIR TRAFFIC CONTROL SYSTEM COMMAND CENTER: A facility operated by the FAA which is responsible for the central flow control, the central altitude reservation system, the airport reservation position system, and the air traffic service contingency command for the air traffic control system.

AIR TRAFFIC HUB: A categorization of commercial service airports or group of commercial service airports in a metropolitan or urban area based upon the proportion of annual national enplanements existing at the airport or airports. The categories are large hub, medium hub, small hub, or non-hub. It forms the basis for the apportionment of entitlement funds.

AIR TRANSPORT ASSOCIATION OF AMERICA: An organization consisting of the principal U.S. airlines that represents the interests of the airline industry on major aviation issues before federal, state, and local government bodies. It promotes air transportation safety by coordinating industry and governmental safety programs and it serves as a focal point for industry efforts to standardize practices and enhance the efficiency of the air transportation system.

ALERT AREA: See special-use airspace.

ALTITUDE: The vertical distance measured in feet above mean sea level.

ANNUAL INSTRUMENT APPROACH (AIA): An approach to an airport with the intent to land by an aircraft in accordance with an IFR flight plan when visibility is less than three miles and/or when the ceiling is at or below the minimum initial approach altitude.

APPROACH LIGHTING SYSTEM (ALS): An airport lighting facility which provides visual guidance to landing aircraft by radiating light beams by which the pilot aligns the aircraft with the extended centerline of the runway on his final approach and landing.

APPROACH MINIMUMS: The altitude below which an aircraft may not descend while on an IFR approach unless the pilot has the runway in sight.

APPROACH SURFACE: An imaginary obstruction limiting surface defined in FAR Part 77 which is longitudinally centered on an extended runway centerline and extends outward and upward from the primary surface at each end of a runway at a designated slope and distance based upon the type of available or planned approach by aircraft to a runway.

APRON: A specified portion of the airfield used for passenger, cargo or freight loading and unloading, aircraft parking, and the refueling, maintenance and servicing of aircraft.

AREA NAVIGATION: The air navigation procedure that provides the capability to establish and maintain a flight path on an arbitrary course that remains within the coverage area of navigational sources being used.

AUTOMATED TERMINAL INFORMATION SERVICE (ATIS): The continuous broadcast of recorded non-control information at towered airports. Information typically includes wind speed, direction, and runway in use.

AUTOMATED SURFACE OBSERVATION SYSTEM (ASOS): A reporting system that provides frequent airport ground surface weather observation data through digitized voice broadcasts and printed reports.

AUTOMATED WEATHER OBSERVATION STATION (AWOS): Equipment used to automatically record weather conditions (i.e. cloud height, visibility, wind speed and direction, temperature, dew point, etc.)

AUTOMATIC DIRECTION FINDER (ADF): An aircraft radio navigation system which senses and indicates the direction to a non-directional radio beacon (NDB) ground transmitter.

AVIGATION EASEMENT: A contractual right or a property interest in land over which a right of unobstructed flight in the airspace is established.

AZIMUTH: Horizontal direction expressed as the angular distance between true north and the direction of a fixed point (as the observer's heading).

B

BASE LEG: A flight path at right angles to the landing runway off its approach end. The base leg normally extends from the downwind leg to the intersection of the extended runway centerline. See "traffic pattern."

BASED AIRCRAFT: The general aviation aircraft that use a specific airport as a home base.

BEARING: The horizontal direction to or from any point, usually measured clockwise from true north or magnetic north.

BLAST FENCE: A barrier used to divert or dissipate jet blast or propeller wash.

BLAST PAD: A prepared surface adjacent to the end of a runway for the purpose of eliminating the erosion of the ground surface by the wind forces produced by airplanes at the initiation of takeoff operations.

BUILDING RESTRICTION LINE (BRL): A line which identifies suitable building area locations on the airport.

C

CAPITAL IMPROVEMENT PLAN: The planning program used by the Federal Aviation Administration to identify, prioritize, and distribute Airport Improvement Program funds for airport development and the needs of the National Airspace System to meet specified national goals and objectives.

CARGO SERVICE AIRPORT: An airport served by aircraft providing air transportation of property only, including mail, with an annual aggregate landed weight of at least 100,000,000 pounds.

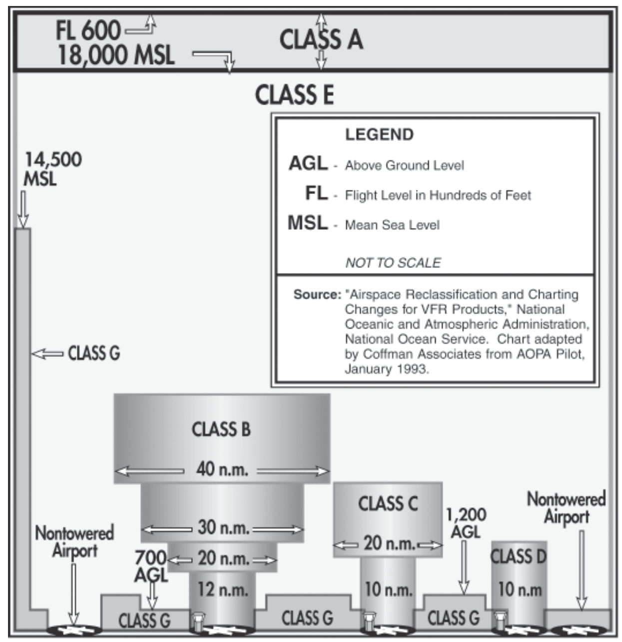
CATEGORY I: An Instrument Landing System (ILS) that provides acceptable guidance information to an aircraft from the coverage limits of the ILS to the point at which the localizer course line intersects the glide path at a decision height of 100 feet above the horizontal plane containing the runway threshold.

CATEGORY II: An ILS that provides acceptable guidance information to an aircraft from the coverage limits of the ILS to the point at which the localizer course line intersects the glide path at a decision height of 50 feet above the horizontal plane containing the runway threshold.

CATEGORY III: An ILS that provides acceptable guidance information to a pilot from the coverage limits of the ILS with no decision height specified above the horizontal plane containing the runway threshold.

CEILING: The height above the ground surface to the location of the lowest layer of clouds which is reported as either broken or overcast.

CIRCLING APPROACH: A maneuver initiated by the pilot to align the aircraft with the runway for landing when flying a predetermined circling instrument approach under IFR.



CLASS A AIRSPACE: See Controlled Airspace.

CLASS B AIRSPACE: See Controlled Airspace.

CLASS C AIRSPACE: See Controlled Airspace.

CLASS D AIRSPACE: See Controlled Airspace.

CLASS E AIRSPACE: See Controlled Airspace.

CLASS G AIRSPACE: See Controlled Airspace.

CLEAR ZONE: See Runway Protection Zone.

COMMERCIAL SERVICE AIRPORT: A public airport providing scheduled passenger service that enplanes at least 2,500 annual passengers.

COMMON TRAFFIC ADVISORY FREQUENCY: A radio frequency identified in the appropriate aeronautical chart which is designated for the purpose of transmitting airport advisory information and procedures while operating to or from an uncontrolled airport.

COMPASS LOCATOR (LOM): A low power, low/medium frequency radio-beacon installed in conjunction with the instrument landing system at one or two of the marker sites.

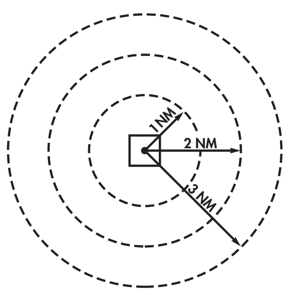
CONICAL SURFACE: An imaginary obstruction-limiting surface defined in FAR Part 77 that extends from the edge of the horizontal surface outward and upward at a slope of 20 to 1 for a horizontal distance of 4,000 feet.

CONTROLLED AIRPORT: An airport that has an operating airport traffic control tower.

CONTROLLED AIRSPACE: Airspace of defined dimensions within which air traffic control services are provided to instrument flight rules (IFR) and visual flight rules (VFR) flights in accordance with the airspace classification. Controlled airspace in the United States is designated as follows:

- **CLASS A**: Generally, the airspace from 18,000 feet mean sea level (MSL) up to but not including flight level FL600. All persons must operate their aircraft under IFR.

- **CLASS B**: Generally, the airspace from the surface to 10,000 feet MSL surrounding the nation's busiest airports. The configuration of Class B airspace is unique to each airport, but typically consists of two or more layers of air space and is designed to contain all published instrument approach procedures to the airport. An air traffic control clearance is required for all aircraft to operate in the area.



- **CLASS C**: Generally, the airspace from the surface to 4,000 feet above the airport elevation (charted as MSL) surrounding those airports that have an operational control tower and radar approach control and are served by a qualifying number of IFR operations or passenger enplanements. Although individually tailored for each airport, Class C airspace typically consists of a surface area with a five nautical mile (nm) radius and an outer area with a 10 nautical mile radius that extends from 1,200 feet to 4,000 feet above the airport elevation. Two-way radio communication is required for all aircraft.

- **CLASS D**: Generally, that airspace from the surface to 2,500 feet above the air port elevation (charted as MSL) surrounding those airports that have an operational control tower. Class D airspace is individually tailored and configured to encompass published instrument approach procedure . Unless otherwise authorized, all persons must establish two-way radio communication.

- **CLASS E**: Generally, controlled airspace that is not classified as Class A, B, C, or D. Class E airspace extends upward from either the surface or a designated altitude to the overlying or adjacent controlled airspace. When designated as a surface area, the airspace will be configured to contain all instrument procedures. Class E airspace encompasses all Victor Airways. Only aircraft following instrument flight rules are required to establish two-way radio communication with air traffic control.

- **CLASS G**: Generally, that airspace not classified as Class A, B, C, D, or E. Class G airspace is uncontrolled for all aircraft. Class G airspace extends from the surface to the overlying Class E airspace.

CONTROLLED FIRING AREA: See special-use airspace.

CROSSWIND: A wind that is not parallel to a runway centerline or to the intended flight path of an aircraft.

CROSSWIND COMPONENT: The component of wind that is at a right angle to the runway centerline or the intended flight path of an aircraft.

CROSSWIND LEG: A flight path at right angles to the landing runway off its upwind end. See "traffic pattern."

D

DECIBEL: A unit of noise representing a level relative to a reference of a sound pressure 20 micro newtons per square meter.

DECISION HEIGHT: The height above the end of the runway surface at which a decision must be made by a pilot during the ILS or Precision Approach Radar approach to either continue the approach or to execute a missed approach.

DECLARED DISTANCES: The distances declared available for the airplane's takeoff runway, takeoff distance, accelerate-stop distance, and landing distance requirements. The distances are:

- **TAKEOFF RUNWAY AVAILABLE (TORA)**: The runway length declared available and suitable for the ground run of an airplane taking off.
- **TAKEOFF DISTANCE AVAILABLE (TODA)**: The TORA plus the length of any remaining runway and/or clear way beyond the far end of the TORA.
- **ACCELERATE-STOP DISTANCE AVAILABLE (ASDA)**: The runway plus stopway length declared available for the acceleration and deceleration of an aircraft aborting a takeoff.
- **LANDING DISTANCE AVAILABLE (LDA)**: The runway length declared available and suitable for landing.

DEPARTMENT OF TRANSPORTATION: The cabinet level federal government organization consisting of modal operating agencies, such as the Federal Aviation Administration, which was established to promote the coordination of federal transportation programs and to act as a focal point for research and development efforts in transportation.

DISCRETIONARY FUNDS: Federal grant funds that may be appropriated to an airport based upon designation by the Secretary of Transportation or Congress to meet a specified national priority such as enhancing capacity, safety, and security, or mitigating noise.

DISPLACED THRESHOLD: A threshold that is located at a point on the runway other than the designated beginning of the runway.

DISTANCE MEASURING EQUIPMENT (DME): Equipment (airborne and ground) used to measure, in nautical miles, the slant range distance of an aircraft from the DME navigational aid.

DNL: The 24-hour average sound level, in Aweighted decibels, obtained after the addition of ten decibels to sound levels for the periods between 10 p.m. and 7 a.m. as averaged over a span of one year. It is the FAA standard metric for determining the cumulative exposure of individuals to noise.

DOWNWIND LEG: A flight path parallel to the landing runway in the direction opposite to landing. The downwind leg normally extends between the crosswind leg and the base leg. Also see "traffic pattern."

E

EASEMENT: The legal right of one party to use a portion of the total rights in real estate owned by another party. This may include the right of passage over, on, or below the property; certain air rights above the property, including view rights; and the rights to any specified form of development or activity, as well as any other legal rights in the property that may be specified in the easement document.

ELEVATION: The vertical distance measured in feet above mean sea level.

ENPLANED PASSENGERS: The total number of revenue passengers boarding aircraft, including originating, stop-over, and transfer passengers, in scheduled and nonscheduled services.

ENPLANEMENT: The boarding of a passenger, cargo, freight, or mail on an aircraft at an airport.

ENTITLEMENT: Federal funds for which a commercial service airport may be eligible based upon its annual passenger enplanements.

ENVIRONMENTAL ASSESSMENT (EA): An environmental analysis performed pursuant to the National Environmental Policy Act to determine whether an action would significantly affect the environment and thus require a more detailed environmental impact statement.

ENVIRONMENTAL AUDIT: An assessment of the current status of a party's compliance with applicable environmental requirements of a party's environmental compliance policies, practices, and controls.

ENVIRONMENTAL IMPACT STATEMENT (EIS): A document required of federal agencies by the National Environmental Policy Act for major projects are legislative proposals affecting the environment. It is a tool for decision-making describing the positive and negative effects of a proposed action and citing alternative actions.

ESSENTIAL AIR SERVICE: A federal program which guarantees air carrier service to selected small cities by providing subsidies as needed to prevent these cities from such service.

F

FEDERAL AVIATION REGULATIONS: The general and permanent rules established by the executive departments and agencies of the Federal Government for aviation, which are published in the Federal Register. These are the aviation subset of the Code of Federal Regulations.

FEDERAL INSPECTION SERVICES: The provision of customs and immigration services including passport inspection, inspection of baggage, the collection of duties on certain imported items, and the inspections for agricultural products, illegal drugs, or other restricted items.

FINAL APPROACH: A flight path in the direction of landing along the extended runway centerline. The final approach normally extends from the base leg to the runway. See "traffic pattern."

FINAL APPROACH AND TAKEOFF AREA (FATO). A defined area over which the final phase of the helicopter approach to a hover, or a landing is completed and from which the takeoff is initiated.

FINAL APPROACH FIX: The designated point at which the final approach segment for an aircraft landing on a runway begins for a non-precision approach.

FINDING OF NO SIGNIFICANT IMPACT (FONSI): A public document prepared by a Federal agency that presents the rationale why a proposed action will not have a significant effect on the environment and for which an environmental impact statement will not be prepared.

FIXED BASE OPERATOR (FBO): A provider of services to users of an airport. Such services include, but are not limited to, hangaring, fueling, flight training, repair, and maintenance.

FLIGHT LEVEL: A designation for altitude within controlled airspace.

FLIGHT SERVICE STATION: An operations facility in the national flight advisory system which utilizes data interchange facilities for the collection and dissemination of Notices to Airmen, weather, and administrative data and which provides pre-flight and in-flight advisory services to pilots through air and ground based communication facilities.

FRANGIBLE NAVAID: A navigational aid which retains its structural integrity and stiffness up to a designated maximum load, but on impact from a greater load, breaks, distorts, or yields in such a manner as to present the minimum hazard to aircraft.

G

GENERAL AVIATION: That portion of civil aviation which encompasses all facets of aviation except air carriers holding a certificate of convenience and necessity, and large aircraft commercial operators.

GENERAL AVIATION AIRPORT: An airport that provides air service to only general aviation.

GLIDESLOPE (GS): Provides vertical guidance for aircraft during approach and landing. The glideslope consists of the following:

1. Electronic components emitting signals which provide vertical guidance by reference to airborne instruments during instrument approaches such as ILS; or

2. Visual ground aids, such as VASI, which provide vertical guidance for VFR approach or for the visual portion of an instrument approach and landing.

GLOBAL POSITIONING SYSTEM (GPS): A system of 24 satellites used as reference points to enable navigators equipped with GPS receivers to determine their latitude, longitude, and altitude.

GROUND ACCESS: The transportation system on and around the airport that provides access to and from the airport by ground transportation vehicles for passengers, employees, cargo, freight, and airport services.

H

HELIPAD: A designated area for the takeoff, landing, and parking of helicopters.

HIGH INTENSITY RUNWAY LIGHTS: The highest classification in terms of intensity or brightness for lights designated for use in delineating the sides of a runway.

HIGH-SPEED EXIT TAXIWAY: A long radius taxiway designed to expedite aircraft turning off the runway after landing (at speeds to 60 knots), thus reducing runway occupancy time.

HORIZONTAL SURFACE: An imaginary obstruction- limiting surface defined in FAR Part 77 that is specified as a portion of a horizontal plane surrounding a runway located 150 feet above the established airport elevation. The specific horizontal dimensions of this surface are a function of the types of approaches existing or planned for the runway.

I

INITIAL APPROACH FIX: The designated point at which the initial approach segment begins for an instrument approach to a runway.

INSTRUMENT APPROACH PROCEDURE: A series of predetermined maneuvers for the orderly transfer of an aircraft under instrument flight conditions from the beginning of the initial approach to a landing, or to a point from which a landing may be made visually.

INSTRUMENT FLIGHT RULES (IFR): Procedures for the conduct of flight in weather conditions below Visual Flight Rules weather minimums. The term IFR is often also used to define weather conditions and the type of flight plan under which an aircraft is operating.

INSTRUMENT LANDING SYSTEM (ILS): A precision instrument approach system which normally consists of the following electronic components and visual aids:

1. Localizer.
2. Glide Slope.
3. Outer Marker.
4. Middle Marker.
5. Approach Lights.

INSTRUMENT METEOROLOGICAL CONDITIONS: Meteorological conditions expressed in terms of specific visibility and ceiling conditions that are less than the minimums specified for visual meteorological conditions.

ITINERANT OPERATIONS: Operations by aircraft that are not based at a specified airport.

K

KNOTS: A unit of speed length used in navigation that is equivalent to the number of nautical miles traveled in one hour.

L

LANDSIDE: The portion of an airport that provides the facilities necessary for the processing of passengers, cargo, freight, and ground transportation vehicles.

LANDING DISTANCE AVAILABLE (LDA): See declared distances.

LARGE AIRPLANE: An airplane that has a maximum certified takeoff weight in excess of 12,500 pounds.

LOCAL AREA AUGMENTATION SYSTEM: A differential GPS system that provides localized measurement correction signals to the basic GPS signals to improve navigational accuracy integrity, continuity, and availability.

LOCAL OPERATIONS: Aircraft operations performed by aircraft that are based at the airport and that operate in the local traffic pattern or within sight of the airport, that are known to be departing for or arriving from flights in local practice areas within a prescribed distance from the airport, or that execute simulated instrument approaches at the airport.

LOCAL TRAFFIC: Aircraft operating in the traffic pattern or within sight of the tower, or aircraft known to be departing or arriving from the local practice areas, or aircraft executing practice instrument approach procedures. Typically, this includes touch and-go training operations.

LOCALIZER: The component of an ILS which provides course guidance to the runway.

LOCALIZER TYPE DIRECTIONAL AID (LDA): A facility of comparable utility and accuracy to a localizer, but is not part of a complete ILS and is not aligned with the runway.

LONG RANGE NAVIGATION SYSTEM (LORAN): Long range navigation is an electronic navigational aid which determines aircraft position and speed by measuring the difference in the time of reception of synchronized pulse signals from two fixed transmitters. Loran is used for en route navigation.

LOW INTENSITY RUNWAY LIGHTS: The lowest clas- sification in terms of intensity or brightness for lights designated for use in delineating the sides of a runway.

M

MEDIUM INTENSITY RUNWAY LIGHTS: The middle classification in terms of intensity or brightness for lights designated for use in delineating the sides of a runway.

MICROWAVE LANDING SYSTEM (MLS): An instrument approach and landing system that provides precision guidance in azimuth, elevation, and distance measurement.

MILITARY OPERATIONS: Aircraft operations that are performed in military aircraft.

MILITARY OPERATIONS AREA (MOA): See special-use airspace

MILITARY TRAINING ROUTE: An air route depicted on aeronautical charts for the conduct of military flight training at speeds above 250 knots.

MISSED APPROACH COURSE (MAC): The flight route to be followed if, after an instrument approach, a landing is not affected, and occurring normally:

1. When the aircraft has descended to the decision height and has not established visual contact; or

2. When directed by air traffic control to pull up or to go around again.

MOVEMENT AREA: The runways, taxiways, and other areas of an airport which are utilized for taxiing/hover taxiing, air taxiing, takeoff, and landing of aircraft, exclusive of loading ramps and parking areas. At those airports with a tower, air traffic control clearance is required for entry onto the movement area.

N

NATIONAL AIRSPACE SYSTEM: The network of air traffic control facilities, air traffic control areas, and navigational facilities through the U.S.

NATIONAL PLAN OF INTEGRATED AIRPORT SYSTEMS: The national airport system plan developed by the Secretary of Transportation on a biannual basis for the development of public use airports to meet national air transportation needs.

NATIONAL TRANSPORTATION SAFETY BOARD: A federal government organization established to investigate and determine the probable cause of transportation accidents, to recommend equipment and procedures to enhance transportation safety, and to review on appeal the suspension or revocation of any certificates or licenses issued by the Secretary of Transportation.

NAUTICAL MILE: A unit of length used in navigation which is equivalent to the distance spanned by one minute of arc in latitude, that is, 1,852 meters or 6,076 feet. It is equivalent to approximately 1.15 statute mile.

NAVAID: A term used to describe any electrical or visual air navigational aids, lights, signs, and associated supporting equipment (i.e. PAPI, VASI, ILS, etc.)

NAVIGATIONAL AID: A facility used as, available for use as, or designed for use as an aid to air navigation.

NOISE CONTOUR: A continuous line on a map of the airport vicinity connecting all points of the same noise exposure level.

NON-DIRECTIONAL BEACON (NDB): A beacon transmitting nondirectional signals whereby the pilot of an aircraft equipped with direction finding equipment can determine his or her bearing to and from the radio beacon and home on, or track to, the station. When the radio beacon is installed in conjunction with the Instrument Landing System marker, it is normally called a Compass Locator.

NON-PRECISION APPROACH PROCEDURE: A standard instrument approach procedure in which no electronic glide slope is provided, such as VOR, TACAN, NDB, or LOC.

NOTICE TO AIRMEN: A notice containing information concerning the establishment, condition, or change in any component of or hazard in the National Airspace System, the timely knowledge of which is considered essential to personnel concerned with flight operations.

O

OBJECT FREE AREA (OFA): An area on the ground centered on a runway, taxiway, or taxilane centerline provided to enhance the safety of aircraft operations by having the area free of objects, except for objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes.

OBSTACLE FREE ZONE (OFZ): The airspace below 150 feet above the established airport elevation and along the runway and extended runway centerline that is required to be kept clear of all objects, except for frangible visual NAVAIDs that need to be located in the OFZ because of their function, in order to provide clearance for aircraft landing or taking off from the runway, and for missed approaches.

ONE-ENGINE INOPERABLE SURFACE: A surface emanating from the runway end at a slope ratio of 62.5:1. Air carrier airports are required to maintain a technical drawing of this surface depicting any object penetrations by January 1, 2010.

OPERATION: The take-off, landing, or touch-and-go procedure by an aircraft on a runway at an airport.

OUTER MARKER (OM): An ILS navigation facility in the terminal area navigation system located four to seven miles from the runway edge on the extended centerline, indicating to the pilot that he/she is passing over the facility and can begin final approach.

P

PILOT CONTROLLED LIGHTING: Runway lighting systems at an airport that are controlled by activating the microphone of a pilot on a specified radio frequency.

PRECISION APPROACH: A standard instrument approach procedure which provides runway alignment and glide slope (descent) information. It is categorized as follows:

- **CATEGORY I (CAT I)**: A precision approach which provides for approaches with a decision height of not less than 200 feet and visibility not less than 1/2 mile or Runway Visual Range (RVR) 2400 (RVR 1800) with operative touchdown zone and runway centerline lights.

- **CATEGORY II (CAT II)**: A precision approach which provides for approaches with a decision height of not less than 100 feet and visibility not less than 1200 feet RVR.

- **CATEGORY III (CAT III)**: A precision approach which provides for approaches with minima less than Category II.

PRECISION APPROACH PATH INDICATOR (PAPI): A lighting system providing visual approach slope guidance to aircraft during a landing approach. It is similar to a VASI but provides a sharper transition between the colored indicator lights.

PRECISION APPROACH RADAR: A radar facility in the terminal air traffic control system used to detect and display with a high degree of accuracy the direction, range, and elevation of an aircraft on the final approach to a runway.

PRECISION OBJECT FREE AREA (POFA): An area centered on the extended runway centerline, beginning at the runway threshold and extending behind the runway threshold that is 200 feet long by 800 feet wide. The POFA is a clearing standard which requires the POFA to be kept clear of above ground objects protruding above the runway safety area edge elevation (except for frangible NAVAIDS). The POFA applies to all new authorized instrument approach procedures with less than 3/4 mile visibility.

PRIMARY AIRPORT: A commercial service airport that enplanes at least 10,000 annual passengers.

PRIMARY SURFACE: An imaginary obstruction limiting surface defined in FAR Part 77 that is specified as a rectangular surface longitudinally centered about a runway. The specific dimensions of this surface are a function of the types of approaches existing or planned for the runway.

PROHIBITED AREA: See special-use airspace.

PVC: Poor visibility and ceiling. Used in determining Annual Service Volume. PVC conditions exist when the cloud ceiling is less than 500 feet and visibility is less than one mile.

R

RADIAL: A navigational signal generated by a Very High Frequency Omni-directional Range or VORTAC station that is measured as an azimuth from the station.

REGRESSION ANALYSIS: A statistical technique that seeks to identify and quantify the relationships between factors associated with a forecast.

REMOTE COMMUNICATIONS OUTLET (RCO): An unstaffed transmitter receiver/facility remotely controlled by air traffic personnel. RCOs serve flight service stations (FSSs). RCOs were established to provide ground-to-ground communications between air traffic control specialists and pilots at satellite airports for delivering en route clearances, issuing departure authorizations, and acknowledging instrument flight rules cancellations or departure/landing times.

REMOTE TRANSMITTER/RECEIVER (RTR): See remote communications outlet. RTRs serve ARTCCs.

RELIEVER AIRPORT: An airport to serve general aviation aircraft which might otherwise use a congested air-carrier served airport.

RESTRICTED AREA: See special-use airspace.

RNAV: Area navigation - airborne equipment which permits flights over determined tracks within prescribed accuracy tolerances without the need to overfly ground-based navigation facilities. Used en route and for approaches to an airport.

RUNWAY: A defined rectangular area on an airport prepared for aircraft landing and takeoff. Runways are normally numbered in relation to their magnetic direction, rounded off to the nearest 10 degrees. For example, a runway with a magnetic heading of 180 would be designated Runway 18. The runway heading on the opposite end of the runway is 180 degrees from that runway end. For example, the opposite runway heading for Runway 18 would be Runway 36 (magnetic heading of 360). Aircraft can takeoff or land from either end of a runway, depending upon wind direction.

RUNWAY ALIGNMENT INDICATOR LIGHT: A series of high intensity sequentially flashing lights installed on the extended centerline of the runway usually in conjunction with an approach lighting system.

RUNWAY END IDENTIFIER LIGHTS (REIL): Two synchronized flashing lights, one on each side of the runway threshold, which provide rapid and positive identification of the approach end of a particular runway.

RUNWAY GRADIENT: The average slope, measured in percent, between the two ends of a runway.

RUNWAY PROTECTION ZONE (RPZ): An area off the runway end to enhance the protection of people and property on the ground. The RPZ is trapezoidal in shape. Its dimensions are determined by the aircraft approach speed and runway approach type and minima.

RUNWAY SAFETY AREA (RSA): A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway.

RUNWAY VISIBILITY ZONE (RVZ): An area on the airport to be kept clear of permanent objects so that there is an unobstructed line of- site from any point five feet above the runway centerline to any point five feet above an intersecting runway centerline.

RUNWAY VISUAL RANGE (RVR): An instrumentally derived value, in feet, representing the horizontal distance a pilot can see down the runway from the runway end.

S

SCOPE: The document that identifies and defines the tasks, emphasis, and level of effort associated with a project or study.

SEGMENTED CIRCLE: A system of visual indicators designed to provide traffic pattern information at airports without operating control towers.

SHOULDER: An area adjacent to the edge of paved runways, taxiways, or aprons providing a transition between the pavement and the adjacent surface; support for aircraft running off the pavement; enhanced drainage; and blast protection. The shoulder does not necessarily need to be paved.

SLANT-RANGE DISTANCE: The straight line distance between an aircraft and a point on the ground.

SMALL AIRPLANE: An airplane that has a maximum certified takeoff weight of up to 12,500 pounds.

SPECIAL-USE AIRSPACE: Airspace of defined dimensions identified by a surface area wherein activities must be confined because of their nature and/or wherein limitations may be imposed upon aircraft operations that are not a part of those activities. Special-use airspace classifications include:

- **ALERT AREA**: Airspace which may contain a high volume of pilot training activities or an unusual type of aerial activity, neither of which is hazardous to aircraft.

- **CONTROLLED FIRING AREA**: Airspace wherein activities are conducted under conditions so controlled as to eliminate hazards to nonparticipating aircraft and to ensure the safety of persons or property on the ground.

- **MILITARY OPERATIONS AREA (MOA)**: Designated airspace with defined vertical and lateral dimensions established outside Class A airspace to separate/segregate certain military activities from instrument flight rule (IFR) traffic and to identify for visual flight rule (VFR) traffic where these activities are conducted.

- **PROHIBITED AREA**: Designated airspace within which the flight of aircraft is prohibited.

- **RESTRICTED AREA**: Airspace designated under Federal Aviation Regulation (FAR) 73, within which the flight of aircraft, while not wholly prohibited, is subject to restriction. Most restricted areas are designated joint use. When not in use by the using agency, IFR/VFR operations can be authorized by the controlling air traffic control facility.

- **WARNING AREA**: Airspace which may contain hazards to nonparticipating aircraft.

STANDARD INSTRUMENT DEPARTURE (SID): A preplanned coded air traffic control IFR departure routing, preprinted for pilot use in graphic and textual form only.

STANDARD INSTRUMENT DEPARTURE PROCEDURES: A published standard flight procedure to be utilized following takeoff to provide a transition between the airport and the terminal area or en route airspace.

STANDARD TERMINAL ARRIVAL ROUTE (STAR): A preplanned coded air traffic control IFR arrival routing, preprinted for pilot use in graphic and textual or textual form only.

STOP-AND-GO: A procedure wherein an aircraft will land, make a complete stop on the runway, and then commence a takeoff from that point. A stop-and-go is recorded as two operations: one operation for the landing and one operation for the takeoff.

STOPWAY: An area beyond the end of a takeoff runway that is designed to support an aircraft during an aborted takeoff without causing structural damage to the aircraft. It is not to be used for takeoff, landing, or taxiing by aircraft.

STRAIGHT-IN LANDING/APPROACH: A landing made on a runway aligned within 30 degrees of the final approach course following completion of an instrument approach.

T

TACTICAL AIR NAVIGATION (TACAN): An ultrahigh frequency electronic air navigation system which provides suitably-equipped aircraft a continuous indication of bearing and distance to the TACAN station.

TAKEOFF RUNWAY AVAILABLE (TORA): See declared distances.

TAKEOFF DISTANCE AVAILABLE (TODA): See declared distances.

TAXILANE: The portion of the aircraft parking area used for access between taxiways and aircraft parking positions.

TAXIWAY: A defined path established for the taxiing of aircraft from one part of an airport to another.

TAXIWAY SAFETY AREA (TSA): A defined surface alongside the taxiway prepared or suitable for reducing the risk of damage to an airplane unintentionally departing the taxiway.

TERMINAL INSTRUMENT PROCEDURES: Published flight procedures for conducting instrument approaches to runways under instrument meteorological conditions.

TERMINAL RADAR APPROACH CONTROL: An element of the air traffic control system responsible for monitoring the en-route and terminal segment of air traffic in the airspace surrounding airports with moderate to high levels of air traffic.

TETRAHEDRON: A device used as a landing direction indicator. The small end of the tetrahedron points in the direction of landing.

THRESHOLD: The beginning of that portion of the runway available for landing. In some instances the landing threshold may be displaced.

TOUCH-AND-GO: An operation by an aircraft that lands and departs on a runway without stopping or exiting the runway. A touch-and go is recorded as two operations: one operation for the landing and one operation for the takeoff.

TOUCHDOWN: The point at which a landing aircraft makes contact with the runway surface.

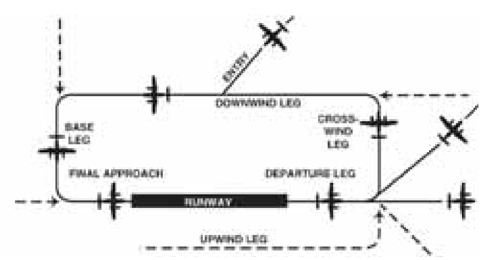
TOUCHDOWN AND LIFT-OFF AREA (TLOF): A load bearing, generally paved area, normally centered in the FATO, on which the helicopter lands or takes off.

TOUCHDOWN ZONE (TDZ): The first 3,000 feet of the runway beginning at the threshold.

TOUCHDOWN ZONE ELEVATION (TDZE): The highest elevation in the touchdown zone.

TOUCHDOWN ZONE (TDZ) LIGHTING: Two rows of transverse light bars located symmetrically about the runway centerline normally at 100- foot intervals. The basic system extends 3,000 feet along the runway.

TRAFFIC PATTERN: The traffic flow that is prescribed for aircraft landing at or taking off from an airport. The components of a typical traffic pattern are the upwind leg, crosswind leg, downwind leg, base leg, and final approach.



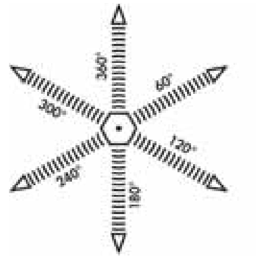
U

UNCONTROLLED AIRPORT: An airport without an air traffic control tower at which the control of Visual Flight Rules traffic is not exercised.

UNCONTROLLED AIRSPACE: Airspace within which aircraft are not subject to air traffic control.

UNIVERSAL COMMUNICATION (UNICOM): A nongovernment communication facility which may provide airport information at certain airports. Locations and frequencies of UNICOM's are shown on aeronautical charts and publications.

UPWIND LEG: A flight path parallel to the landing runway in the direction of landing. See “traffic pattern.”



V

VECTOR: A heading issued to an aircraft to provide navigational guidance by radar.

VERY HIGH FREQUENCY/ OMNIDIRECTIONAL RANGE (VOR): A ground-based electronic navigation aid transmitting very high frequency navigation signals, 360 degrees in azimuth, oriented from magnetic north. Used as the basis for navigation in the national airspace system. The VOR periodically identifies itself by Morse Code and may have an additional voice identification feature.

VERY HIGH FREQUENCY OMNI-DIRECTIONAL RANGE/ TACTICAL AIR NAVIGATION (VORTAC): A navigation aid providing VOR azimuth, TACAN azimuth, and TACAN distance-measuring equipment (DME) at one site.

VICTOR AIRWAY: A control area or portion thereof established in the form of a corridor, the centerline of which is defined by radio navigational aids.

VISUAL APPROACH: An approach wherein an aircraft on an IFR flight plan, operating in VFR conditions under the control of an air traffic control facility and having an air traffic control authorization, may proceed to the airport of destination in VFR conditions.

VISUAL APPROACH SLOPE INDICATOR (VASI): An airport lighting facility providing vertical visual approach slope guidance to aircraft during approach to landing by radiating a directional pattern of high intensity red and white focused light beams which indicate to the pilot that he is on path if he sees red/white, above path if white/white, and below path if red/red. Some airports serving large aircraft have three-bar VASI’s which provide two visual guide paths to the same runway.

VISUAL FLIGHT RULES (VFR): Rules that govern the procedures for conducting flight under visual conditions. The term VFR is also used in the United States to indicate weather conditions that are equal to or greater than minimum VFR requirements. In addition, it is used by pilots and controllers to indicate type of flight plan.

VISUAL METEOROLOGICAL CONDITIONS: Meteorological conditions expressed in terms of specific visibility and ceiling conditions which are equal to or greater than the threshold values for instrument meteorological conditions.

VOR: See “Very High Frequency Omnidirectional Range Station.”

VORTAC: See “Very High Frequency Omnidirectional Range Station/Tactical Air Navigation.”

W

WARNING AREA: See special-use airspace.

WIDE AREA AUGMENTATION SYSTEM: An enhancement of the Global Positioning System that includes integrity broadcasts, differential corrections, and additional ranging signals for the purpose of providing the accuracy, integrity, availability, and continuity required to support all phases of flight.

AC: advisory circular

ADF: automatic direction finder

ADG: airplane design group

AFSS: automated flight service station

AGL: above ground level

AIA: annual instrument approach

AIP: Airport Improvement Program

AIR-21: Wendell H. Ford Aviation Investment and Reform Act for the 21st Century

ALS: approach lighting system

ALSF-1: standard 2,400-foot high intensity approach lighting system with sequenced flashers (CAT I configuration)

ALSF-2: standard 2,400-foot high intensity approach lighting system with sequenced flashers (CAT II configuration)

AOA: Aircraft Operation Area

APV: instrument approach procedure with vertical guidance

ARC: airport reference code

ARFF: aircraft rescue and fire fighting

ARP: airport reference point

ARTCC: air route traffic control center

ASDA: accelerate-stop distance available

ASR: airport surveillance radar

ASOS: automated surface observation station

ATCT: airport traffic control tower

ATIS: automated terminal information service

AVGAS: aviation gasoline - typically 100 low lead (100L)

AWOS: automated weather observation station

BRL: building restriction line

CFR: Code of Federal Regulation

CIP: capital improvement program

DME: distance measuring equipment

DNL: day-night noise level

DWL: runway weight bearing capacity of aircraft with dual-wheel type landing gear

DTWL: runway weight bearing capacity of aircraft with dual-tandem type landing gear

FAA: Federal Aviation Administration

FAR: Federal Aviation Regulation

FBO: fixed base operator

FY: fiscal year

GPS: global positioning system

GS: glide slope

HIRL: high intensity runway edge lighting

IFR: instrument flight rules (FAR Part 91)

ILS: instrument landing system

IM: inner marker

LDA: localizer type directional aid

LDA: landing distance available

LIRL: low intensity runway edge lighting

LMM: compass locator at ILS outer marker

LORAN: long range navigation

MALS: midium intensity approach lighting system with indicator lights

MIRL: medium intensity runway edge lighting

MITL: medium intensity taxiway edge lighting

MLS: microwave landing system

MM: middle marker

MOA: military operations area

MSL: mean sea level

NAVAID: navigational aid

NDB: nondirectional radio beacon

NM: nautical mile (6,076.1 feet)

NPES: National Pollutant Discharge Elimination System

NPIAS: National Plan of Integrated Airport Systems

NPRM: notice of proposed rule making

ODALS: omnidirectional approach lighting system

OFA: object free area

OFZ: obstacle free zone

OM: outer marker

PAC: planning advisory committee

PAPI: precision approach path indicator

PFC: porous friction course

PFC: passenger facility charge

PCL: pilot-controlled lighting

PIW public information workshop

PLASI: pulsating visual approach slope indicator

POFA: precision object free area

PVASI: pulsating/steady visual approach slope indicator

PVC: poor visibility and ceiling

RCO: remote communications outlet

REIL: runway end identifier lighting

RNAV: area navigation

RPZ: runway protection zone

RSA: runway safety area

RTR: remote transmitter/receiver

RVR: runway visibility range

RVZ: runway visibility zone

SALS: short approach lighting system

SASP: state aviation system plan

SEL: sound exposure level

SID: standard instrument departure

SM: statute mile (5,280 feet)

SRE: snow removal equipment

SSALF: simplified short approach lighting system with runway alignment indicator lights

STAR: standard terminal arrival route

SWL: runway weight bearing capacity for aircraft with single-wheel tandem type landing gear

TACAN: tactical air navigational aid

TAF: Federal Aviation Administration (FAA) Terminal Area Forecast

TLOF: Touchdown and lift-off

TDZ: touchdown zone

TDZE: touchdown zone elevation

TODA: takeoff distance available

TORA: takeoff runway available

TRACON: terminal radar approach control

VASI: visual approach slope indicator

VFR: visual flight rules (FAR Part 91)

VHF: very high frequency

VOR: very high frequency omni-directional range

VORTAC: VOR and TACAN collocated

Appendix B

ENVIRONMENTAL OVERVIEW

Appendix B
ENVIRONMENTAL OVERVIEW

A review of the potential environmental impacts associated with proposed airport projects is an essential consideration in the Airport Master Plan process. The primary purpose of this section is to review the proposed improvement program at Ryan Airfield to determine whether the proposed actions could, individually or collectively, have the potential to significantly affect the quality of the environment. The information contained in this section was obtained from previous studies, various internet websites, and analysis by the consultant.

Construction of the improvements depicted on the Airport Layout Plan will require compliance with the *National Environmental Policy Act (NEPA) of 1969*, as amended, to receive federal financial assistance. For projects not "categorically excluded" under FAA Order 1050.1E, *Environmental Impacts: Policies and Procedures*, compliance with NEPA is generally satisfied through the preparation of an Environmental Assessment (EA). In instances in which significant environmental impacts are expected, an Environmental Impact Statement (EIS) may be required. While this portion of the Master Plan is not designed to satisfy the NEPA requirements for a categorical exclusion, EA, or EIS, it is intended to supply a preliminary review of environmental issues that would need to be analyzed in more detail within the NEPA process. This evaluation considers all environmental categories required for the NEPA process as outlined in FAA Order 1050.1E and Order 5050.4B, *National Environmental Policy Act (NEPA) Implementation Instructions for Airport Actions.*

ENVIRONMENTAL ANALYSIS

FAA Orders 1050.1E and 5050.4B contain a list of the environmental categories to be evaluated for airport projects. Of the 20 plus environmental categories, the following resources are not found within the airport environs:

- Coastal Resources
- Environmental Justice Areas and Children's Environmental Health Risks
- Farmlands
- Wetlands
- Wild and Scenic Rivers

The following sections describe potential impacts to resources present within the airport environs. These resources were described in detail within Chapter One of this study.

AIR QUALITY

According to the most recent update contained on the EPA's Greenbook website, Pima County is currently in attainment for all criteria pollutants. The *2008 Revision to the Carbon Monoxide Limited Maintenance Plan for the Tucson Air Planning Area* prepared by Pima Association of Governments (PAG), states that the Tucson Air Planning Area (TAPA) has been an active limited maintenance plan area for Carbon Monoxide (CO) since July 10, 2000.

A number of projects planned at the airport could have temporary air quality impacts during construction. Emissions from the operation of construction vehicles and fugitive dust from pavement removal are common air pollutants during construction. However, with the use of best management practices (BMPs) during construction, these air quality impacts can be significantly lessened. Local construction permits will need to be acquired prior to the commencing of any construction project.

COMPATIBLE LAND USE

According to the Pima County Assessor's office (May 2007), the area surrounding the airport is designated for commercial use or vacant. These land use designations are both considered compatible land uses. The vast majority of surrounding land is privately owned. The City of Tucson owns a parcel to the northwest of the airport, the State of Arizona owns land to the east, and two parcels south of the airport are owned by the federal government. The land proposed for acquisition in this master plan along the northern boundary of airport property is privately owned.

CONSTRUCTION IMPACTS

Construction impacts typically relate to the effects on specific impact categories, such as air quality, water quality, or noise, during construction. The use of BMPs during construction is typically a requirement of construction-related permits such as an NPDES (AZDES) permit. Use of these measures typically alleviates potential resource impacts.

Short-term construction-related noise impacts should be minimal as land immediately adjacent to the airport is primarily vacant. Also, these impacts typically do not arise unless construction is being undertaken during early morning, evening, or nighttime hours.

Construction-related air and water quality impacts can also be expected. Air emissions related to construction activities will be short-term in nature and will be included in air emissions inventories prepared prior to project implementation as requested by the FAA. The most common type of air pollution related to construction is fugitive dust. The Activity Permit Program, monitored by the Pima County Department of Environmental Quality (PDEQ), ensures that individuals are aware of fugitive dust emissions regulations and requires them to provide information regarding the location and types of activities prior to construction.

In regards to water quality, the Tucson Airport Authority (TAA) has prepared a general Storm Water Pollution Prevention Plan (SWPPP) for construction activities dated May 2008. The TAA SWPPP sets minimum standards to comply with the AZPDES General Permit based on FAA Advisory Circular 150/5320-15 *Storm Water Management for Construction Activities* dated September 1992. For any development project at the airport, it is the responsibility of the contractor to prepare a Site Specific SWPPP which identifies all BMPs that are necessary to ensure compliance with the TAA's SWPPP and general permit provisions.

SECTION 4(f) PROPERTIES

As described within Chapter One, previous coordination with the Pima County Parks and Recreation Department expressed concern regarding Vahalla Regional Park located approximately 2.5 miles southeast of the airport. The Arizona State Parks Department has also previously expressed concern regarding air traffic over the San Xavier Del Bac Mission, which is located on the National Register of Historic Places. The mission is located eight miles southeast of the airport. An 80-acre baseball diamond park is planned to be developed approximately one mile to the east of the airfield. During the anticipated NEPA analysis for the runway development projects, coordination should be undertaken with the appropriate agencies to assess potential project concerns.

FISH, WILDLIFE, AND PLANTS

Table B1 lists the threatened, endangered, and candidate species with the potential to occur in Pima County.

TABLE B1
Threatened or Endangered Species in Pima County, Arizona

Species	Federal Status
California brown pelican	Endangered
Chiricahua leopard frog	Threatened
Desert pupfish	Endangered
Gila chub	Endangered
Gila topminnow	Endangered
Huachua water umbel	Endangered
Jaguar	Endangered
Kearney blue star	Endangered
Lesser long-nosed bat	Endangered
Masked bobwhite	Endangered
Mexican spotted owl	Threatened
Nichol Turk's head cactus	Endangered
Ocelot	Endangered
Pima pineapple cactus	Endangered
Sonoran pronghorn	Endangered
Southwestern willow flycatcher	Endangered
Acuna cactus	Candidate
Sonoyta mud turtle	Candidate
Yellow-billed cuckoo	Candidate

Source: FWS online listed species database, November 2007

As discussed in Chapter One, the Arizona Heritage Data Management System online environmental review tool indicates that the Pima Pineapple Cactus, a federally listed species, has a recorded occurrence within three miles of the airport. It has also been indicated that one or more native plants listed on the Arizona Native Plant Law and Antiquities Act have been documented within the vicinity of the airport. Previously conducted surveys failed to locate any significant or sensitive habitat or threatened or endangered species. However, prior to development in previously undisturbed areas, field surveys will likely be needed. Surveys will likely be required prior to construction of Runway 6L-24R as well as the planned extensions to the existing runway systems. The development of new apron and hangar facilities may also be required prior to construction. Survey results should be communicated to the U.S. Fish and Wildlife Service and the Arizona Fish and Game Department.

A majority of the County's threatened or endangered species rely on riparian habitats for survival. Riparian habitats are rare areas that provide flood controls, habitats for fish and wildlife, and irrigation water. More recently they have been utilized for urbanization water needs. In a January 2003 report prepared by the Pima Association of Governments (PAG), *Riparian Areas: Regulatory Controls in Eastern Pima County*, riparian areas can fall within the following categories:

- "Flood control features with very little vegetation;
- Dual purpose washes that convey storm water but also contain some natural elements;
- Effluent-based systems, such as those downstream from the wastewater outfalls;
- Outlying rural washes, with little direct impact from urbanization, but that still receive indirect impacts; and
- A few unique waters that include a lot of critical elements such as perennial groundwater, shallow groundwater, and unique vegetation communities. The San Pedro River, Honey Bee Canyon, Cienega Creek, and the west branch of the Santa Cruz are examples of these somewhat pristine watercourses."

Pima County adopted the *Sonoran Desert Conservation Plan* in 2001 to establish a plan to protect and enhance these riparian areas. Ryan Airfield is located within a riparian restoration/rehabilitation area as identified on **Exhibit B1**. Analysis and coordination with Pima County will need to be undertaken to determine impacts of airport improvement projects on any riparian areas located in the vicinity of the airport.

HAZARDOUS MATERIALS, POLLUTION PREVENTION, AND SOLID WASTE

According to the Environmental Protection Agency's (EPA) National Priorities List (NPL), there are no active Superfund sites located in the vicinity of the airport.

The airport will need to continue to comply with an Arizona Pollution Discharge Elimination System (AZPDES) permit, which will ensure that pollution control measures are in place at the airport. As development occurs at the airport, the permit will need to be modified to reflect the additional impervious surfaces and stormwater retention facilities. The addition and removal of impervious surfaces may require modifications to this permit should drainage patterns be modified.

As a result of increased operations at the airport, solid waste will slightly increase; however, these increases are not anticipated to be significant.

Prior to the acquisition of the parcels north of the airport, a Phase I Environmental Due Diligence Audit (EDDA) will likely be requested by the FAA as part of the NEPA documentation.

Ryan Airfield was once the site of a City of Tucson landfill that was used from 1973 to 1977. The closed 15 acre landfill site, identified on **Exhibit B2**, has a groundwater depth of 300 feet and is located in the area of proposed developments. Coordination with the City will be needed prior to the development of these areas.

HISTORICAL, ARCHITECTURAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

Previous studies completed at the airport did not identify the presence of any historic, prehistoric, or isolated artifact. However, a 1990 Environmental Assessment for Proposed Development at Ryan Airfield indicated that the airport is located in an area where significant cultural resources might be located. It is anticipated that field surveys will be needed for previously undisturbed areas prior to development. These surveys would typically be undertaken during the NEPA documentation processes. Coordination with the State Historic Preservation Office is required prior to project implementation.

LIGHT EMISSIONS AND VISUAL IMPACTS

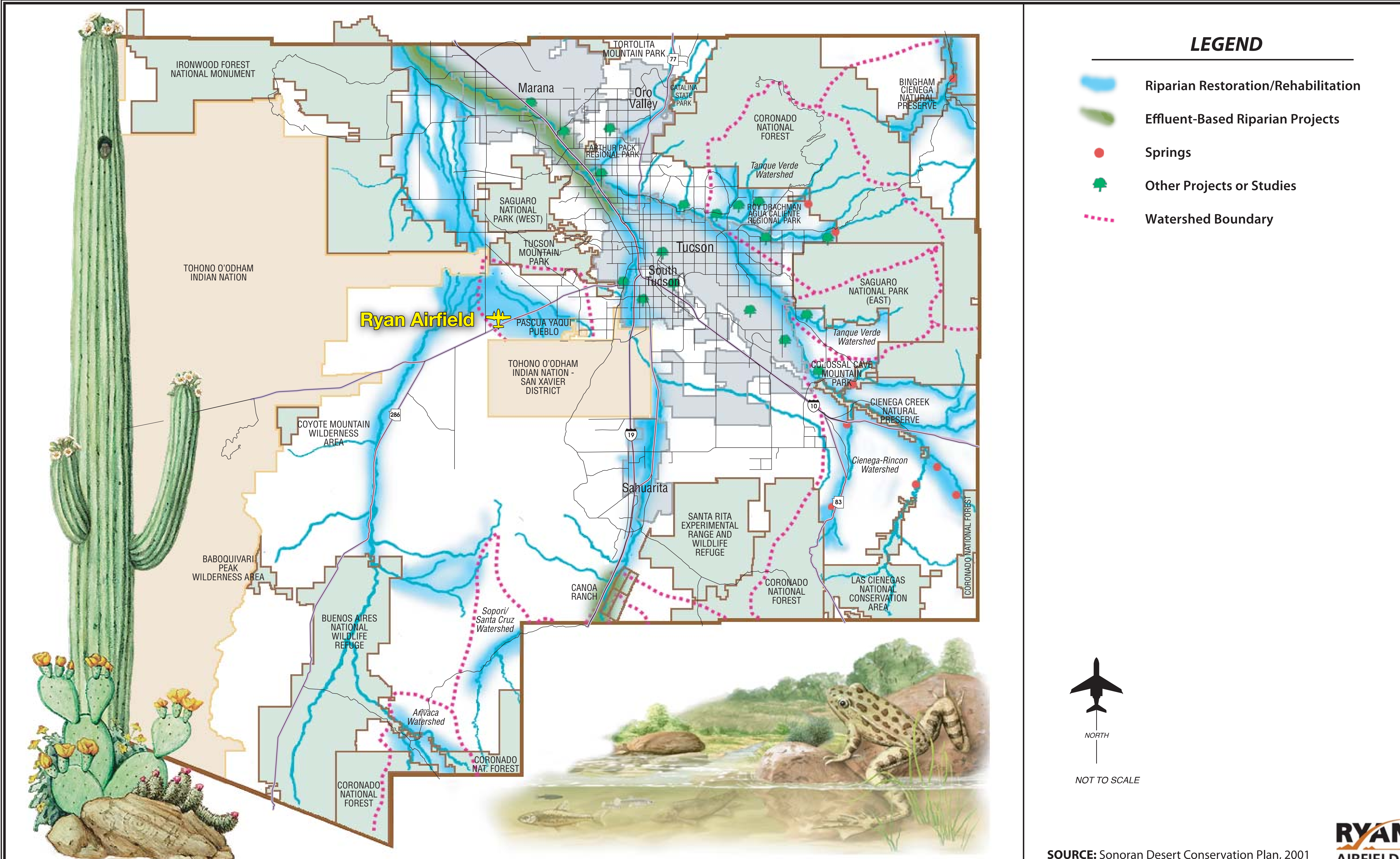
Airside development will include a 2,800-foot extension to Runway 6R-24L, a 105-foot extension to Runway 6L-24R, an 800-foot extension to Runway 15-33, and the installation of medium intensity approach lighting systems (MALSR) at each end of Runway 6R-24L. The runway extensions will result in the extension of runway and taxiway lighting.

Landside development at the airport will create new hangar space, aviation-use revenue support parcels, relocated segmented circle/lighted wind sock, and an airport perimeter service road.

Construction of these proposed facilities will introduce new light emissions, resulting in an increase of light emissions from the airport. Due to the airport's relatively remote location, light and visual impacts are not anticipated.

NATURAL RESOURCES AND ENERGY SUPPLY

Increased use of energy and natural resources are anticipated as the operations at the airport grow. None of the planned development projects are anticipated to result in significant increases in energy consumption.



SOURCE: Sonoran Desert Conservation Plan, 2001

RYAN AIRFIELD TUCSON AIRPORT AUTHORITY

Exhibit B1
PIMA COUNTY RIPARIAN RESOURCES

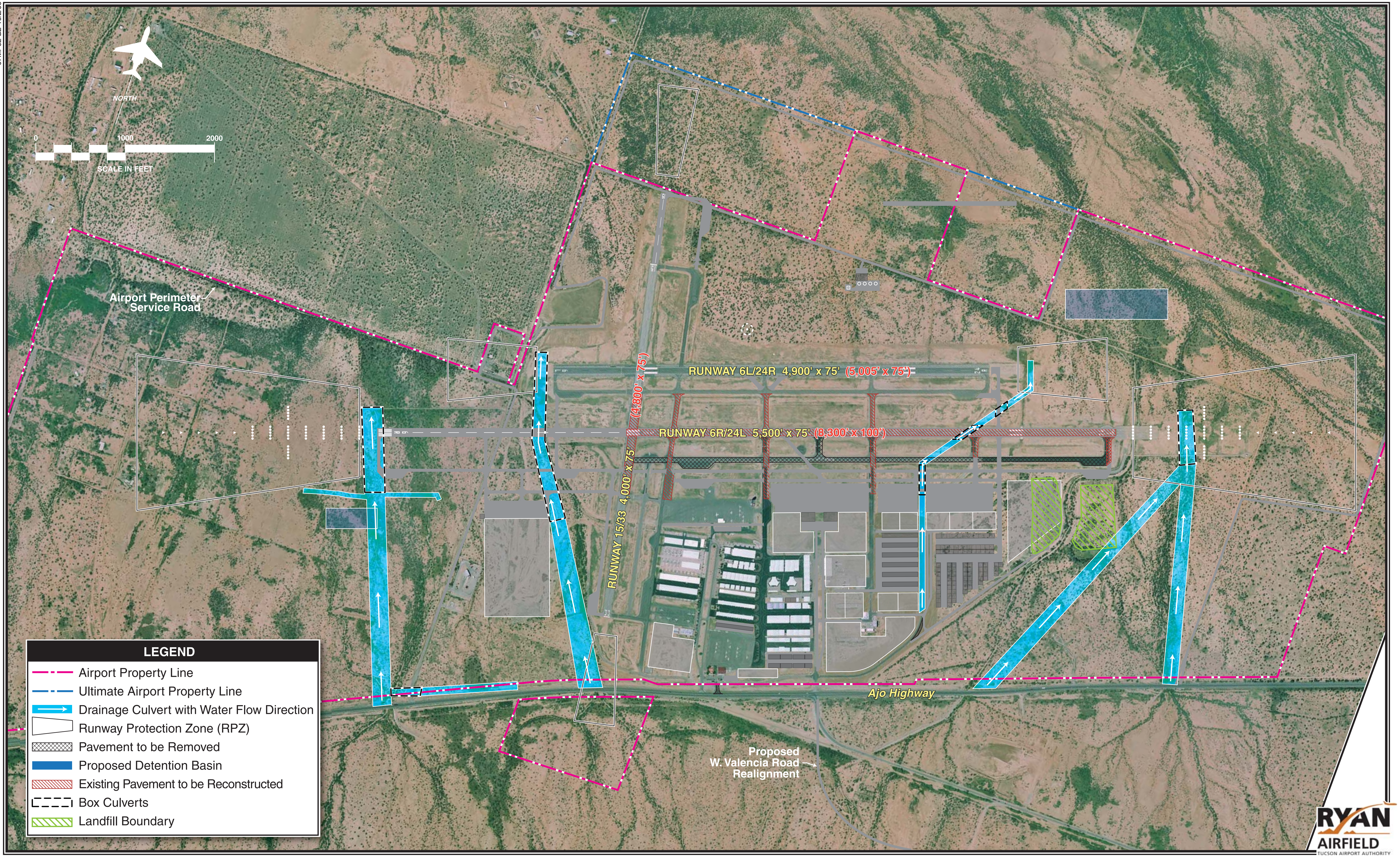


Exhibit B2
PROPOSED DRAINAGE IMPROVEMENT
AND LANDFILL LOCATION

NOISE

An airport's compatibility with surrounding land uses is usually associated with the extent of the airport's noise contours. Airport projects such as those needed to accommodate fleet mix changes, an increase in operations at the airport, or air traffic changes are examples of activities which can alter noise impacts and affect surrounding land uses. The 2008 noise exposure contours for Ryan Airfield are shown on **Exhibit B3**. As shown on the exhibit the 65 DNL noise contour remains largely on airport property. The contour extends off airport property north of the approach end to Runway 24R, over an area that is currently undeveloped. The contour also extends off airport property to the west of the approach end to Runway 6L, over an area owned by the City of Tucson that is not planned for noise-sensitive land uses.

Exhibit B4 depicts the 2027 noise exposure contours for the airport. As shown on the exhibit the noise contours continue to remain largely on airport property. The portions of the contour that extend beyond current airport property are over areas planned to be acquired for airport uses. To the west of the airport the contour extends over property owned by the City of Tucson that is not planned for noise-sensitive land uses. The circular shaped portion of the noise contours located north of Runway 6L-24R results from a planned helipad and helicopter training touchdown and lift-off (TLOF) area in that location. Additional information regarding the development of the noise exposure contours can be found in **Appendix C** of this document.

SECONDARY (INDUCED) IMPACTS

Significant shifts in patterns of population movement or growth or public service demands are not anticipated as a result of the proposed development. It could be expected, however, that the proposed development would potentially induce positive socioeconomic impacts for the community over a period of years. The airport, with expanded facilities and services, would be expected to attract additional users. It is also expected to encourage tourism, industry, and trade and to enhance the future growth and expansion of the community's economic base. Future socioeconomic impacts resulting from the proposed development are anticipated to be primarily positive in nature.

SOCIOECONOMIC IMPACTS

The proposed project includes the acquisition of two parcels of land totaling approximately 119.3 acres located along the northern boundary of the existing property line. These parcels would be acquired to accommodate the extension to Runway 15 and its runway protection zone (RPZ), the potential construction of a third parallel runway, and the construction of an airport perimeter service road. The acquisition will not include the relocation of residents or businesses. The airport perimeter service road will be located entirely on airport property and will not be accessible to the public.

WATER QUALITY

The airport will need to continue to comply with an AZPDES operations permit. With regard to construction activities, the airport and all applicable contractors will need to obtain and comply with the requirements and procedures of the construction-related AZPDES General Permit number AZG2003-001, including the preparation of a *Notice of Intent* and a *SWPPP,* prior to the initiation of product construction activities.

As development occurs at the airport, the AZPDES permit will need to be modified to reflect the additional impervious surfaces and any stormwater retention facilities. The addition and removal of impervious surfaces may require modifications to this permit should drainage patterns be modified.

A review of the aerial photography for the airport indicates the presence of a number of washes within the planned development area. Specifically, potential washes are located within the proposed MALSR area for Runway 24L as well as the western portions of airport property, which contain the proposed Runway 6R-24L runway extensions, taxiway projects, and apron and future airport building locations. Along with these development projects are plans to improve drainage throughout the airport. The 2006 Ryan Airfield drainage master plan addressed many drainage improvements and analyzed their impact on the existing washes. This Master Plan proposes additional improvements, which are depicted on **Exhibit B2** and combined with the recommended improvements from the drainage master plan. Additional study will need to be undertaken during preliminary design to determine the impact of these drainage improvements on the existing washes. Disturbance of these areas may require the issuance of a Section 404 Permit from the U.S. Army Corps of Engineers. Prior to development, field surveys should be undertaken to delineate potential jurisdictional areas.

FLOODPLAINS

According to the most recent Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM), Ryan Airfield is located within a Special Flood Hazard Area (100-year floodplain). An existing earthen levee west of the airfield confines 100-year flow from a tributary to the Black Wash. However this levee does not have the freeboard required by FEMA standards and is not certified per FEMA

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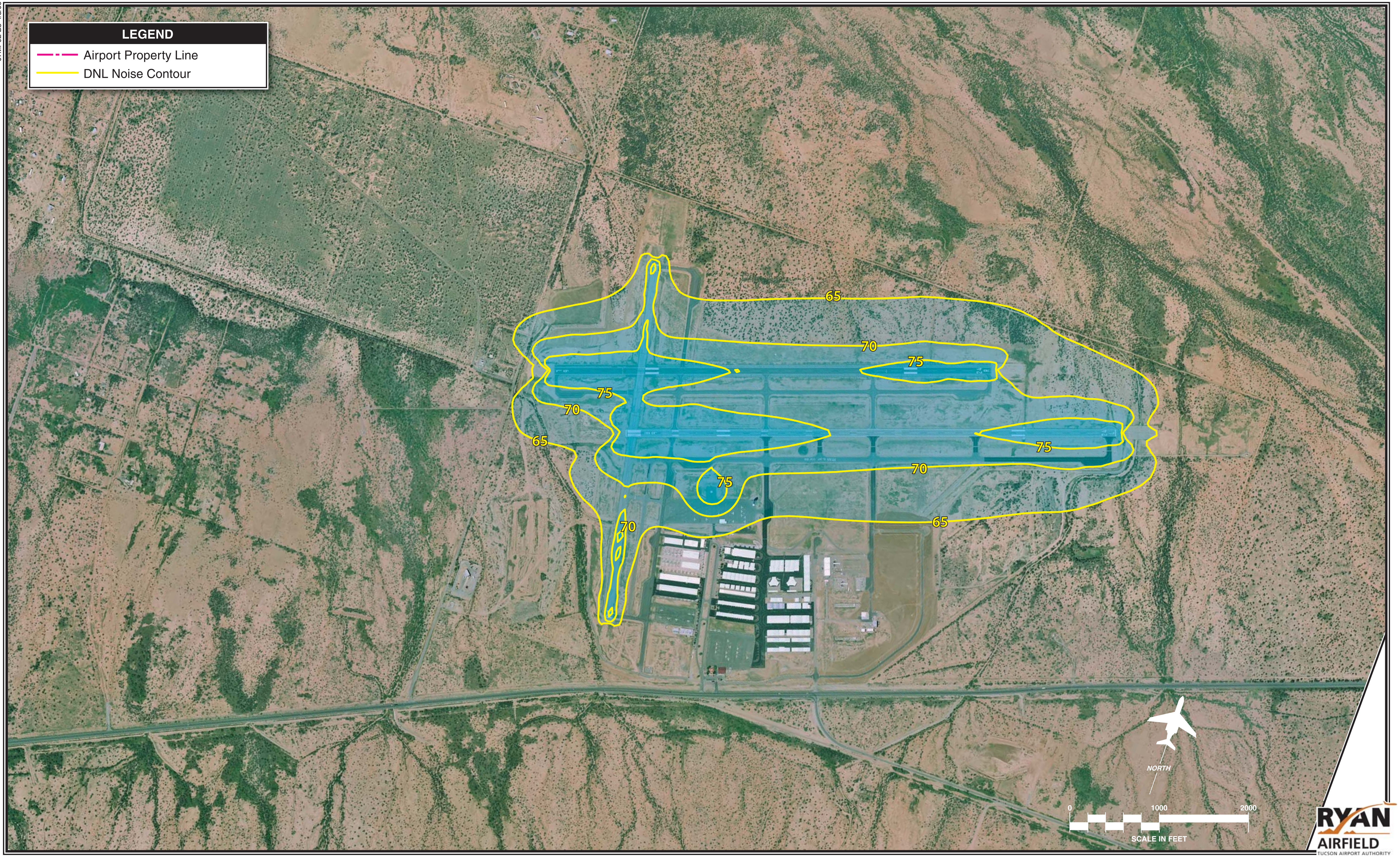

Exhibit B3
2008 AIRCRAFT NOISE EXPOSURE

07MP02-B4-10/6/09

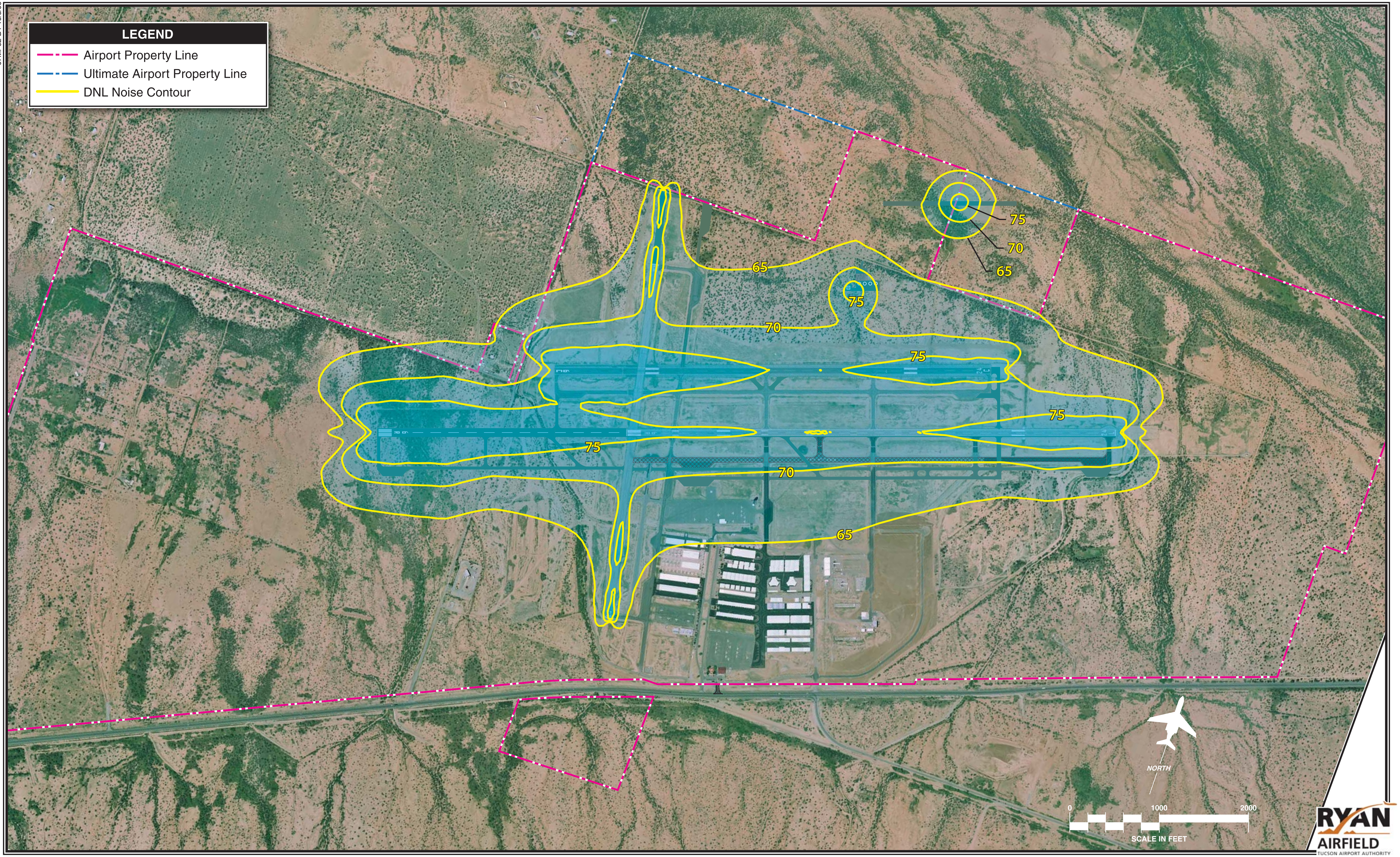

Exhibit B4
2027 AIRCRAFT NOISE EXPOSURE

standards. An uncertified levee is assumed to fail by FEMA standards and therefore, the 100-year floodplain would extend within the adjacent airport related development areas and airfield operations areas and flow north into the airfield. For this reason, a new levee is required at Ryan Airfield to contain the 100-year flow from the tributary of the Black Wash. The Ryan Airfield Airport-Wide Basin Study Update (March 20, 2006) identifies a new alignment for this levee, approximately 600 ft. east of the existing levee. Once construction plans are developed for the levee, a Conditional Letter of Map Revision (CLOMR) could be process with FEMA to conditionally revise the floodplain for the tributary wash. Subsequent to approval of the CLOMR, and construction of the levee and associated low flow channel, a final Letter of Map Revision (LOMR) may be pursued.

Appendix C

14 CFR PART 150 REVIEW

Appendix C
INVENTORY

14 CFR Part 150 Review
Ryan Airfield

INTRODUCTION

The purpose of this review is to provide an assessment for the current Noise Compatibility Study by reexamining the noise and land use conditions at Ryan Airfield and the surrounding area. The information presented in this section will be used to identify existing and future noise-sensitive areas that may be adversely impacted by aircraft noise and to evaluate the current strategies to mitigate or avoid those impacts. The information in this chapter includes:

- A discussion of the purpose and procedures required to undertake a Noise Compatibility Program, as described under Title 14, Part 150 of the Code of Federal Regulations (CFR) (formerly referred to as F.A.R. Part 150).

- A description of airport facilities, airspace, and airport operating procedures.

- A discussion of the roles and responsibilities for each of the entities impacted by aircraft activity from Ryan Airfield.

- An overview of the land use planning documents and tools applicable within the area surrounding the airport.

The information outlined in this appendix was obtained through on-site inspections, interviews with airport staff, airport tenants, and representatives of Pima County Planning, the Arizona Department of Transportation (ADOT), and the Federal Aviation Administration (FAA). Information was also obtained from available documents concerning the airport and the Tucson area.

This review is being prepared concurrently with the Airport Master Plan Update for Ryan Airfield. This provides ample opportunity for the full assessment of potential noise impacts of alternative master planning strategies. At the same time, it enables a thorough analysis of potential airport modifications that could promote noise abatement.

WHAT IS A NOISE COMPATIBILITY PROGRAM?

Before presenting background information related to the airport and surrounding communities, the definition and purpose of a Part 150 Noise Compatibility Study is necessary. A Noise Compatibility Program is intended to promote aircraft noise control and land use compatibility. Three things make such a study unique: (1) it is the only comprehensive approach to preventing and reducing airport and community land use conflicts; (2) eligible items in the approved plan may be funded from a special account in the Federal Airport Improvement Program; and (3) it is the only kind of airport study by the FAA primarily for the benefit of airport neighbors.

The principal objectives of any Noise Compatibility Program are to:

- Identify the current and projected aircraft noise levels and their impact on the airport environs.
- Propose ways to reduce the impact of aircraft noise through changes in aircraft operations or airport facilities.
- In undeveloped areas where aircraft noise is projected to remain, encourage future land uses which are compatible with the noise, such as agriculture, commercial or industrial.
- In existing residential areas which are expected to remain impacted by noise, determine ways of reducing the adverse impacts of noise.
- Establish procedures for implementing, reviewing, and updating the plan.

JURISDICTION AND RESPONSIBILITIES

From the national to local level, each government has specific responsibilities to reduce or limit aviation noise impacts. At Ryan Airfield, the federal, state, and county governments each have a role in airport land use compatibility planning.

FEDERAL GOVERNMENT

The federal government, primarily through the FAA, has the authority and responsibility to control aircraft noise sources with the following methods:

- Implement and Enforce Aircraft Operational Procedures – Where and how aircraft are operated is under the complete jurisdiction of the FAA. This includes pilot responsibilities, compliance with Air Traffic Control instructions, flight restrictions, and monitoring careless and reckless operation of aircraft.

- Manage the Air Traffic Control System – The FAA is responsible for the control of navigable airspace and review of any proposed alterations in the flight procedures for noise abatement.

- Certification of Aircraft – The FAA requires the reduction of aircraft noise through certification, modification of engines, or aircraft replacement as defined in CFR Title 14, Part 36. Additionally, CFR Title 14, Part 91 outlines the phase-out of aircraft not meeting the requirements of Part 36.

- Pilot licensing – Individuals licensed as pilots are trained under strict guidelines concentrating on safe and courteous aircraft operating procedures.

- Noise Compatibility Studies – The FAA collaborates with airport sponsors to fund and evaluate Noise Compatibility Studies in accordance with Part 150 regulations.

14 CFR Parts 36 and 91 Federal Aircraft Noise Regulations

The FAA requires the reduction of aircraft noise with the regulations adopted under 14 CFR Parts 36 and 91. These regulations apply only to civilian aircraft and do not address noise generated by military aircraft.

Part 36 prohibits the escalation of noise levels from small, piston-driven aircraft, subsonic civil turbojet and transport aircraft, and supersonic transport aircraft. Part 36 also requires new aircraft types to be markedly quieter than earlier models by limiting the noise emissions allowed by newly certified aircraft. To achieve this, Part 36 has four stages of certification.

- Stage 1 includes all aircraft certificated prior to December 1, 1969.

- Stage 2 applies to aircraft certificated between December 1, 1969 and November 5, 1975.

- Stage 3 applies to aircraft certificated between November 5, 1975 and January 1, 2006.

- Stage 4 is the most rigorous and applies to aircraft certificated after January 1, 2006.

Additionally, Part 91, Subpart 1, known as the "Fleet Noise Rule," mandates a compliance schedule under which Stage 1 aircraft were to be retired or refitted with hush kits or quieter engines by January 1, 1988. A limited number of exemptions have been granted by the U.S. Department of Transportation for foreign aircraft operating at specified international airports.

Pursuant to the Congressional mandate outlined in the *Airport Noise and Capacity Act of 1990* (ANCA), FAA has established amendments to Part 91 by setting December 31, 1999 as the date for discontinuing use of all Stage 2 aircraft exceeding 75,000 pounds within the contiguous United States. Stage 2 aircraft operating non-revenue generating flights can operate beyond the deadline for the following purposes:

- To sell, lease, or scrap the aircraft;
- To obtain modifications to meet the most recent noise standards;
- To undergo scheduled heavy maintenance or significant modifications;
- To deliver the aircraft to a lessee or return it to a lessor;
- To park or store the aircraft;
- To prepare the aircraft for any of these events; or
- To operate under an experimental airworthiness certificate.

Additional restrictions or phase-out dates have not been adopted for Stage 3 and Stage 4 aircraft.

14 CFR, Part 161 Regulation of Noise and Access Restrictions

14 CFR, Part 161, sets forth requirements for notice and approval of local restrictions on aircraft noise levels and airport access. Part 161 was developed in response to ANCA. It applies to local airport restrictions that would limit operations of Stage 2 weighing less than 75,000 pounds and Stage 3 aircraft. Restrictions addressed by Part 161 include direct limits on maximum noise levels, nighttime curfews, and special fees intended to encourage changes in airport operations to reduce noise.

To implement noise or access restrictions on Stage 2 aircraft, the airport proprietor must provide public notice of the proposal and a 45-day comment period. This includes FAA notification and publication of the proposed restriction in the Federal Register.

An analysis must be prepared describing the proposal, alternatives to the proposal, and the costs and benefits of each. The FAA will either accept the analysis for the restriction or return it with a request for additional study. Following acceptance, the restriction may be implemented. It should be noted that although the study is accepted, the restriction may violate an airport's federal grant assurances, which could jeopardize project funding.

Noise or access restrictions on Stage 3 aircraft must meet the following criteria outlined in the statute:

(1) The restriction is reasonable, non-arbitrary, and non-discriminatory.

(2) The restriction does not create an undue burden on interstate or foreign commerce.

(3) The proposed restriction maintains safe and efficient use of the navigable airspace.

(4) The proposed restriction does not conflict with any existing federal statute or regulation.

(5) The applicant provides adequate opportunity for public comment on the proposed action.

(6) The proposed restriction does not create an undue burden on the national aviation system.

The airport operator's application must include an Environmental Assessment (EA) prepared under the provisions of the *National Environmental Protection Act* (NEPA) and a complete analysis addressing the six previously discussed conditions. Within 30 days of receipt of the application, the FAA must determine whether the application is complete. After a completed application has been filed, the FAA must publish a notice of the proposal in the Federal Register. The FAA must approve or disapprove the restriction within 180 days of receipt of the completed application. More information regarding the status of Part 161 studies can be found in the TIP titled, *Federal Aviation Noise Regulations*, located at the end of this document.

Airport operators that implement noise and access restrictions in violation of Part 161 are subject to termination of eligibility for airport grant funds and authority to impose and collect passenger facility charges (PFCs).

STATE AND LOCAL

Control of land use in noise-impacted areas around airports is a key tool in limiting the number of residents exposed to aircraft noise. The FAA encourages land use compatibility within the vicinity of airports, and Part 150 has guidelines relating to land use compatibility based on varying levels of noise exposure. Nevertheless, the federal government has no direct legal authority to regulate land use. That responsibility rests exclusively with state and local governments.

State

The State of Arizona, through enabling legislation, has given the power to administer land use regulations to counties, cities, and towns. *Arizona Revised Statutes* do not require the establishment of planning commissions, agencies, or departments in municipalities; however, where such appointments are made, the municipality is required to prepare and adopt a long-range general plan and may regulate zoning, subdivision of land, and land development, consistent with the plan.

The State of Arizona provides for the disclosure of aviation activities to prospective buyers of real estate. In 1997, the state adopted legislation allowing airport sponsors to identify Airport Influence Areas (AIA) around public and commercial use airports. The establishment of an AIA is voluntary and requires a public hearing. The boundary of the AIA must be recorded with the county in which the airport resides.

In addition, the 1999 Arizona State Legislature adopted legislation requiring the state real estate department to prepare and maintain a series of maps depicting the traffic pattern airspace of each public airport in the state. These maps are to be provided to the public on request. The intent of the maps is to provide disclosure of the location of the airport as well as the potential influence the airport may have on the surrounding property.

The Public Disclosure Map for Ryan Airfield was updated in January 2005 and is depicted on **Exhibit C1.** The boundary of this area is based on the traffic pattern airspace for the airport. <u>The issuance of avigation easements and fair disclosure notices is required for development within the public disclosure area.</u>

Local Government

In the Ryan Airfield study area, Pima County is responsible for off-airport land use regulations.

In addition to regulating land use, local governments may acquire property to mitigate or prevent airport noise impacts or may sponsor sound insulation programs for this purpose. They are also eligible to apply for FAA grants under Part 150 if they are designated as a sponsor of a project in an approved noise compatibility program.

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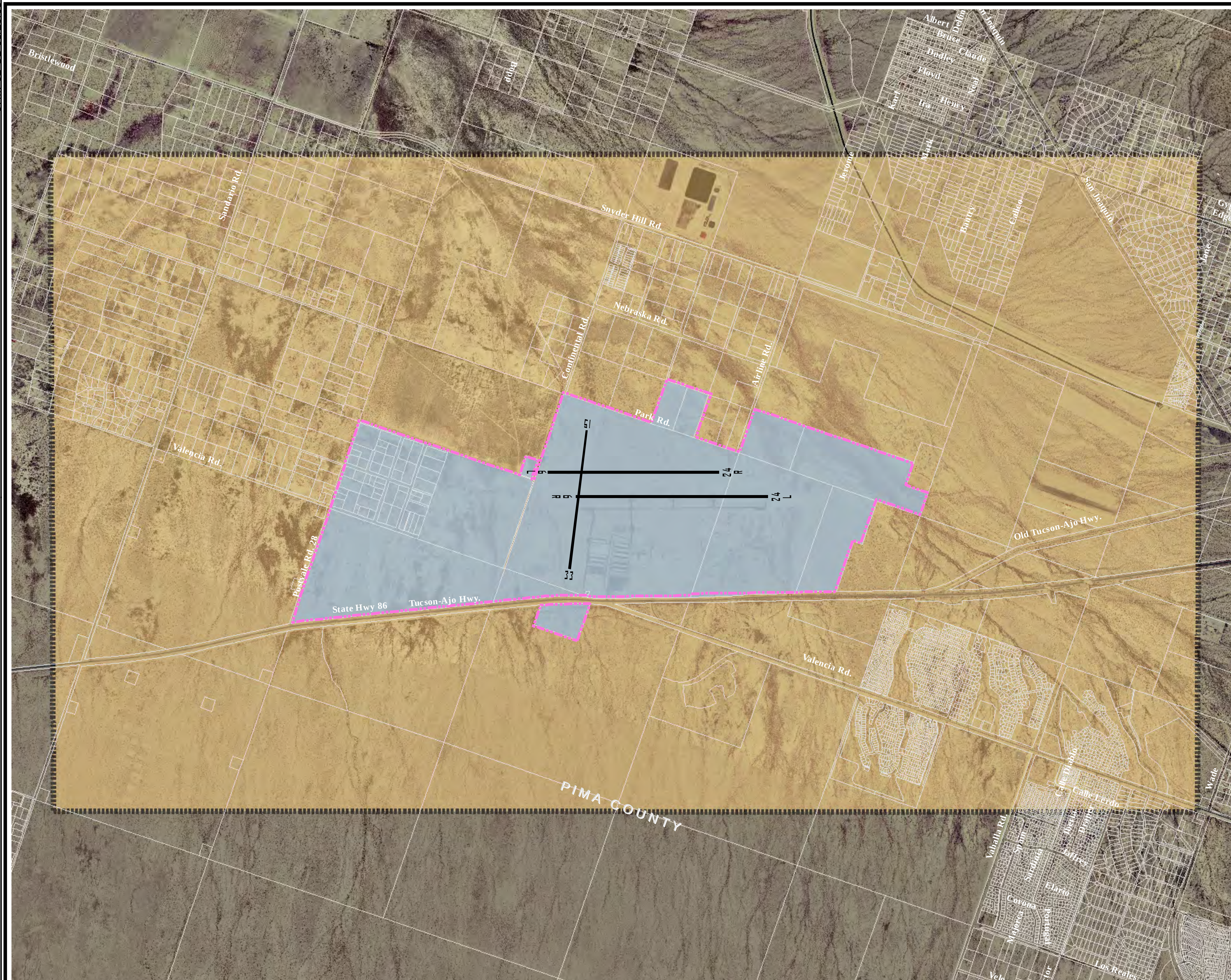

LEGEND

- Airport Property Boundary
- Public Airport
- Airport Disclosure Area

Source: Pima County Department of Transportation Goegraphic Information System, (June, 2008).
Aerial Photo, U.S. Department of Agriculture, Service Center Agencies, (June, 2003).

NORTH

0 3,000
1" = 3,000'

RYAN AIRFIELD
TUCSON AIRPORT AUTHORITY

Exhibit C1
AIRPORT DISCLOSURE MAP

OWNERSHIP AND MANAGEMENT

Ryan Airfield is owned by the City of Tucson and is operated and maintained by the TAA. The Tucson Airport Authority is a non-profit organization that was created by state charter in 1948 to promote air transportation and commerce in the state, to maintain the Tucson International Airport and Ryan Airfield facilities, and to encourage economic growth in Tucson and southern Arizona. The TAA is made up of 115 community volunteers and a nine-person board which oversees policy decisions. The TAA also has a staff of approximately 300 employees who handle daily operations at Tucson International Airport and Ryan Airfield.

AIRPORT SETTING AND ROLE

Ryan Airfield is located approximately ten miles southwest of the City of Tucson at the intersection of Ajo Highway (State Route 86) and West Valencia Road. Ryan Airfield is situated on 1,754 acres at 2,417 feet above mean sea level (MSL) and is one of five public-use airport facilities in Pima County. Exhibit 1A following page 1-2 of this document depicts the airport in its regional and state setting.

Ryan Airfield is included in the Pima Association of Governments' (PAG) *2002 Regional Aviation System Plan* (RASP). The RASP provides an overview for airport planning in the region, reflecting the overall plans for each airport in the region and assessing proposed project costs and the proper phasing of each project. Ryan Airfield is one of six public-use airports included in the RASP. The RASP classifies public-use airports as either Level I or Level II. Level I airports are those that are essential to meeting the region's transportation and economic needs, whereas Level II airports are thought of as support facilities. Ryan Airfield is classified as a Level I airport in the PAG RASP.

At the state level, Ryan Airfield is also included in the Arizona *State Aviation System Plan* (SASP). The purpose of the SASP is to ensure that the state has an adequate and efficient system of airports to serve its aviation needs. The SASP defines the specific role of each airport in the state's aviation system and establishes funding needs. Through the state's continuous aviation system planning process, the SASP is updated every five years. The most recent update to the SASP was in 2000, when the *State Aviation Needs Study* (SANS) was prepared. The SANS provides policy guidelines that promote and maintain a safe aviation system in the state, assess the state's airports' capital improvement needs, and identify resources and strategies to implement the plan. Ryan Airfield is one of 112 airports included in the 2000 SANS, which includes all airports and heliports in Arizona that are open to the public, including tribal and recreational airports. The SANS classifies Ryan Airfield as a reliever airport.

At the national level, Ryan Airfield is designated within the FAA's *National Plan of Integrated Airport Systems* (NPIAS). Inclusion within the NPIAS allows the airport to be eligible for Federal Airport Improvement Program (AIP) funding. Ryan Airfield is classified as a reliever airport in the NPIAS. A total of 3,489 airports across the country are included in the NPIAS. This number includes existing and proposed airports. Ryan Airfield is one of 59 airports in the State of Arizona that are included in the NPIAS and one of seven airports in Arizona classified as a reliever airport.

AIRPORT FACILITIES

Ryan Airfield is served by a three-runway system including parallel Runways 6R-24L and 6L-24R and crosswind Runway 15-33. **Exhibit C2** depicts the existing facility at Ryan Airfield. Runways 6R-24L and 6L-24R are both asphalt and oriented in a northeast to southwest manner with Runway 6R-24L measuring 5,500 feet in length and 75 feet wide, and Runway 6L-24R measuring 4,900 feet in length and 75 feet wide. The parallel runways both slope upward from the southwest to the northeast. The Runway 24L end elevation is 3.3 feet higher than the Runway 6R end, equating to a runway gradient (difference in runway elevations divided by the length of the runway) of 0.07 percent. The Runway 24R end elevation is 4.6 feet higher than the Runway 6L end, equating to a runway gradient of 0.08 percent.

The crosswind runway (Runway 15-33) is oriented in a northwest-southeast manner and has a length of 4,000 feet and a width of 75 feet. This runway is also asphalt, but the load bearing strength has not been certified to date. Runway 15-33 slopes upward from southeast to the northwest. The Runway 33 end elevation is 32 feet higher than the Runway 15 end, resulting in an effective runway gradient of 0.8 percent.

OTHER AREA AIRPORTS

There are six other airports in the vicinity that are open to the public, one military base (Davis-Monthan AFB), and approximately five private, restricted-use airports. These airports are described in detail in Chapter 1, pages 1-16 and 1-17, and depicted on Exhibit 1D of this document.

AIRSPACE ENVIRONMENT

Airspace, navigational aids and flight procedures have a significant impact on a number of aircraft operating criteria such as altitude, communications, navigation, air traffic services, reduced visibility procedures, and pilot qualifications. These factors aid in defining the types of aircraft operations which can be expected in the region. Since aviation noise is directly related to aircraft operations in the vicinity of an airfield, an examination of a region's flight environment is helpful in defining potential sources of aircraft noise.

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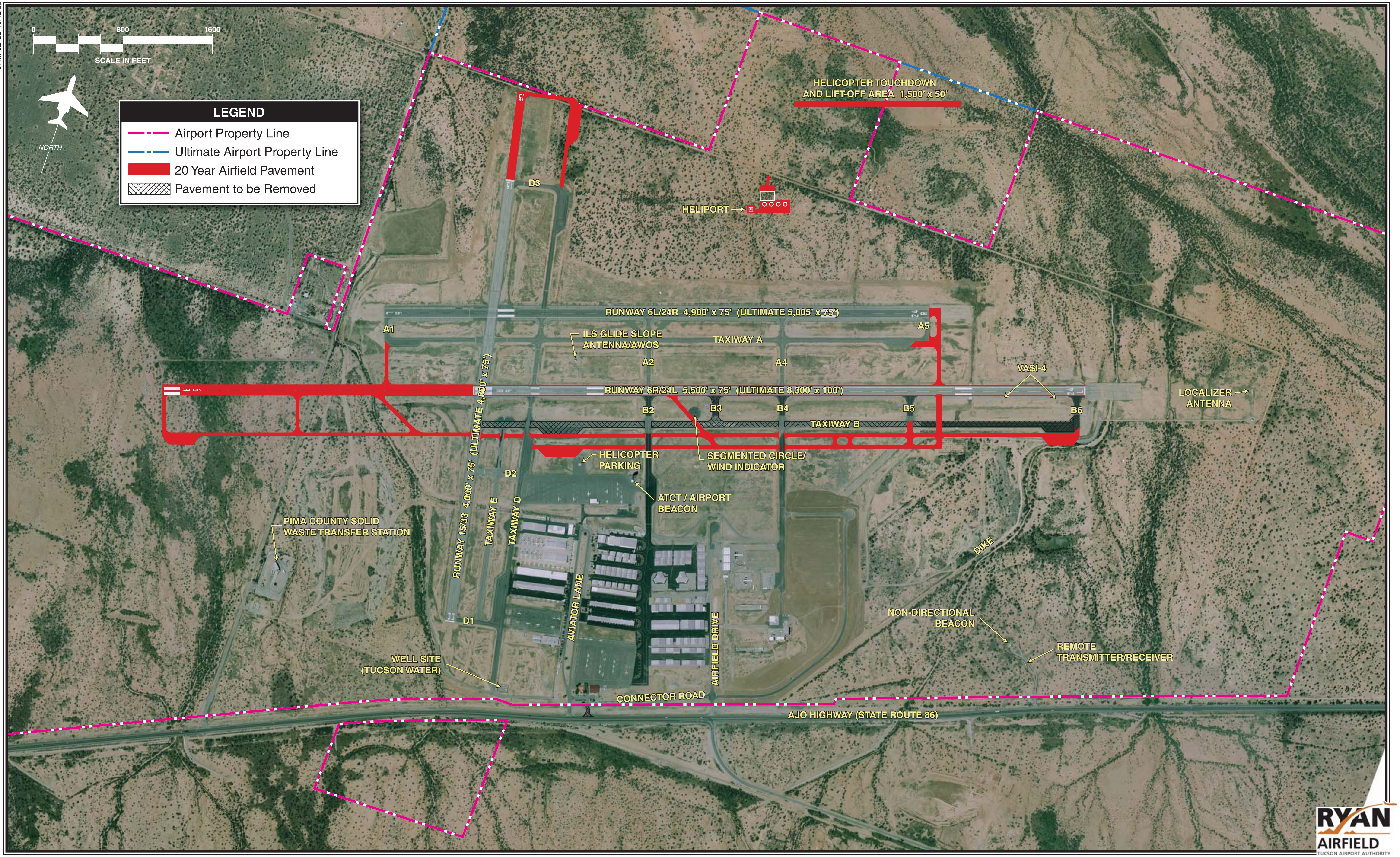


Exhibit C2
AIRFIELD FACILITIES

AIRSPACE STRUCTURE

Since the inception of aviation, nations have set up procedures within their territorial boundaries to regulate the use of airspace. Airspace relates primarily to requirements for pilot qualifications, ground-to-air communications, navigation and air traffic services, and weather conditions. Chapter 1, pages 1-9 to 1-16, and Exhibits 1C and 1D of this document describe the air traffic controlling facilities and categories of airspace for the Tucson area. A discussion of the Ryan Airfield navigational aid, instrument procedures, and visual procedures can also be found in this section.

EXISTING LAND USE

Exhibit C3 shows existing land use in the Ryan Airfield study area. The map was developed from aerial photography, a field survey made by the consultant in September 2007, and the aid of existing land use maps obtained from Pima County Development Services Department.

As indicated on **Exhibit C3**, the areas in the immediate vicinity of the airport are largely undeveloped. Land cover in these areas consists of open rangeland with scrub vegetation. North of the airport development is limited. There is a small industrial development located south of Snyder Hill Road and a wastewater treatment facility north of the airport. Additionally, there are scattered single-family and mobile home residences in this area. To the west of the airport, there are several low-density single-family and mobile home residences. East of the airport, there are two commercial properties including a gun shooting range and a salvage yard. The area directly south of the airport is undeveloped rangeland. Southeast of the airport, along Valencia Road, there are multiple single-family residential developments with existing residences, houses under construction, and available lots. The density of these developments is greater than the existing single-family developments north and west of the airport.

SCHOOL DISTRICTS

There are two school districts within the Ryan Airfield Study Area: The Tucson Unified School District and the Altar School District. **Exhibit C4** depicts the school districts in the Ryan Airfield study area. The Tucson Unified School District owns several parcels that could be used for future school sites in the western Tucson area; however, none of these sites are within the immediate vicinity of the airport.

LAND USE PLANNING POLICIES AND REGULATIONS

In most cities and counties, the chief land use regulatory document is the zoning ordinance which regulates the types of uses, building height, bulk, and density permitted in various locations. Subdivision regulations are another important land use tool, regulating the platting of land. Local communities also regulate development through building codes. Non-regulatory policy documents which influence development include the general plan and the local capital improvements program. The general plan provides the basis for the zoning ordinance and sets forth guidelines for future development. The capital improvements program is typically a short-term schedule for constructing and improving public facilities, such as streets, sewers and water lines.

The following paragraphs describe each of the above areas as a means towards understanding the land use planning policies and regulations impacting the study area.

REGULATORY FRAMEWORK

In the Ryan Airfield environs, Pima County is responsible for land use regulation. The county administers zoning ordinances, subdivision regulations, and building codes.

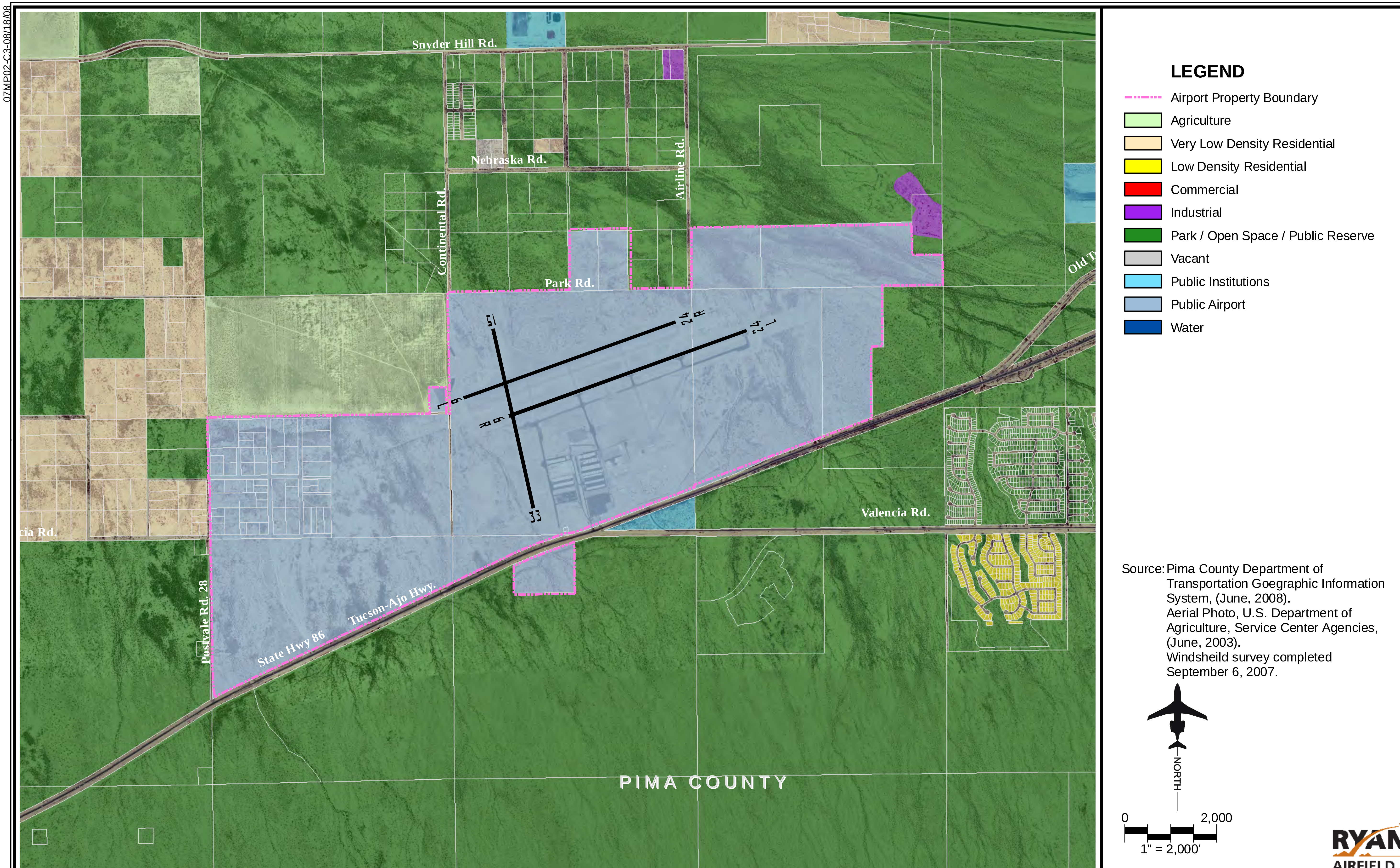
Arizona state law requires counties to prepare a comprehensive, generalized land use plan for development of their area of jurisdiction. The county plan shall also provide for zoning and the delineation of zoning districts. The county is also responsible for regulating the subdivision of all lands within its corporate limits, except subdivisions which are regulated by municipalities. Adoption of building codes are optional for those counties which have adopted zoning. Pima County does regulate land use within the study area.

Within the Ryan Airfield environs, Pima County has prepared and adopted general plans, zoning ordinances, subdivision regulations, building codes, and capital improvement programs. These planning and development tools are described below.

General Plans

Comprehensive, long-range plans serve as a guide to individual communities and jurisdictions to provide quality growth and development. The plans represent a generalized guideline, as opposed to a precise blueprint, for locating future development. The plan generally consists of elements which examine existing land uses and designates proposed future land uses and facilities. By illustrating preferred land use patterns, including extraterritorial areas, a general plan can be used by community decision-makers and staff, developers, investors, and citizens to assist them in evaluating future development opportunities. **Exhibit C5** depicts the proposed future land uses for the study area as adopted in the *Pima County Comprehensive Land Use Plan*.

Chapter 18.89 of the Pima County Code sets forth requirements for the preparation and adoption of land use plans. It defines the county comprehensive plan as a plan covering the entire county, prepared in conjunction with the incorporated municipalities of the county.



RYAN AIRFIELD
TUCSON AIRPORT AUTHORITY

Exhibit C3
EXISTING LAND USE

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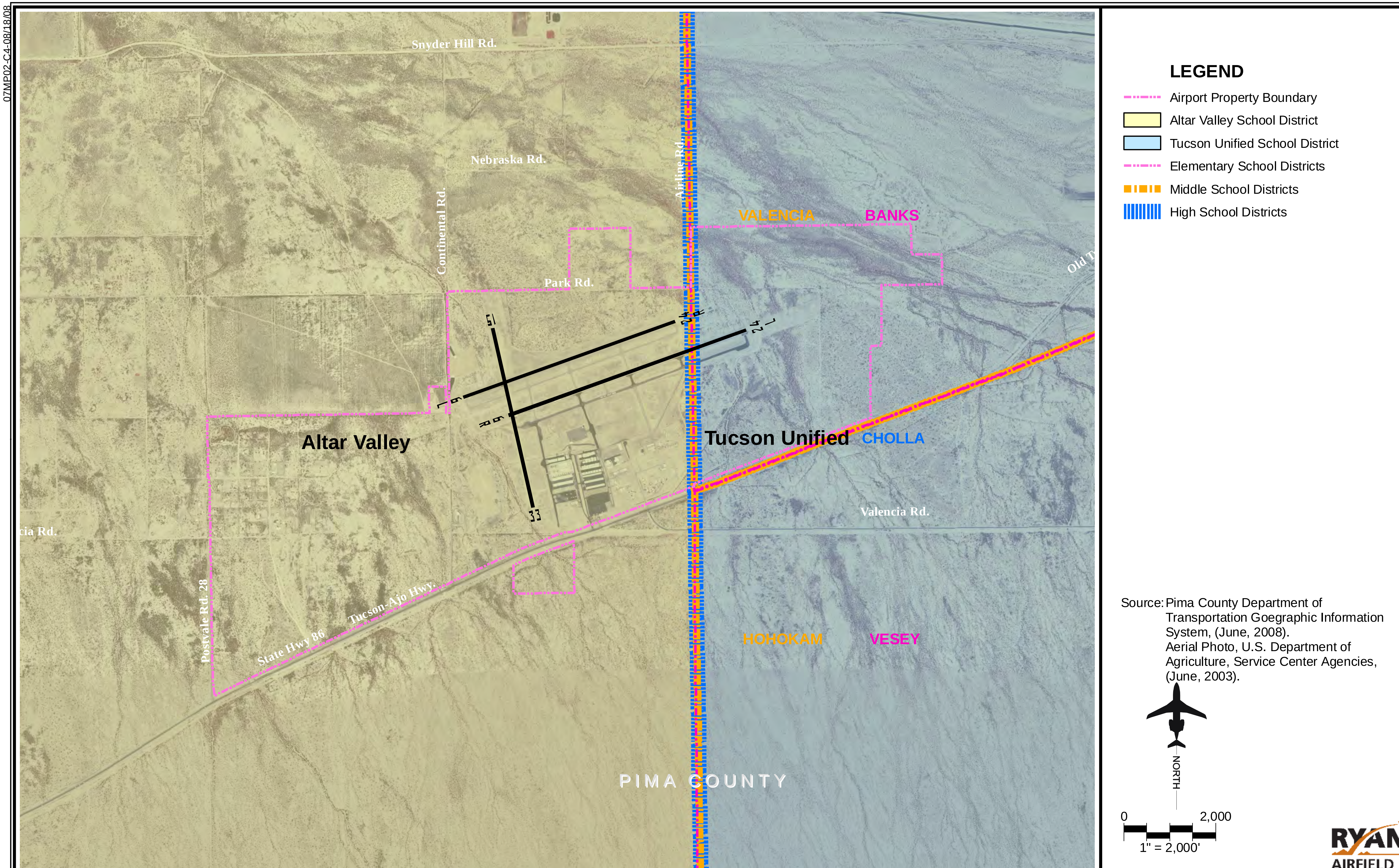
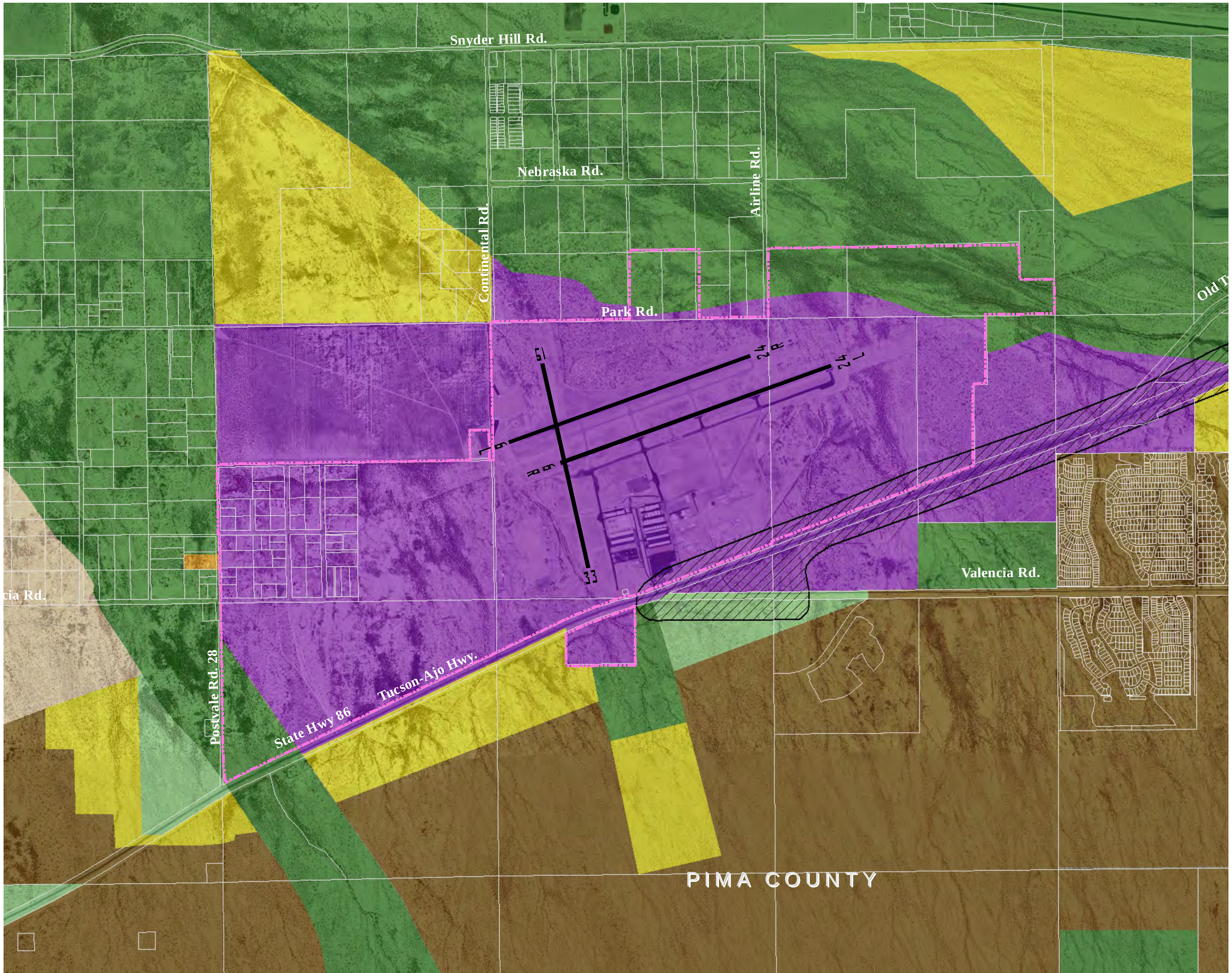


Exhibit C4
UNIFIED SCHOOL DISTRICTS



LEGEND

- Airport Property Boundary
- Low Intensity Rural Residential
- Low Intensity Urban Residential
- Medium Intensity Urban Residential
- Medium-High Intensity Urban Residential
- Industrial
- Resource Transition
- Community Activity Centers
- AJO Corridor

Source: Pima County Department of Transportation Goegraphic Information System, (June, 2008). Aerial Photo, U.S. Department of Agriculture, Service Center Agencies, (June, 2003).

NORTH

0 2,000
1" = 2,000'

RYAN AIRFIELD
TUCSON AIRPORT AUTHORITY

Exhibit C5
COMPREHENSIVE LAND USE PLAN

The code also establishes procedures for the periodic review and updating of land use plans.

In December 2001, Pima County adopted its *Comprehensive Plan Update*. The Plan divides Pima County into six sub-regions based on specific sub-regional characteristics. Each sub-region is assigned key issues which create a foundation for planning within that sub-region. Ryan Airfield is contained in the Southwest Sub-region, which is dominated by characteristics such as high natural resource content, scenic value, and an expansive 100-year floodplain. Currently, much of this area is rural in character and contains mostly low density residential uses and large tracts of undeveloped land. The northeast portion of this sub-region, however, borders the City of Tucson and is therefore becoming urbanized.

The *Pima County Comprehensive Land Use Plan* designates Special Areas as a means to accomplish site-specific planning objectives. The 2-01 Ajo Corridor/Western Gateway Special Area has been established to encourage appropriate development in the vicinity of Ryan Airfield. This development is designed to promote planned nodal development along the Ajo Corridor, preserve scenic quality, and mitigate the negative impacts of large planned industrial areas. The specific policies contained in this Special Area are as follows:

- The gateway area in the vicinity of Ryan Airfield shall accommodate support business for the airport and shall have design standards which will incorporate an airport/aviation/industrial theme.

- Site planning and design of industrial and support businesses within this Special Area shall be designed to promote internal circulation and minimize curb cuts and/or strip commercial development.

- Landscaping shall promote preservation of natural vegetation and application of xeriscape concepts in landscape design.

- Areas to remain natural in this gateway corridor area shall be supplementally planted with plant materials natural to this area and broadcast with desert wildflower seed mix for an area of 40 feet on both sides of the right-of-way.

- The area of Black Wash within this special area shall be preserved and restored as riparian habitat. All development affecting Black Wash, including public works, shall be required to preserve and restore riparian habitat, and provide opportunities for view enhancement and interpretive signage. A scenic pull-off to include interpretation of the riparian area and a view orientation to the visible mountain ranges shall be encouraged.

Zoning

While general land use plans are broad-spectrum land use policy guidelines, cities and counties actually control land use through zoning ordinances. In the study area, Pima County has established a zoning ordinance.

The Pima County Zoning Code is administered by the Pima County Development Services Department. The regulations require that building permits, zoning use permits, and zoning construction permits cannot be issued until compliance with the Zoning Code has been established.

Rezonings must be reviewed and analyzed by the Pima County Development Services Department. The Planning and Zoning Commission then reviews the proposal and conducts a public hearing. The recommendations of the commission are then transmitted to the Board of Supervisors, which holds another public hearing and then makes the final decision on the rezoning. The Zoning Code provides a number of mechanisms for detailed review of development proposals and the negotiation of development concepts and details. The Code requires the filing of a detailed development plan for all developments involving more than three dwelling units on a single lot. The plan must show proposed building placement, easements, landscaping, and grading, among other things.

The Code also provides for the conditional approval of certain land uses. This involves the review of the proposed land use by a hearing administrator or the Board of Supervisors, depending on the type of use. Special conditions on the development may be imposed to protect the public interest. The Code also establishes procedures for specific plans. This involves the preparation and approval of a detailed development plan for an area. It is approved by ordinance by the Board of Supervisors and becomes a special zoning district. All future development within the specific plan boundaries must conform to the details of the approved plan.

The **Pima County Zoning Code** establishes standard zoning districts and overlay zoning districts to control development within the county. The provisions of these districts, as they apply to noise compatibility planning, are summarized in **Table C1**. A generalized zoning map is shown in **Exhibit C6**. In order to simplify the map and improve its legibility, the districts have been combined into larger, simpler categories on the map. **Table C2** shows how the zoning districts were assigned to the map categories.

Although much of the area near Ryan Airfield is undeveloped, the potential for development remains. An examination of the Pima County zoning designations, although not permanent, can provide some insight into how the land could be developed. A parcel's zoning classification determines the type of development that may occur on the property as outlined in the county's zoning ordinance. According to the Pima County Assessor's office, the areas immediately surrounding the airport are zoned as Rural Homestead (RH). This classification allows residential uses and commercial and industrial development appropriate and necessary to serve the needs of rural areas. The land north of the airport is zoned as General Industrial (CI-2) which allows a variety of

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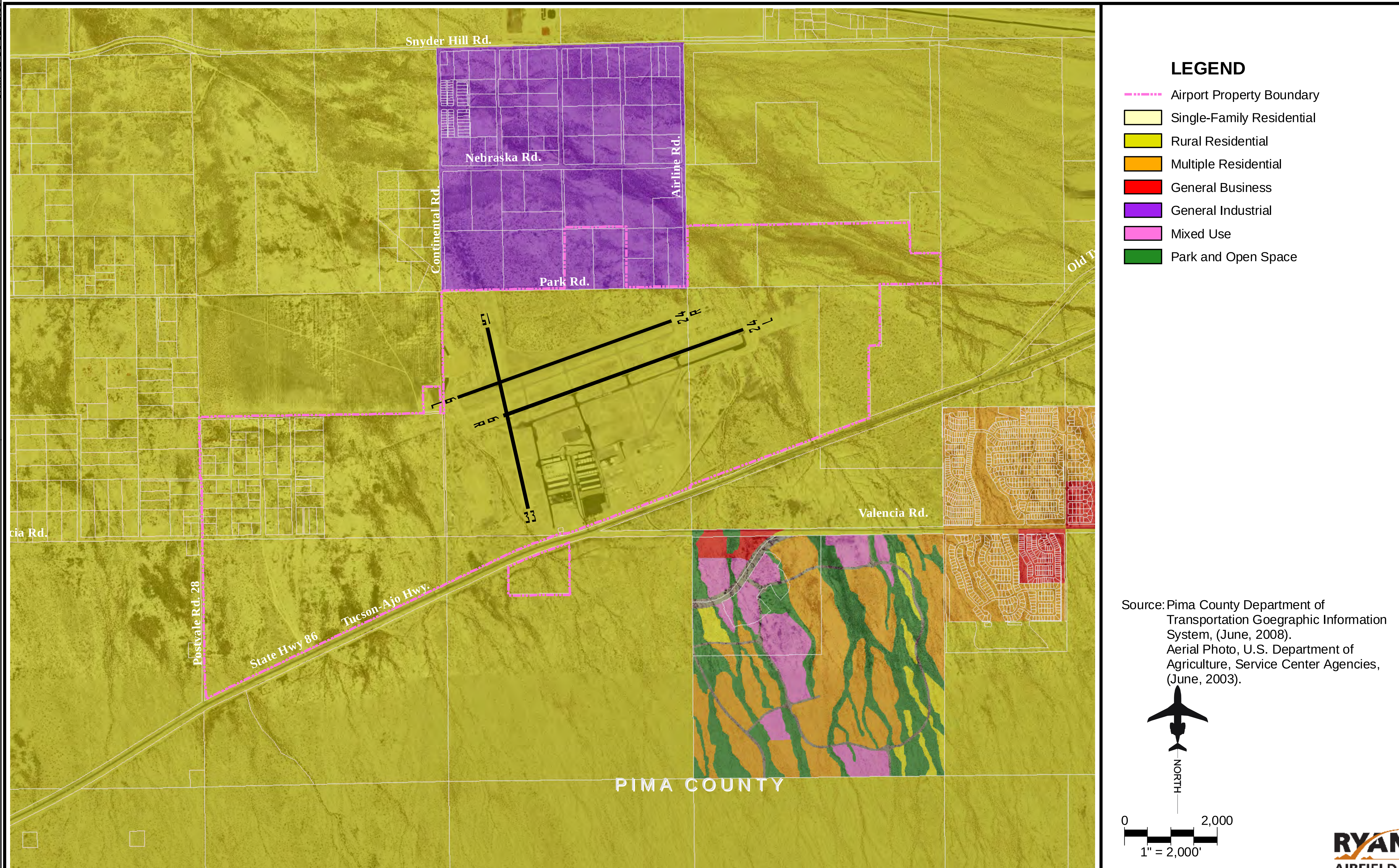

Source: Pima County Department of Transportation Goegraphic Information System, (June, 2008). Aerial Photo, U.S. Department of Agriculture, Service Center Agencies, (June, 2003).

RYAN AIRFIELD
TUCSON AIRPORT AUTHORITY

Exhibit C6
GENERALIZED ZONING

industrial and manufacturing land uses and airport facilities. There are also several smaller parcels zoned for a variety of residential and supporting commercial land uses located throughout the airport area. These parcels are zoned as Mixed Dwelling (CR-4), Rural Residential (GR-1), Transitional (TR), and Local Business (CB-1). A detailed listing of the allowable uses within each of these zones can be found in Chapter 18 of the Pima County Code.

TABLE C1
Summary of Zoning Provisions
Pima County

	Noise-Sensitive Uses		
Zoning Districts	**Permitted**	**Conditional**	**Minimum Lot Size or Density Units/Acre**
RURAL DISTRICT			
IR, Institutional Reserve Zone	Single-family dwelling Manufactured or mobile home Farm labor housing Guest dwelling Public school Places of worship Health care clinic	Minor Resort Museum Private school	36 acres
RH, Rural Homestead Zone	Single-family dwelling Manufactured or mobile home Guest dwelling Public school Places of worship Child care center Group foster home Health care clinic	Minor resort Private school Museum Rest home Manufactured home park Cluster development	180,000 $ft.^2$
GR-1, Rural Residential Zone	Same as RH	Same as RH	36,000 $ft.^2$
SR, Suburban Ranch Zone	Single-family dwelling Places of worship Public school	Minor resort College Private school Residential substance abuse diagnostic and treatment facility Library Museum	144,000 $ft.^2$
SR-2, Suburban Ranch Estate	Same as SR	Same as SR	72,000 $ft.^2$
SH, Suburban Homestead Zone	Duplex Manufactured or mobile home Others per SR	Manufactured home park Cluster development Others per SR	18,000-36,000 $ft.^2$ *
RESIDENTIAL DISTRICTS			
TH, Trailer Home site Zone	Single-family dwelling Manufactured or mobile home Trailer park	--	2,000 $ft.^2$
ML, Mount Lemmon Zone	Private school other than parochial Others per SR	Cluster development	36,000 $ft.^2$
CR-1, Single Residence Zone	Private school College Other per SR	Same as ML	36,000 $ft.^2$
CR-2, Single Residence Zone	Same as CR-1	Same as CR-1	16,000 $ft.^2$
CR-3, Single Residence Zone	Same as CR-2	Same as CR-2	8,000 $ft.^2$

TABLE C1 (Continued)
Summary of Zoning Provisions
Pima County

Zoning Districts	Noise-Sensitive Uses: Permitted	Noise-Sensitive Uses: Conditional	Minimum Lot Size or Density Units/Acre
RESIDENTIAL DISTRICTS (Continued)			
CR-4, Mixed-Dwelling Type Zone	Duplex Multiple dwelling Private school Others per SR	--	3,500- 7,000 $ft.^2$ *
CR-5, Multiple Residence Zone	Same as CR-4	--	2,000- 6,000 $ft.^2$
TR, Transitional Zone	College Library Museum Hospital or sanitarium Child care center Motel or hotel Other residential Others per CR-5	--	1,000- 10,000 $ft.^2$ *
CMH-1, County Manufactured and Mobile Home-1 Zone	Single-family dwelling Places of worship Manufactured or mobile home Private school College Health care clinic Library Museum	Cluster development	8,000 $ft.^2$
CMH-2, County Manufactured and Mobile Home-2 Zone	Child care center Places of worship Museum Others per CMH-1	--	3,500 $ft.^2$
BUSINESS DISTRICTS			
MR, Major Resort Zone	Major resort	--	--
RVC, Rural Village Center Zone	Child care center Places of worship Health care clinic Library Museum	--	--
CB-1, Local Business Zone	Trade and craft schools Places of worship Library Others per TR	--	1,000- 10,000 $ft.^2$*
CB-2, General Business Zone	Auditorium Others per CB-1	--	1,000- 7,000 $ft.^2$ *

TABLE C1 (Continued)
Summary of Zoning Provisions
Pima County

	Noise-Sensitive Uses		
Zoning Districts	**Permitted**	**Conditional**	**Minimum Lot Size or Density Units/Acre**
INDUSTRIAL DISTRICTS			
MU, Multiple Use Zone	Single-family dwelling Duplex Places of worship Public school Multi-family dwelling Manufactured or mobile home Trailer or trailer court Boarding/rooming house Private school other than parochial College Hospital or sanitarium	--	3,500-7,000 ft.^{2} *
CPI, Campus Park Industrial Zone	Child care centers	--	--
CI-1, Light Industrial/Warehouse Zone	Auditorium Trade school Commercial school Hotel	Public assembly facility	--
CI-2, General Industrial Zone	Doctors office or clinic Others per CI-1	--	--
CI-3, Heavy Industrial Zone	--	--	--
OVERLAY ZONES			
GC, Golf Course	--	--	--
HD, Hillside Development	--	--	--
H-1, Historic Zone-1	--	--	--
AE, Airport Environs and Facilities **	--	--	--
BOZO, Buffer Overlay Zone	--	--	--

* The larger number is the minimum lot size. The smaller number is the minimum lot area per dwelling unit for duplex and multi-family dwellings.

** Within the AE overlay zone, 10 other overlay zones have been established – ADC-1, ADC-2, ADC-3, NCZ-A, NCZ-B, RSZ, CUZ-1, CUZ-2, CUZ-3, and CUZ-4.

Source: The Pima County Zoning Code, 2008.

In addition to the primary zoning classifications, Pima County has established an airport overlay zone for Ryan Airfield that consists of a height overlay and a land use overlay. The height overlay establishes a maximum allowable height for structures near the airport. The intent of this zone is to protect the airspace in the arrival and departure corridors at the airport from potential obstructions. The land use overlay zone permits a variety of non-residential uses that are considered compatible with airport operations and establishes a maximum density of one dwelling unit per acre for residential land uses.

TABLE C2 Classification of Zoning Districts	
Generalized Pima County Zoning Districts	
Single-Family Residential	TH, Trailer Home site Zone ML, Mount Lemmon Zone CR-1, Single Residence Zone CR-2, Single Residence Zone CR-3, Single Residence Zone CMH-1, County Manufactured and Mobile Home-1 Zone CMH-2, County Manufactured and Mobile Home-2 Zone
Multiple Residential	CR-4, Mixed-Dwelling Type Zone CR-5, Multiple Residence Zone TR, Transitional Zone
Rural Residential	IR, Institutional Reserve Zone RH, Rural Homestead Zone GR-1, Rural Residential Zone SR, Suburban Ranch Zone SH, Suburban Homestead Zone
General Industrial	MU, Multiple Use Zone CPI, Campus Park Industrial Zone CI-1, Light Industrial/Warehouse Zone CI-2, General Industrial Zone
General Business	MR, Major Resort Zone RVC, Rural Village Center Zone CB-1, Local Business Zone CB-2, General Business Zone

Chapter 18.57 of the Zoning Code has provisions for land use control near airports. Ten overlay zones are established to control the height of structures in airport environs and to regulate land uses within runway approach areas and within noise-impacted areas. These regulations apply to Tucson International Airport, Davis-Monthan Air Base, Pinal Airpark, and Ryan Airfield.

The Airport Environs overlay districts applying in the Ryan Airfield vicinity are shown on **Exhibit C7**. These include the HOZ-Height Overlay Zone, and the RSZ and CUZ-2 compatible use overlay zones. These zones were established to regulate height and land use in the environs of civilian and military airports in order to ensure safe aircraft approach and departure, avoid the concentration of population in potential accident areas, and reduce the harmful effect of noise exposure on humans and animals. Within the RSZ zone, crop raising is the only permitted use. Within the CUZ-2 zone, commercial, industrial, and institutional uses are permitted, although a number of uses which are sensitive to noise or which might compromise safety near the runway approaches are prohibited. These permitted and excluded uses are listed in **Table C3**. Residential

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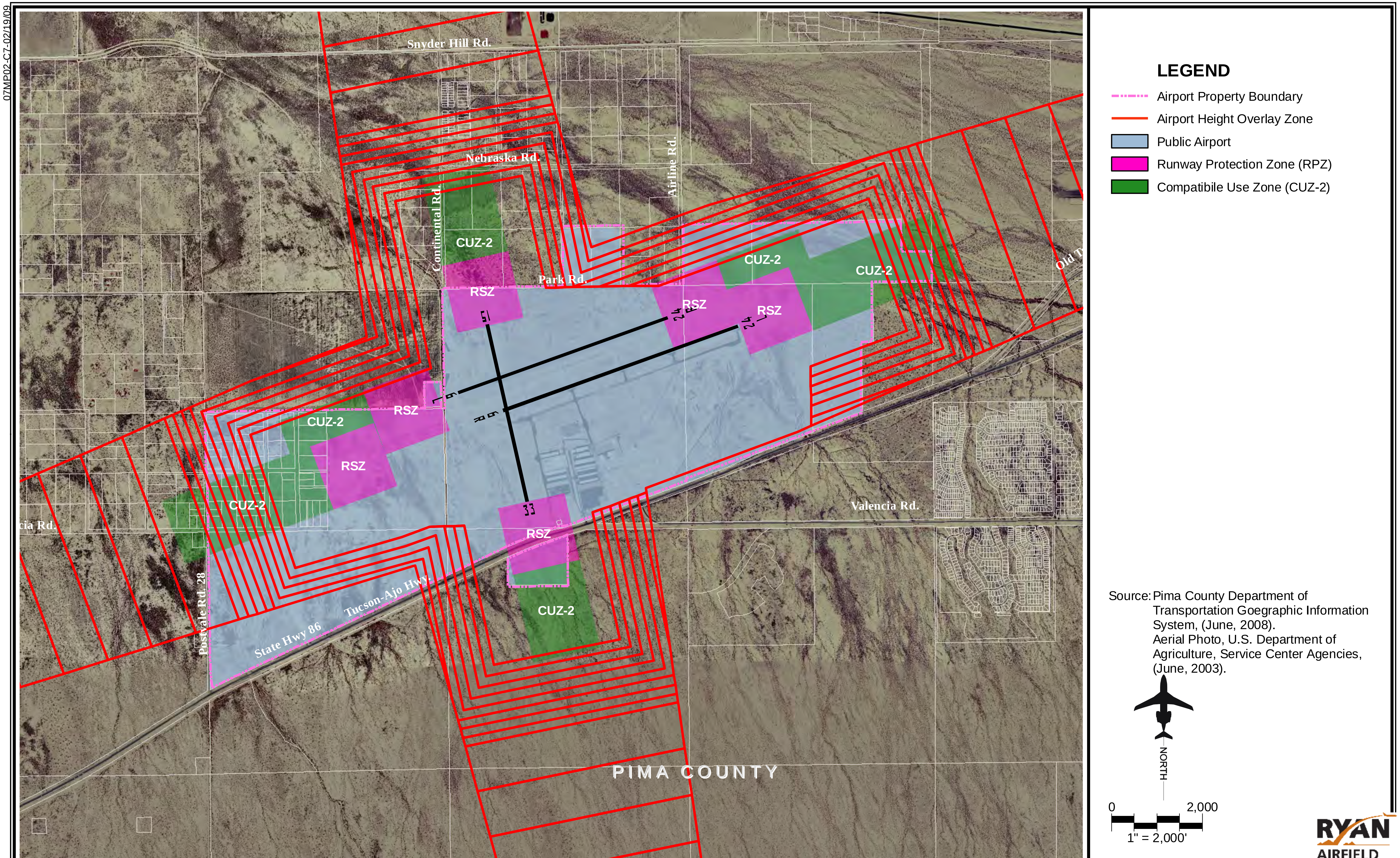

Exhibit C7
CURRENT AIRPORT OVERLAY ZONING

uses in the CUZ-2 zone at Ryan Airfield are permitted if the density does not exceed one residence per acre.

TABLE C3 **Permitted Uses in the CUZ-2 Overlay Zone**	
Uses Per Pima County Code	
(a) Commercial, Industrial, and Institutional uses as per CB-1, CB-2, CPI, CI-1, CI-2, and CI-3, EXCEPT of the following: Amusement or recreational enterprises (indoor) Auctions Auditoriums or assembly halls Clubs Department stores Drive-in theaters Fairs, carnivals, or tent shows Grocery stores (except delicatessens and convenience stores) Gymnasiums Industrial or trade schools Hotels Libraries Racetracks Sports arenas or stadiums Religious rescue missions or temporary revivals Rifle ranges Schools or colleges Swimming pools Theaters Trade shows or exhibitions And within the first one thousand feet of the CUZ-2 zone (nearest the runway): retail and office uses are prohibited as primary uses.	
(b)	Enclosed sales and display areas incidental to light manufacturing and assembly.
(c)	Accessory uses for employees only (including cafeterias, offices, and indoor entertainment facilities).
(d)	Ryan Airfield only: Until the runway is realigned, residential uses not exceeding one residence per acre.
Source: **Pima County Zoning Code**, 1988, Section 18.57.030(c).	

Further development constraints are posed by the presence of a designated Riparian Habitat associated with several unnamed washes on the eastern side of airport property. Any proposed alteration of these habitats would require a Mitigation Plan and rationale explaining the absence of alternative options, per Pima County Code.

Subdivision Regulations

Subdivision regulations apply in cases where a parcel of land is proposed to be divided into lots or tracts. They are established to ensure the proper arrangement of streets, adequate and convenient open space, efficient movement of traffic, adequate and properly located utilities, access for firefighting apparatus, avoidance of congestion, and the orderly and efficient layout and use of land.

Subdivision regulations can be used to enhance noise-compatible land development by requiring developers to plat and develop land so as to minimize noise impacts or reduce the noise sensitivity of new development. The regulations can also be used to protect the airport proprietor from litigation for noise impacts at a later date. The most common requirement is the dedication of a noise or avigation easement to the local government by the land subdivided as a condition of development approval. The easement authorizes overflights of the property, with the noise levels attendant to such operations. It also requires the developer to provide noise insulation in the construction of the buildings.

Pima County administers subdivision regulations in the study area. The regulations, which are set forth in Chapter 18.69 of the zoning code, do not include any special requirements pertaining to airport noise.

Building Codes

Building codes regulate the construction of buildings, ensuring that they are built to safe standards. Building codes may be used to require noise insulation in new residential, office, and institutional building construction when warranted by existing or potential high aircraft noise levels.

Pima County administers the 2006 edition of the International Building Code (IBC) promulgated by the International Code Council (ICC). Pima County amended the IBC to include additional noise-level reduction requirements for properties within the vicinity of Tucson International Airport and Davis-Monthan Air Force Base. The amendment does not include any requirements for the properties within the vicinity of Ryan Airfield.

Capital Improvement Programs

Capital improvement programs are multi-year plans, typically covering five or six years, which list major capital improvements planned to be undertaken during each year. Most capital improvements have no direct bearing on noise compatibility. The obvious exceptions to this are schools and, in certain circumstances, libraries, medical facilities, and cultural and recreational facilities.

Some capital improvements exert a strong influence on development trends and may have an important indirect relationship to noise compatibility. For instance, sewer and water facilities may open up large vacant areas for residential development. Pima County has a five-year Capital Improvement Program. Currently, the program proposes no Capital Improvement Projects in the immediate vicinity of the airport.

Infrastructure Plan

As previously stated, Ryan Airfield is located within the Southwest Sub-region planning area. Pima County accepted the *Pima County Southwest Infrastructure Plan* in December 2007 to plan for anticipated increases in density and demand for infrastructure in this region. Approximately 14,000 residences are located in the Southwest Sub-region, and the plan assumes that an additional 44,000 could be constructed in this area. The plan focuses on the infrastructure needed to accommodate the addition of these residences and associated retail and business development.

The plan outlines the following infrastructure improvements within the immediate vicinity of Ryan Airfield:

- Adoption of a Compatibility Overlay Zone. The Tucson Airport Authority adopted this airport compatibility zone concept in May 2007. It has not been incorporated into the Pima County zoning ordinance. Shown on **Exhibit C8**, the overlay includes the following zones.
    - Commercial and industrial uses preferred. Residential uses are discouraged but acceptable at existing densities.
    - Industrial and commercial uses. Location and area to be expanded in balance with proposed developments.
    - Industrial and commercial uses recommended. Existing residential densities preferred. Low density residential uses considered.
    - No residential or increase in residential density per TAA policy.
    - Open space/No residential uses which result in the congregation of large numbers of people.
- New or improved drainage culvert road crossings at five points along Ajo Highway adjacent to Ryan Airfield Property.
- Widen Ajo Highway to six-lane parkway from Sandario Road to Interstate 19. This improvement includes the section of Ajo Highway that provides service to Ryan Airfield. The plan also identifies the intersection of Ajo Highway and Valencia Road as the site for an interchange.

- Construction of a high-capacity transit service line on Valencia Road terminating at Ajo Highway south of the airport.

- Construction of new sanitary sewer trunk lines north and south of the airport.

LAND USE COMPATIBILITY

The degree of annoyance which people experience from aircraft noise varies depending on their activities during the time of exposure. Studies regarding airport noise revealed that people rarely are as disturbed by aircraft noise when they are working, shopping, or driving as when they are at home. Occupants of hotels and motels seldom express as much concern with aircraft noise as do permanent residents of an area. To standardize the assessment of airport land use compatibility, the Federal Aviation Administration (FAA) has established guidelines, codified within 14 CFR Part 150, that identify suitable land uses for development near airport facilities.

14 CFR PART 150 GUIDELINES

In the early 1980s, the FAA promulgated Code of Federal Regulations Title 14, Part 150 to guide airport land use compatibility studies. These guidelines were based on earlier studies and guidelines by federal agencies (*Federal Interagency Committee on Urban Noise*, 1980). These land use compatibility guidelines are advisory in nature, rather than regulatory. **Part 150 explicitly states that determinations of land use compatibility are purely local responsibilities.** (See Section A150.101(a) and (d) and explanatory note in Table 1 of 14 CFR Part 150.) **Exhibit C9** summarizes the FAA airport noise land use compatibility guidelines.

The FAA uses Part 150 guidelines as the basis for defining areas within which noise compatibility projects, such as sound insulation or property acquisition, may be eligible for federal funding. Federal grants are available through the noise set-aside funds from the Airport Improvement Program (AIP). In general, noise compatibility projects must be within the 65 DNL noise contour to be eligible for federal funding. According to the AIP handbook, "Noise compatibility projects usually are located in areas where aircraft noise is significant, as measured in day-night average sound level (DNL) or 65 decibels (dB) or greater." (See FAA Order 5100.38C, Chapter 8, paragraph 810.b.) However, projects may also be approved and made eligible in areas of less noise exposure. In these cases, the following criterion apply: the airport operator must adopt a designation of non-compatibility different from federal guidelines, the noise exposure maps (NEM) and noise compatibility program (NCP) must identify areas as non-compatible, and measures proposed for mitigation within the area must meet Part 150 criteria.

The FAA guidelines outlined in **Exhibit C9** state that residential development, including standard construction (residential construction without acoustic treatment), mobile homes, and transient lodging are all incompatible with noise above 65 DNL. Homes of

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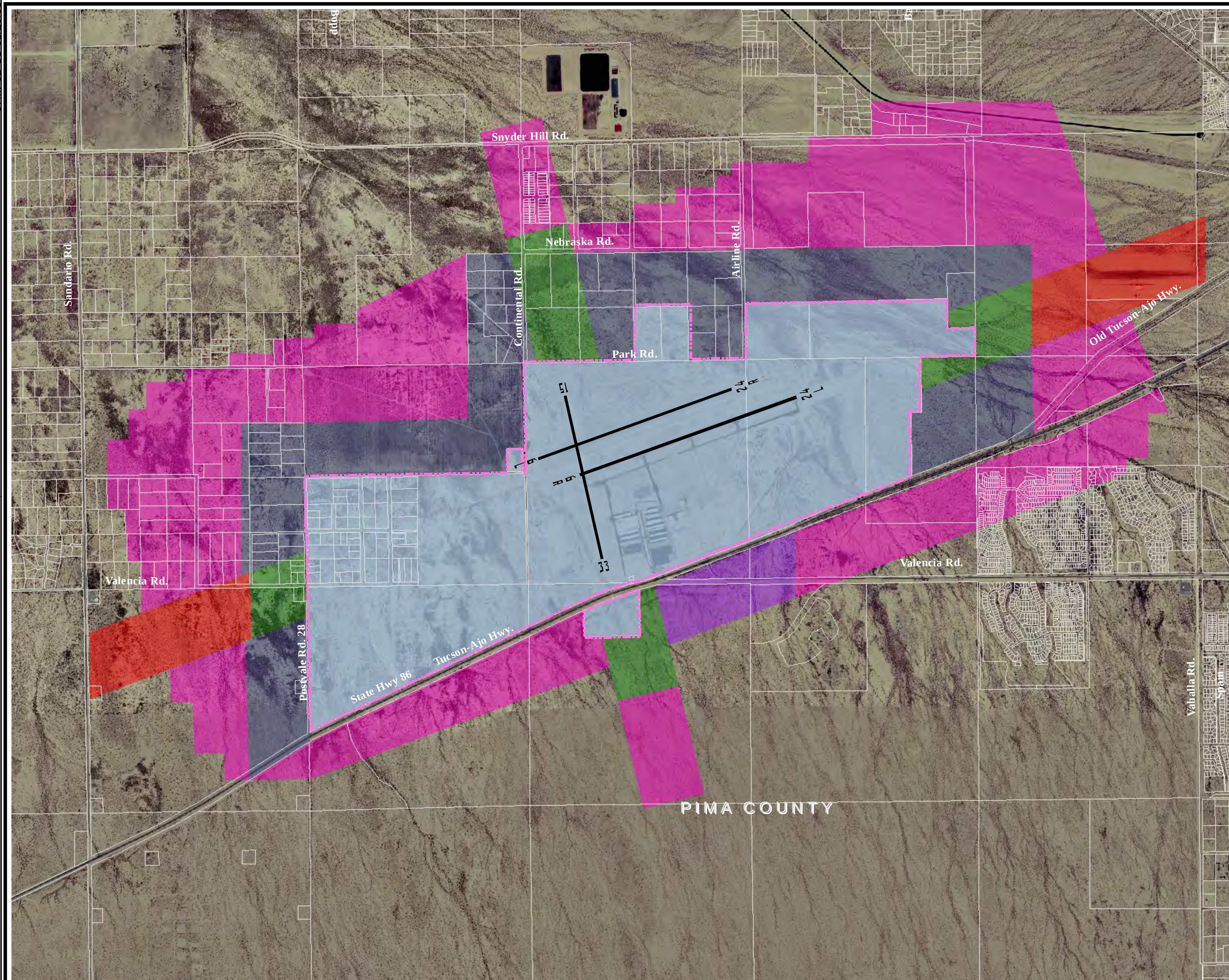

LEGEND

- Airport Property Boundary
- Public Airport
- Commercial and Industrial Uses Preferred. Residential Uses are Discouraged but Acceptable at existing Densities.
- Industrial and Commercial Uses. Location and Area to be expanded in Balance with Proposed Developements.
- Industrial and commercial Uses Recommended. Existing residential Densities Preferred. Low Density residential Uses Considered.
- No Residential or Increase in Residential Density per TAA Policy
- Open Space / No Residential or Uses which Results in the Congregation of Large Numbers of People.

Source: Pima County Department of Transportation Goegraphic Information System, (June, 2008).
Aerial Photo, U.S. Department of Agriculture, Service Center Agencies, (June, 2003).

NORTH

0 2,500
1" = 2,500'

RYAN AIRFIELD
TUCSON AIRPORT AUTHORITY

Exhibit C8
PROPOSED AIRPORT OVERLAY ZONING

07MP02-C9-8/19/08

LAND USE	Yearly Day-Night Average Sound Level (DNL) in Decibels					
	Below 65	65-70	70-75	75-80	80-85	Over 85
RESIDENTIAL						
Residential, other than mobile homes and transient lodgings	Y	N[1]	N[1]	N	N	N
Mobile home parks	Y	N	N	N	N	N
Transient lodgings	Y	N[1]	N[1]	N[1]	N	N
PUBLIC USE						
Schools	Y	N[1]	N[1]	N	N	N
Hospitals and nursing homes	Y	25	30	N	N	N
Churches, auditoriums, and concert halls	Y	25	30	N	N	N
Government services	Y	Y	25	30	N	N
Transportation	Y	Y	Y[2]	Y[3]	Y[4]	Y[4]
Parking	Y	Y	Y[2]	Y[3]	Y[4]	N
COMMERCIAL USE						
Offices, business and professional	Y	Y	25	30	N	N
Wholesale and retail-building materials, hardware and farm equipment	Y	Y	Y[2]	Y[3]	Y[4]	N
Retail trade-general	Y	Y	25	30	N	N
Utilities	Y	Y	Y[2]	Y[3]	Y[4]	N
Communication	Y	Y	25	30	N	N
MANUFACTURING AND PRODUCTION						
Manufacturing, general	Y	Y	Y[2]	Y[3]	Y[4]	N
Photographic and optical	Y	Y	25	30	N	N
Agriculture (except livestock) and forestry	Y	Y[6]	Y[7]	Y[8]	Y[8]	Y[8]
Livestock farming and breeding	Y	Y[6]	Y[7]	N	N	N
Mining and fishing, resource production and extraction	Y	Y	Y	Y	Y	Y
RECREATIONAL						
Outdoor sports arenas and spectator sports	Y	Y[5]	Y[5]	N	N	N
Outdoor music shells, amphitheaters	Y	N	N	N	N	N
Nature exhibits and zoos	Y	Y	N	N	N	N
Amusements, parks, resorts, and camps	Y	Y	Y	N	N	N
Golf courses, riding stables, and water recreation	Y	Y	25	30	N	N

The designations contained in this table do not constitute a federal determination that any use of land covered by the program is acceptable under federal, state, or local law. The responsibility for determining the acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with the local authorities. FAA determinations under Part 150 are not intended to substitute federally-determined land uses for those determined to be appropriate by local authorities in response to locally-determined needs and values in achieving noise compatible land uses.

See other side for notes and key to table.

RYAN AIRFIELD
TUCSON AIRPORT AUTHORITY

Exhibit C9
LAND USE COMPATIBILITY GUIDELINES

standard construction and transient lodging may be considered compatible where local communities have determined these uses are permissible; however, sound insulation methods are recommended. Schools and other public use facilities are also generally considered to be incompatible with noise exposure above 65 DNL. As with residential development, communities can permit these uses to be acceptable with appropriate sound insulation measures.

Examples of incompatible land uses at various noise levels include outdoor music venues and amphitheatres at levels exceeding 65 DNL; zoos and nature exhibits above 70 DNL; and hospitals, nursing homes, places of worship, auditoriums, concert halls, livestock breeding, amusement parks, resorts, and camps above 75 DNL.

Historic properties, such as those listed on the National Register of Historic Places, have been deemed to be in compliance with Part 150, Section 4(f) of the *Department of Transportation Act* (DOT Act), and the *National Historic Preservation Act of 1966*, as amended. In general, these properties are not any more sensitive to noise than are other properties of similar uses; however, federal regulations require that noise effects on these uses be considered when evaluating the effects of an action, such as a noise abatement or land use management procedure.

The strictest of these requirements is the *Department of Transportation* (DOT) *Act*. Section 4(f) of the DOT Act provides that the U.S. Secretary of Transportation shall not approve any program (such as a Noise Compatibility Program) or project which requires the use of any historic site of national, state, or local significance unless there is no feasible and prudent alternative to the use of such land. The FAA is required to consider the direct physical taking of eligible property (such as acquisition and demolition of historic structures) and the indirect use of, or adverse impact to, eligible property (such as noise exposure within the 65 DNL noise contour). When evaluating the effects of the noise abatement and land use management alternatives later in this report, it will be necessary to also identify whether the proposed action conflicts with or is compatible with the normal activity or aesthetic value of any historic properties not already significantly affected by noise. The NEM contours are not evaluated under Section 4(f).

POTENTIAL GROWTH RISK

Before evaluating the impact of future aircraft noise, the likelihood of noise-sensitive development in the area must be understood. This is of particular importance for Ryan Airfield as much of the area surrounding the airport is undeveloped. Calculating the number of potential residents near the airport should emphasize the importance of airport noise compatibility planning. Understanding development trends in the vicinity of Ryan Airfield is also critical to compatibility planning as future residential growth can constrain airport operations if it occurs beneath aircraft flight tracks and within areas subject to increased noise levels. The following sections describe population growth and potential residential development within the airport environs. The focus of this discussion includes population projections, residential development projections, and a discussion of other potential noise-sensitive development.

As presented in **Table C4**, population within the Pima County area is anticipated to continue growing through 2027. According to the Arizona Department of Commerce, population in the Pima County area is expected to increase by over 280,029 people during the next 20 years. With the increase in population, it is assumed that additional residences will be constructed and demand will increase for noise-sensitive institutions such as schools, places of worship, and daycare facilities.

TABLE C4
Population Trends

Year	State of Arizona	Avg. Annual % Change	Pima County	Avg. Annual% Change	City of Tucson	Avg. Annual % Change
1960	1,302,161	--	265,660	--	212,892	--
1970	1,770,900	3.1%	351,666	2.8%	262,933	2.1%
1980	2,718,215	4.4%	531,433	4.2%	330,537	2.3%
1990	3,665,228	3.0%	666,880	2.3%	405,390	2.1%
2000	5,130,632	3.4%	843,746	2.4%	486,699	1.8%
2007	6,432,007	3.3%	1,003,918	2.5%	541,132	1.5%
Forecasts						
2012	7,370,993	2.9%	1,113,749	2.2%	578,769	1.4%
2027	9,898,153	2.3%	1,393,778	1.7%	657,788	0.9%

Sources: U.S. Census Bureau (1960-2000)
Pima Association of Governments (2007)
Forecast information from the Arizona Department of Commerce (2006)

Growth Risk Analysis

The growth risk analysis for Ryan Airfield focuses on the undeveloped land which is planned or zoned for residential or noise-sensitive land uses. In order to identify areas of potential future development, existing land use (**Exhibit C3**), community general plans (**Exhibit C5**), and zoning designations (**Exhibits C6** and **C7**) were evaluated. Future residential development will be influenced by zoning on undeveloped parcels, the physical constraints of the individual sites, the availability of sewer and water infrastructure, and the market for residential development in the area. Areas identified as growth risk are illustrated on **Exhibit C10**.

The determination of the number of dwelling units per acre is calculated using the highest density allowed in the zoning district or land use plan designation, minus 33 percent for infrastructure such as roads, sidewalks, and utilities.

Growth risk population is calculated by multiplying the number of dwelling units by the average number of people per household from the U.S. Census Bureau. The average household size for the Pima County area is 2.51 persons.

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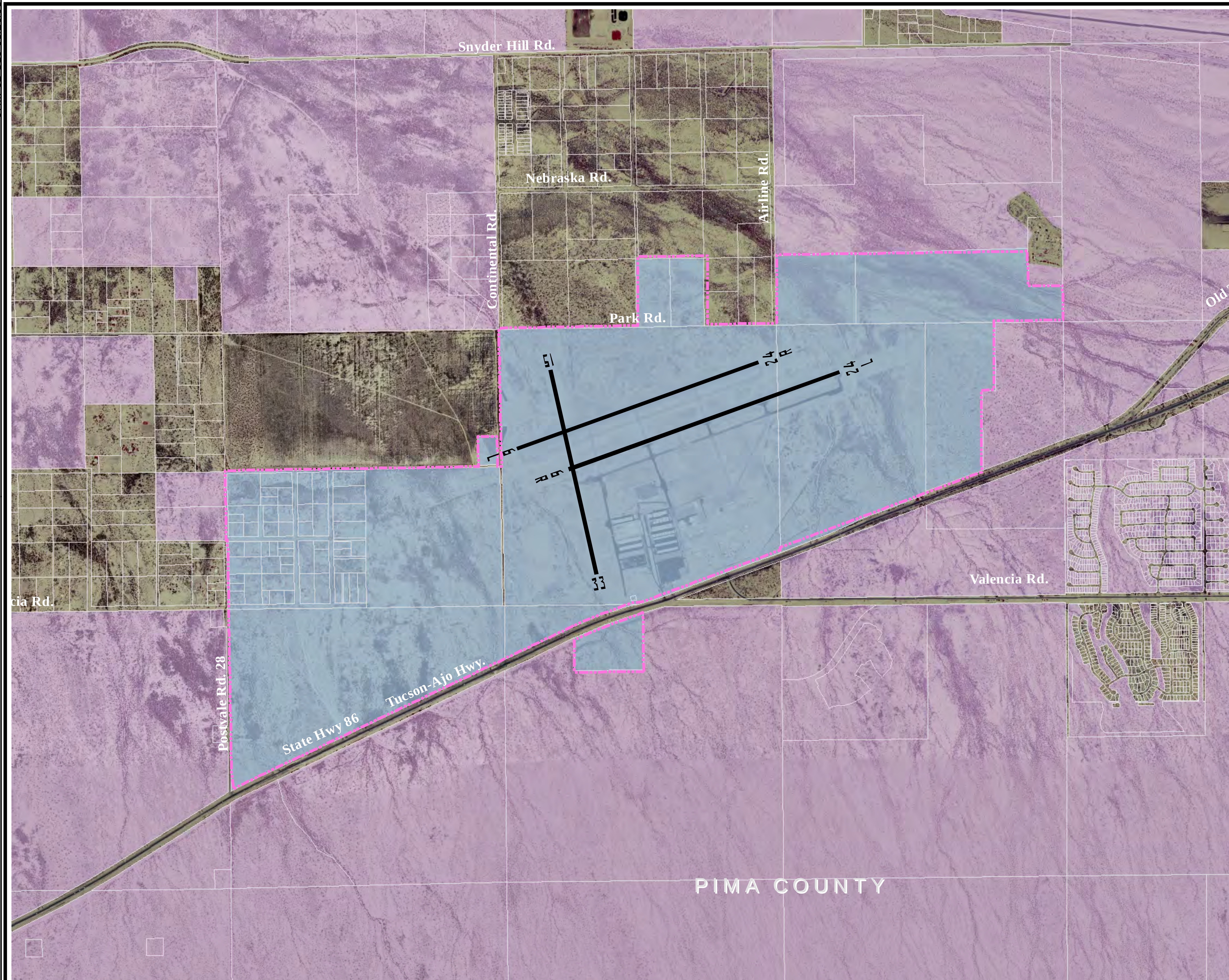

LEGEND

- Airport Property Boundary
- Public Airport
- Growth Risk Areas

Source: Pima County Department of Transportation Goegraphic Information System, (June, 2008).
Aerial Photo, U.S. Department of Agriculture, Service Center Agencies, (June, 2003).

NORTH

0 2,000
1" = 2,000'

RYAN AIRFIELD
TUCSON AIRPORT AUTHORITY

Exhibit C10
NOISE-SENSITIVE LAND USE
GROWTH RISK AREAS

AIRCRAFT NOISE ANALYSIS METHODOLOGY

Part 150 guidelines mandate that the prevailing noise conditions at an airport must be analyzed using a computer simulation model. The FAA has approved the use of the Integrated Noise Model (INM) for analysis in noise compatibility studies. The most recent version of the INM is quite sophisticated in predicting noise conditions at a given geographic location and accounts for variables such as airfield elevation, temperature, headwinds, and local topography. Version 7.0a of the INM was used to prepare updated noise exposure contours for Ryan Airfield.

The purpose of the noise model is to graphically represent noise conditions at the airport and to identify areas that are exposed to aircraft noise. To achieve an accurate representation, data regarding various airport operations characteristics must be gathered.

Input categories for the INM include runway configuration, flight track locations, aircraft fleet mix, terrain, and numbers of daytime and nighttime operations by aircraft type. **Exhibit C11** depicts the various INM input categories for developing the noise exposure contours.

The INM includes information regarding the noise characteristics for aircraft that commonly operate at Ryan Airfield. For each aircraft, the INM computes typical profiles for aircraft operating at the specified airport location based on its field elevation, temperature, and flight procedure data provided by aircraft manufacturers. The INM will also accept user-provided input, although the FAA reserves the right to accept or deny the use of such data depending on its statistical validity.

To develop the noise exposure contours, the INM calculates aircraft noise levels at a set of grid points surrounding the airport. The numbers and locations of the grid points are established by the user during the noise modeling process to assess noise levels in areas where operations are concentrated, depending on tolerance and level of refinement specified. The noise level values at the grid points are used to prepare noise contours which connect points of equal noise exposure.

INM INPUT

AIRPORT INFORMATION

Runway position information for Ryan Airfield was input into the INM according to the longitude, latitude, and elevation of the runway ends. As previously mentioned, the INM computes typical flight profiles for aircraft operating at the airport location. Ryan Airfield's field elevation is 2,417 feet above mean sea level (MSL), and its average annual temperature is 68.7 degrees Fahrenheit (F). The INM also allows the user to incorporate topographic data to account for changes in elevation in the surrounding terrain, which can alter the way noise is experienced. Incorporating this information allows the INM to recreate, as realistically as possible, the existing conditions surrounding the airport. Topographic data from the United States Geological Survey was used to develop the noise contours for Ryan Airfield.

AIRCRAFT ACTIVITY DATA

This study uses current and forecast operations (takeoffs and landings) data from Chapter Two of this document. Table 2H, on page 2-13 of this document, summarizes the operations data. The annual operations data in the table are divided by 365 to get the average daily operations data required for input to the model.

FLEET MIX

Table 2E, on page 2-9 of this document, presents the current and forecast fleet mix for Ryan Airfield. This information and operations by aircraft type from the instrument flight rules (IFR) database formed the basis for the fleet mix input data for the noise analysis. **Table C5** summarizes the fleet mix and annual aircraft operations.

TABLE C5
Annual Operations by Aircraft Type
Ryan Airfield

	INM Designator	2008	2012	2027
ITINERANT OPERATIONS				
Light Single-variable pitch propeller	GASEPF	29,143	28,285	43,238
Light Single-fixed pitch propeller	GASEPF	29,143	28,285	43,238
Multi-Engine	BEC58P	1,158	1,165	1,635
Turboprop	BEC100	225	600	4,000
Lear 35	LEAR35	25	150	2,000
Cessna Mustang	CNA510	0	175	1,000
Gulfstream IV	GIV	0	50	500
Robinson R22	R22	1,156	3,165	5,265
S-70 Blackhawk	S70	920	875	875
Subtotal, Itinerant Operations		61,770	62,750	101,750
LOCAL OPERATIONS				
Light Single-variable pitch propeller	GASEPF	51,349	52,698	73,425
Light Single-fixed pitch propeller	GASEPV	51,349	52,698	73,425
Multi-Engine	BEC58P	521	535	900
Robinson R22	R22	2,003	1,945	3,125
S-70 Blackhawk	S70	960	875	875
Subtotal, Local Operations		106,182	108,750	151,750
TOTAL OPERATIONS		167,952	171,500	253,500

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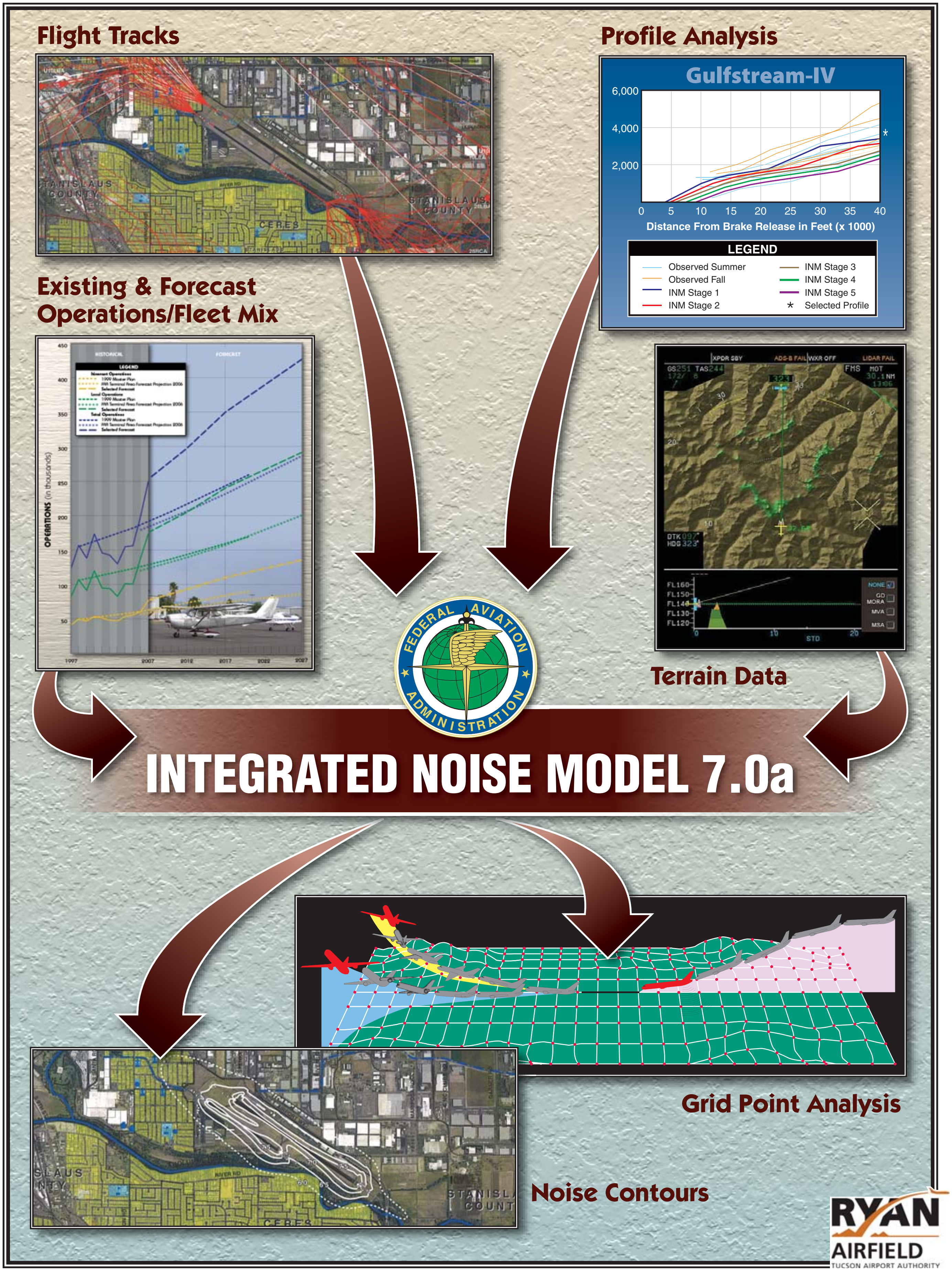


Exhibit C11
INM PROCESS

DATA BASE SELECTION

The INM includes aircraft noise data for most of the aircraft operating at Ryan Airfield. **Table C5** indicates the INM identifier used for modeling each aircraft. Designators for the following business jets are available in the INM: Lear 35, Cessna Mustang 510, and Gulfstream IV. Each of these was modeled with the corresponding identifier.

In cases where an aircraft is not included, the INM includes an aircraft substitution list that identifies aircraft with comparable noise characteristics. The aircraft substitution list indicates that the general aviation single-engine variable-pitch propeller model, identified as GASEPV in the INM, can be used to model noise for several general aviation aircraft. These include the Beech Bonanza, Cessna 177 and 180, and Piper PA-32, among others. Additionally, a variety of general aviation single-engine fixed-propeller aircraft are modeled with the GASEPF aircraft. Included among these are the Cessna 150, Piper Archer, and Piper Tomahawk.

The FAA aircraft substitution list recommends the Beech Baron, identified as BEC58P, to represent light multi-engine piston aircraft such as the Piper Navajo, Beech Duke, Cessna 310, and others. The BEC100 represents the small multi-engine turboprop aircraft in the fleet.

General aviation and military helicopter operations were modeled using the Robinson R-22 (R22). Military operations were also modeled using the S70 designator.

All substitutions are commensurate with published FAA guidelines.

Flight Profiles

The INM program uses a three-degree approach as the standard arrival profile. Nothing in the inventory interviews for the Master Plan or in the published airport information indicates any variation in this standard procedure at Ryan Airfield. Therefore, the models in this study use the standard approach procedure as representative of local operating conditions.

The INM computes takeoff profiles based on the user-supplied airport elevation and the average annual temperature entries in the input data.

Ryan Airfield lies at 2,417 feet mean sea level (MSL) with an average annual temperature of 68.7 degrees F. The INM automatically computes the takeoff profiles using the airplane performance coefficients in the data base and the equations in the Society of Automotive Engineers Aerospace Information Report 1845 (SAE/AIR 1845). The INM computes separate departure profiles (altitude at a specified distance from the airport with associated velocity and thrust settings) for each of the various types of aircraft using the airport.

Time-of-Day

The INM attaches special significance to the time-of-day at which operations occur because of the extra weighting of nighttime flights. In calculating airport noise exposure, one nighttime operation has the same noise emission value as 10 daytime operations (a weight of 10 extra decibels). At Ryan Airfield, the Airport Traffic Control Tower (ATCT) is operated from 6 a.m. to 8 p.m. and the airport closes Runway 6L-24R from sunset to sunrise because it does not have runway lighting. Runway 15-33 is also not equipped with runway lights and is limited to daytime activity. These airfield limitations also limit statistics on nighttime activity. Recognizing that nighttime flying constitutes an important part of any flight training program, a representative model must show some activity at night. Based on interviews with airport management, the noise exposure models in this study assume three percent of total operations occur between the hours of 10 p.m. and 7 a.m.

Runway Use

For modeling purposes, wind data analysis usually determines runway use percentages. However, wind analysis provides only the directional availability of a runway and does not consider pilot selection, primary runway operation, or local operating conventions. At Ryan Airfield, local operating convention designates Runways 6R and 6L as the preferential runways up to a 10-knot tailwind. ATCT staff indicated that Runways 6L/R are used approximately 71 percent of the time given this preferential runway use program. Aircraft use Runways 24L/R approximately 25 percent of the time. Runways 15 and 33 each accommodate two percent of the operations. **Table C6** shows the runway use percentages for the noise exposure models of this study.

TABLE C6
Runway Use Percentages
Ryan Airfield

Runway	Turboprop, Business Jet, Military, other large aircraft	Light Singles, Light Twins, Rotorcraft
6R	87.5	35.5
24L	12.5	12.5
6L	0	35.5
24R	0	12.5
15	0	2
33	0	2

Flight Tracks

Coordination with ATCT staff and airport management personnel and a review of the previous Part 150 study provided the basis for flight track determination. Observed itinerant departures turn right or left to destination headings when using any runway, therefore, the models in this study do not use straight-out departures. However, all arrival tracks were modeled on straight-in tracks. A standard left-hand pattern is used as the local training pattern on all runways except for Runways 6R and 24R. These runways were modeled with right-hand patterns.

Although the consolidated flight tracks and sub-tracks shown on **Exhibits C12, C13, C14,** and **C15** appear as distinct paths, they actually represent average flight routes and illustrate the areas where aircraft operations most likely will occur. As the exhibit shows, air traffic density generally increases nearer the airport as the aircraft funnel into and disperse from the runway system. The tracks presented on the accompanying exhibit do not represent the only flight paths used. Variations by individual aircraft along these tracks may occur based on pilot technique, aircraft type, weather conditions, and air traffic control needs. Generally speaking, an observer may expect to see an aircraft almost anywhere in the sky around the airport.

Assignment of Aircraft To Flight Tracks

The assignment of aircraft and their related operations values to specific flight tracks completes the input data for the INM. No predominate destination heading emerged from the inventory interviews or from a review of the previous study. Therefore, the technician split itinerant departure operations equally between north and south turning departure tracks off the main 6L/R-24R/L runway system. The previously discussed runway use assumptions based on wind data and the preferential runway use program dictated the assignment of aircraft and operations to the itinerant arrival tracks and to the touch-and-go tracks (local training pattern). In general, the technician factored the number of operations by a specific aircraft by the runway use, the directional assignment, and the time-of-day. That process continued to cover the assignment of all operations to flight tracks.

INM OUTPUT

The INM offers a wide variety of metrics as output options. For this study, average annual noise contours in DNL are required. Part 150 requires 65, 70, and 75 DNL contours for the official Noise Exposure Maps. The following paragraphs present the results of the contour analysis for current and forecast noise exposure conditions as developed from the Integrated Noise Model.

2008 Noise Exposure Contours

Exhibit C16 presents the plotted results of the INM contour analysis for 2008 conditions using input data described in the preceding pages. **Table C7** shows the surface areas and noise-sensitive land uses within each contour.

TABLE C7
Summary of Noise Exposure And Impacts

DNL Contour	Total Area Inside Contours (acres)	Contour Area Inside Airport Property (acres)	Contour Area Outside Airport Property (acres)	Existing Dwelling Units/Noise-Sensitive Uses	Potential Dwelling Units/Noise-Sensitive Uses[2]
2008 – EXISTING CONDITIONS					
65-70	179.0	176.8	2.2	0	0
70-75	142.8	142.8	0.0	0	0
75+	61.0	61.0	0.0	0	0
Total	382.8	380.6	2.2	0	0
2012 – FORECAST[1]					
65-70	177.6	174.9	2.7	0	0
70-75	153.5	153.4	0.1	0	0
75+	60.9	60.9	0.0	0	0
Total	392.0	389.2	2.8	0	0
2027 – FORECAST[1]					
65-70	257.2	247.2	10.0	0	0
70-75	203.8	203.2	0.6	0	0
75+	96.3	96.3	0.0	0	0
Total	557.3	546.7	10.6	0	0

[1] Includes future acquisition areas.
[2] Area outside airport property within the noise exposure contours is owned by the City of Tucson and is unlikely to be developed with noise-sensitive land uses.
Source: Coffman Associates analysis.

The overall shape of the noise pattern around the airport shows the effects of the preferential runway use program. The contours extend to the east, reflecting the higher portion of departures using Runways 6L and 6R.

The rounded shape which extends west of Runway 6R represents departure noise. The 65, 70, and 75 DNL contours, except for a very small portion, remain on airport property. The 65 DNL contour escapes airport property on the north side, just north and west of the end of Runway 6L, by about 200 feet. Approximately 2.2 acres of the 65 DNL noise contour is not on airport property. All the 70 and 75 DNL contour remains on airport property.

There are no existing noise-sensitive land uses within the 2.2 acres of noise exposure contour not contained on airport property. The property north of the airport is planned for future airport acquisition. The area to the northwest is currently owned by the City of Tucson and managed by the Pima County Waste Water Department. Therefore, the development of noise-sensitive land uses in the future in this area is unlikely.

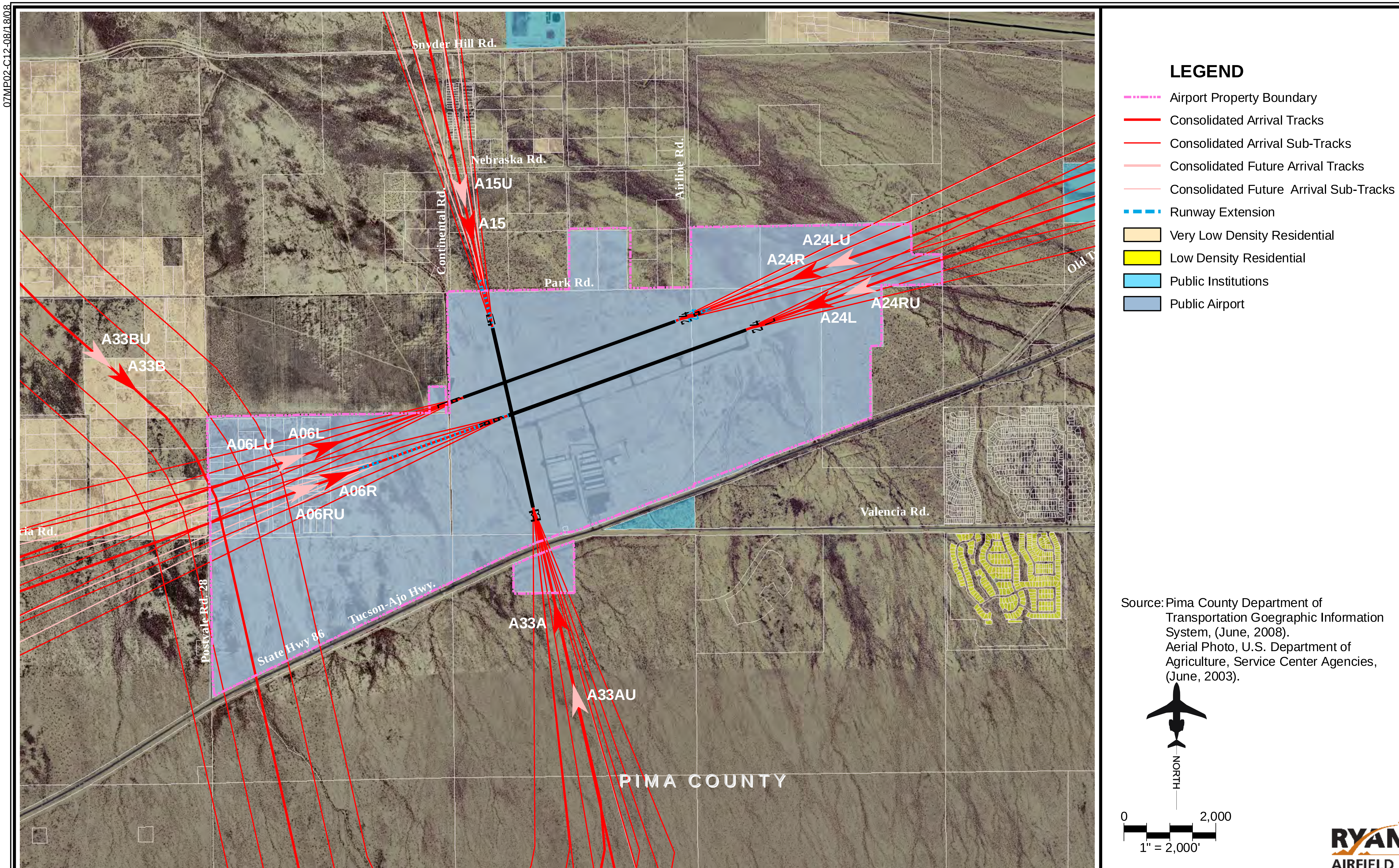
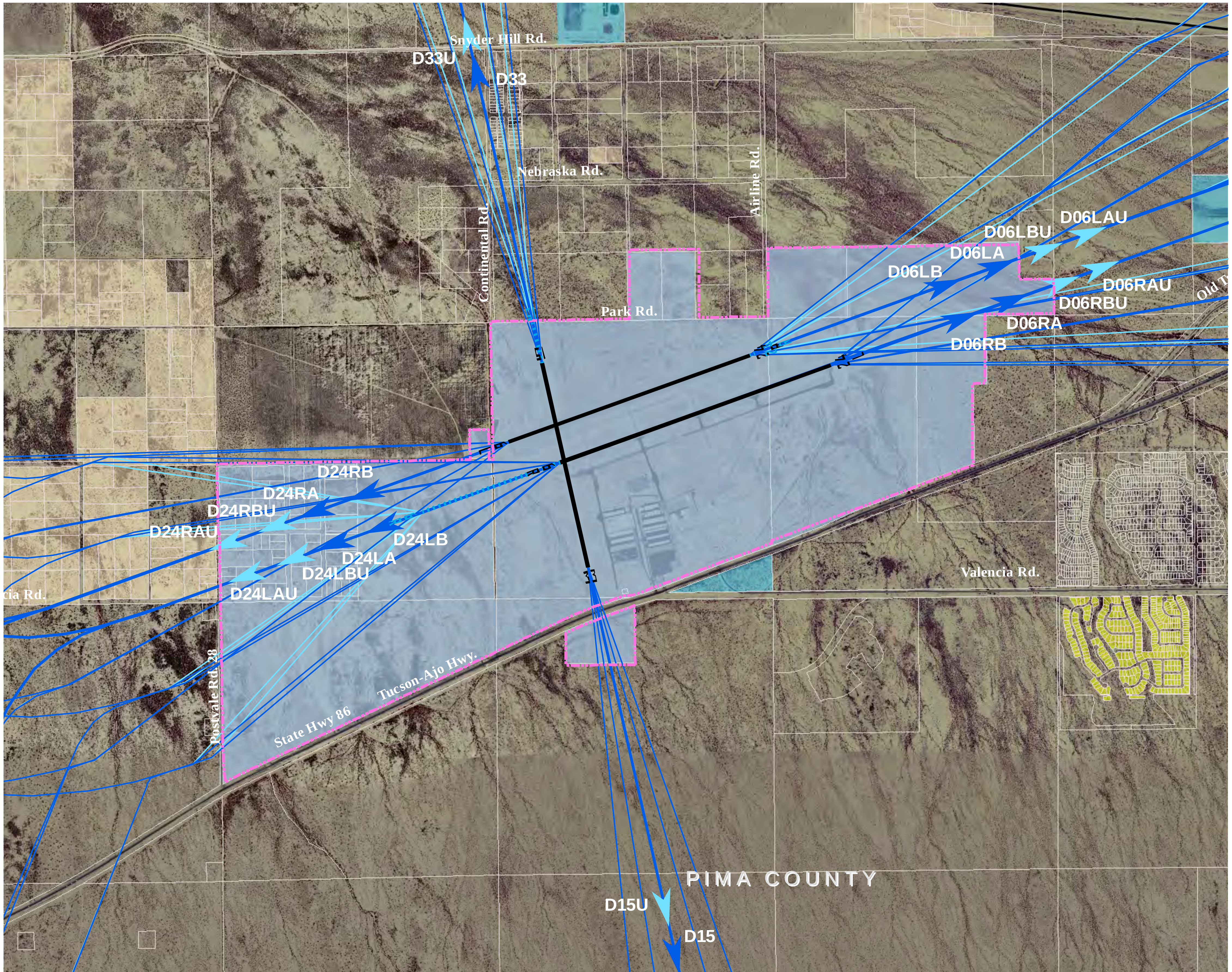


Exhibit C12
CONSOLIDATED EXISTING AND FUTURE ARRIVAL TRACKS WITH EXISTING LAND USE

07MP02-C13-08/18/08



LEGEND

- Airport Property Boundary
- Consolidated Departure Tracks
- Consolidated Departure Sub-Tracks
- Consolidated Future Departure Sub-Tracks
- Consolidated Future Departure Sub-Tracks
- Runway Extension
- Very Low Density Residential
- Low Density Residential
- Public Institutions
- Public Airport

Source: Pima County Department of Transportation Goegraphic Information System, (June, 2008).
Aerial Photo, U.S. Department of Agriculture, Service Center Agencies, (June, 2003).

NORTH

0 2,000
1" = 2,000'

RYAN AIRFIELD
TUCSON AIRPORT AUTHORITY

Exhibit C13
CONSOLIDATED EXISTING AND FUTURE DEPARTURE TRACKS WITH EXISTING LAND USE

07MP02-C14-08/18/08

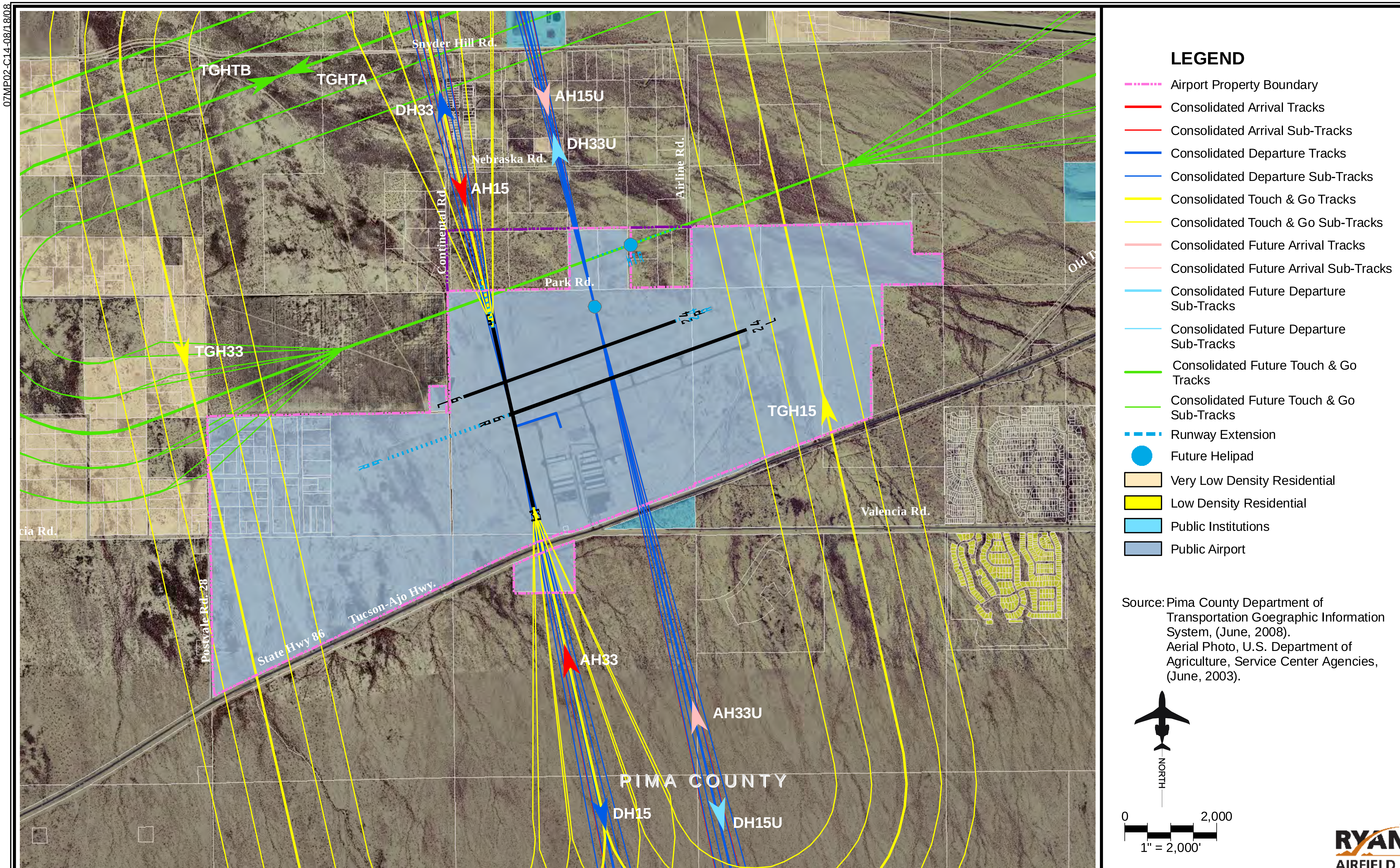
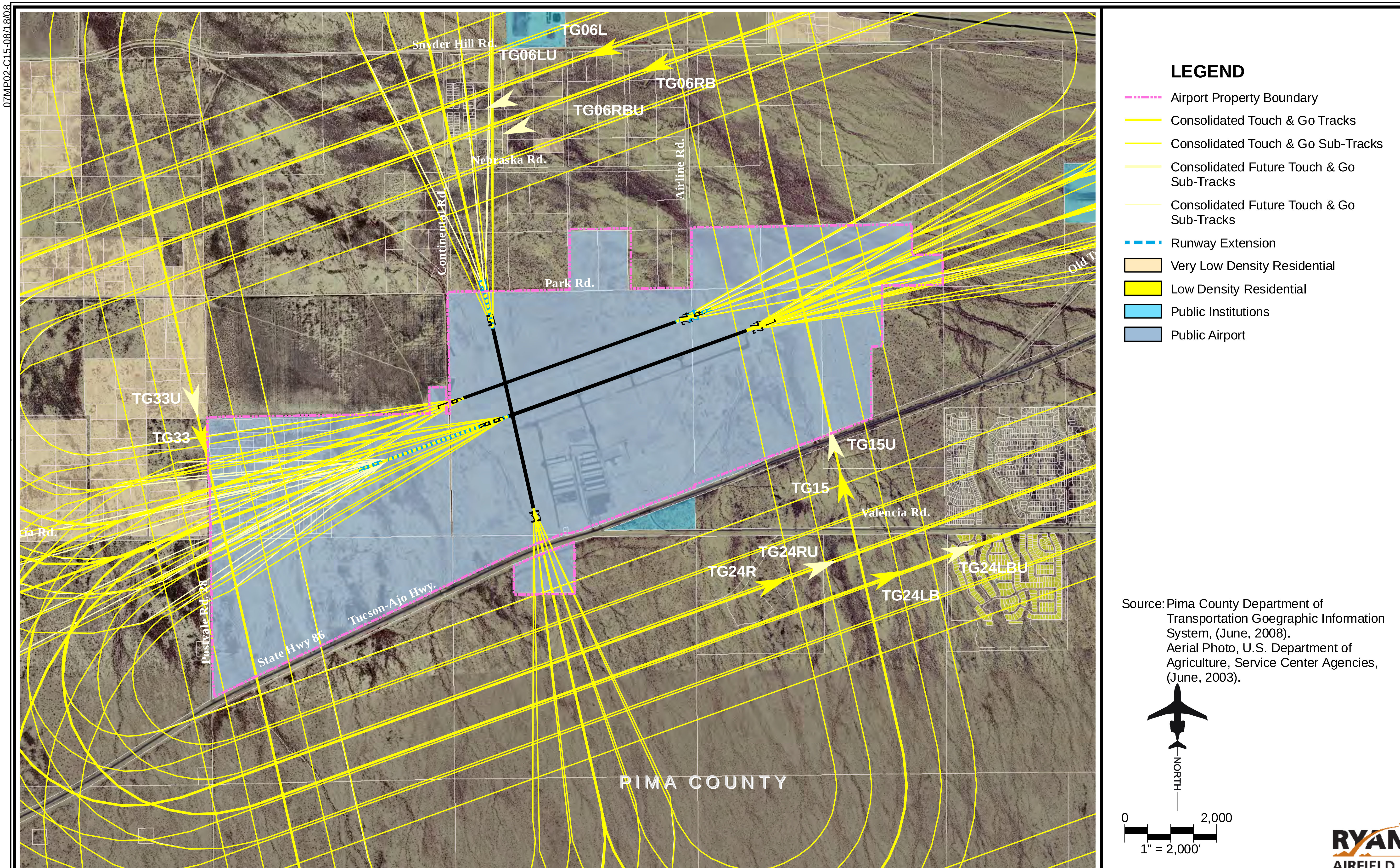


Exhibit C14
CONSOLIDATED EXISTING AND FUTURE
HELICOPTER TRACKS WITH EXISTING LAND USE

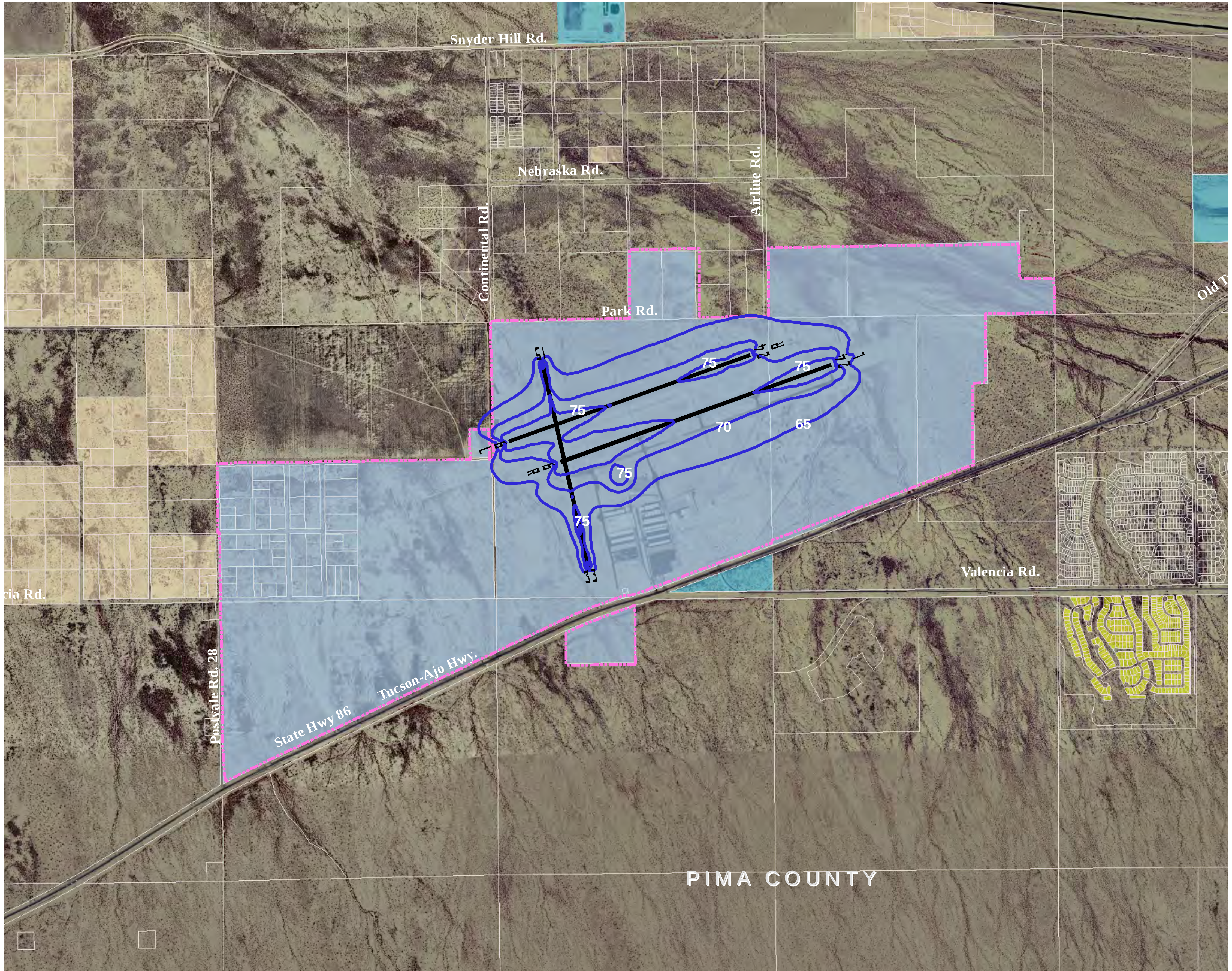


07MP02-C15-08/18/08

RYAN AIRFIELD
TUCSON AIRPORT AUTHORITY

Exhibit C15
CONSOLIDATED EXISTING AND FUTURE TOUCH-AND-GO TRACKS WITH EXISTING LAND USE

07MP02-C16-04/02/2009



LEGEND

- Airport Property Boundary
- DNL Noise Exposure Contour
- Very Low Density Residential
- Low Density Residential
- Public Institutions
- Public Airport

Source: Pima County Department of Transportation Goegraphic Information System, (June, 2008). Aerial Photo, U.S. Department of Agriculture, Service Center Agencies, (June, 2003).

NORTH

0 2,000

1" = 2,000'

RYAN AIRFIELD
TUCSON AIRPORT AUTHORITY

Exhibit C16
2008 NOISE EXPOSURE CONTOURS
WITH EXISTING LAND USE

2012 Noise Exposure Contours

The 2012 noise contours represent the estimated noise conditions based on the forecasts of future operations. **Exhibit C17** presents the plotted results of the 2012 conditions using input data described in the preceding pages.

The 2012 contours maintain the same general shape as their 2008 counterparts. There is one noticeable change to the noise exposure contours to the west. An extension to Runway 6R to the west caused the noise contour to shift into this area. The overall increase in the size of the noise contours reflects the forecast increase in annual operations. **Table C7** shows the surface areas and noise-sensitive impacts for this contour set.

The proposed property boundaries would contain the noise exposure contours north of the airport. Much like its counterpart in the 2008 scenario, the 65 DNL contour gets off airport property about 300 feet on the northwest. Approximately 2.7 acres of the 65 DNL noise contour is not on airport property. The 70 DNL contour stays on airport property, except for a northwest bulge of approximately 50 feet (approximately 0.1 acres). As in 2008, the 75 DNL contour, which separates into several parts, remains on airport property, staying very close to the runways.

There continues to be no existing noise-sensitive land uses within the 2.8 acres of noise exposure contour not contained on airport property. As previously mentioned, this area is currently owned by the City of Tucson and managed by the Pima County Waste Water Department. Therefore, the development of noise-sensitive land uses in the future in this area is unlikely.

2027 Noise Exposure Contours

The 2027 noise contours represent the estimated noise conditions based on the long-range forecast future operations with a change in airport configuration. The master plan has recommended an additional extension on the west end of Runway 6R, bringing its total length to 8,300 feet. In addition, the recommendation of extending Runway 15-33 800 feet to the north has been incorporated. A new heliport facility is planned north of the existing runways. A training helipad is also planned on the north side of the airport. As shown on **Exhibit C18**, although the long-range contours retain the same general shape as the near-term, the forecast increase in operations make the contour set bigger, and they shift to the north and west, following the runway extensions. A small noise exposure contour bubble also occurs over the planned helipad facility to the north. **Table C7** shows the surface areas for this contour set. The 65 DNL contour escapes airport property on the west by about 500 feet. The 70 DNL contour remains on the airport except for the small bulge on the west side. The 75 DNL noise exposure contours is contained on airport property.

Similar to 2008 and 2012, there continues to be no existing noise-sensitive land uses within the 10.6 acres of noise exposure contour not contained on airport property. As previously mentioned, the area within the 65 and 70 DNL is currently owned by the City of Tucson and managed by the Pima County Waste Water Department. Therefore, the development of noise-sensitive land uses in the future in this area is unlikely. The 75 DNL noise contour is contained on airport property.

PREVIOUS NOISE COMPATIBILITY STUDY

The previous Noise Compatibility Plan was completed in July 1990. The primary objective of the Plan was to improve the compatibility between Ryan Airfield aircraft operations and noise-sensitive land uses within the airport environs, while allowing the airport to continue to serve its role in the community, region, and nation. The Plan contained two closely related program measures aimed at satisfying this objective: noise abatement measures and land use management alternatives.

Although no noise abatement measures were recommended in the previous Plan, the following were given as possible considerations towards noise abatement alternatives:

NA-1: Construction of a 2,800-foot extension of Runway 6R/24L, ultimately extending this runway to the east. In addition, the construction of a 4,900-foot parallel Runway 6L/24R located 700 feet north of existing Runway 6R/24L.

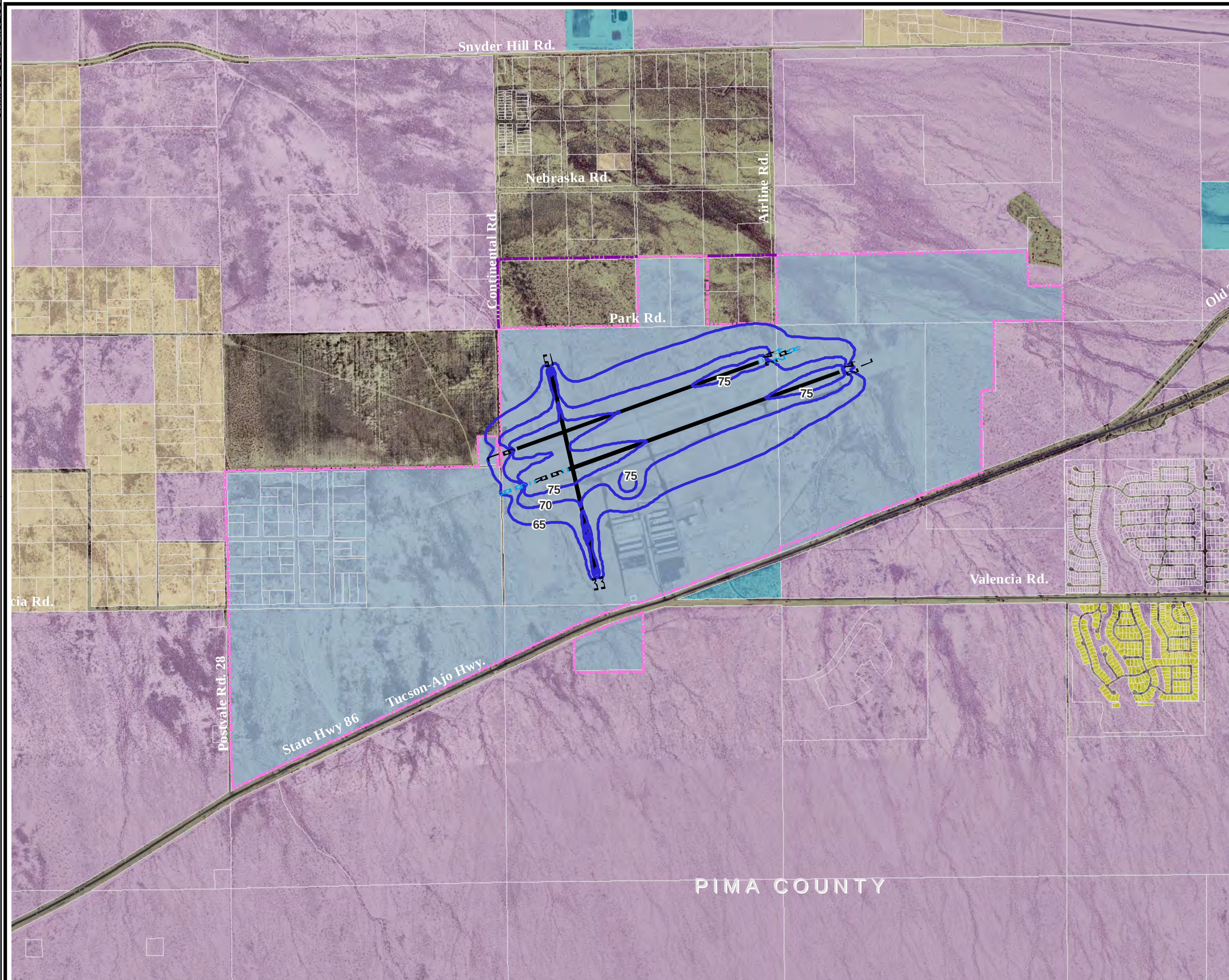
Status: Runway 6R/24L has been extended to the east by 2,800 feet. An additional 4,900-foot runway (Runway 6L/24R) was constructed in 1993, 700 feet north of Runway 6R/24L as suggested in NA-1.

NA-2: As an option to runway configuration to NA-1, Runway 6R/24L could be extended to the west. The location of the additional parallel Runway 6L/24R would be moved further west in this option compared to NA-1.

Status: Noise Abatement Measure 1 has been implemented. Therefore, implementation of this measure will not be pursued.

NA-3: A second runway configuration option considered was abandoning Runway 6R/24L and replacing it with an 8,300-foot runway located near the east end of the Runway 6L/24R. An additional parallel 4,900-foot runway would be constructed 700 feet south in this option.

07MP02-C17-04/02/09



LEGEND

- Airport Property Boundary
- Ultimate Airport Property Boundary
- DNL Noise Exposure Contour
- Runway Extension
- Very Low Density Residential
- Low Density Residential
- Public Institutions
- Public Airport
- Growth Risk Areas

Source: Pima County Department of Transportation Goegraphic Information System, (June, 2008). Aerial Photo, U.S. Department of Agriculture, Service Center Agencies, (June, 2003).

NORTH

0 2,000

1" = 2,000'

RYAN AIRFIELD
TUCSON AIRPORT AUTHORITY

Exhibit C17
2012 NOISE EXPOSURE CONTOURS
WITH EXISTING LAND USE

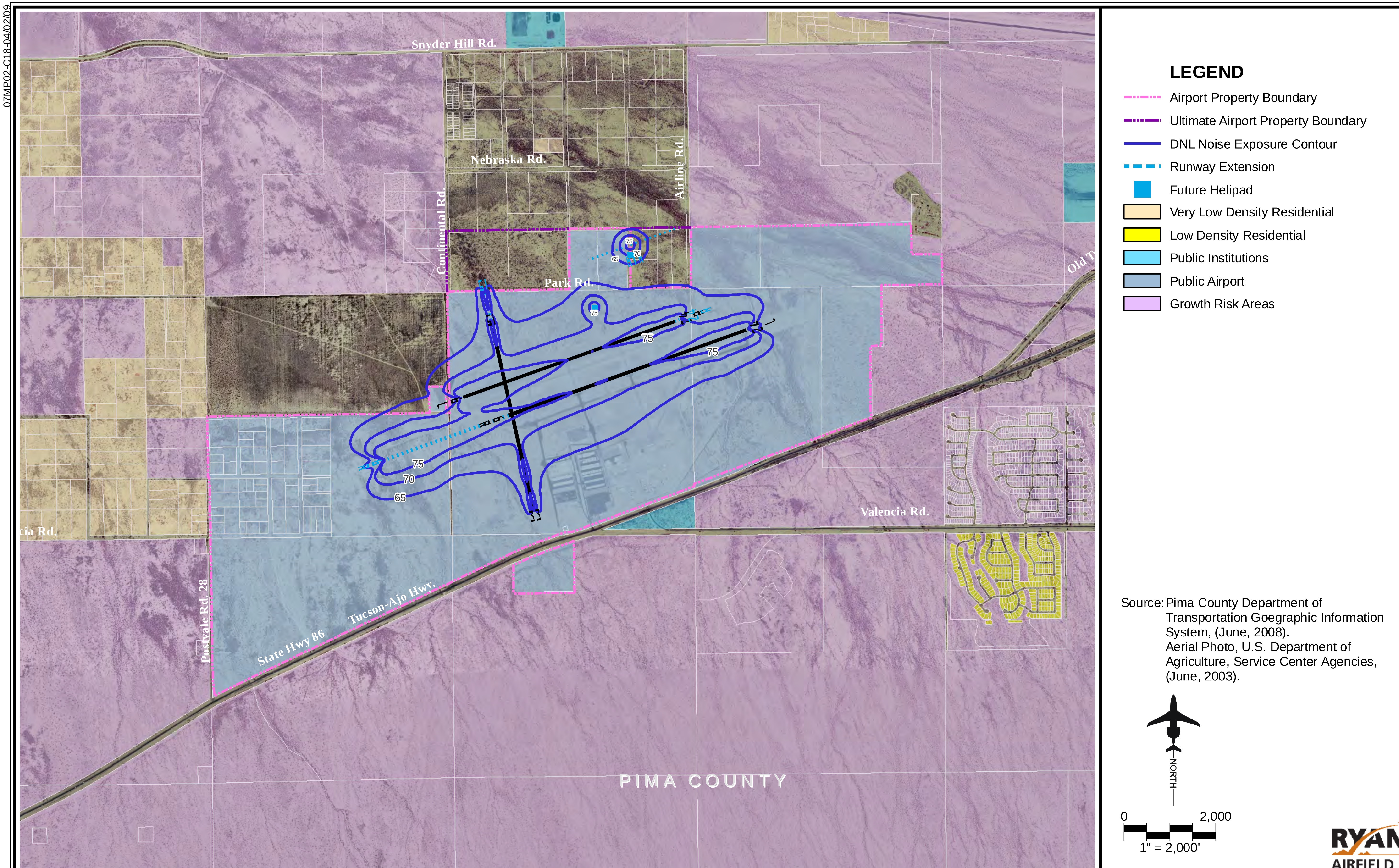


Exhibit C18
2027 NOISE EXPOSURE CONTOURS
WITH EXISTING LAND USE

Status: Noise Abatement Measure 1 has been implemented. Therefore, implementation of this measure will not be pursued.

NA-4: A third runway configuration option considered was a new 8,300-foot runway 700 feet south of Runway 6L/24R and extending 1,500 feet west of Runway 15-33. This option also considered converting Runway 6L/24R from the main runway to a secondary runway.

Status: Noise Abatement Measure 1 has been implemented. Therefore, implementation of this measure will not be pursued.

NA-5: As a means of marketing Ryan Airfield as an airline training facility, a runway configuration identical to that in NA-1 would be beneficial. Such an anticipated training facility would utilize nine single engine and six multi-engine aircraft performing 8,000 annual flight operations each.

Status: The current school uses a 10,000-square-foot facility along with a 10,500-square-foot apron. Space is available for up to 20 single and multi-engine piston-driven aircraft.

Land Use Management Strategies

The following land use management strategies were recommended in the previous Plan:

LU-1: Pima County should maintain existing industrial and commercial zoning areas beneath commonly used flight tracks at Ryan Airfield. Consider industrial rezonings of land designated for industrial use in the Southwest Area Plan, consistent with the recommendations in the Black Wash Drainage Analysis and Policy Assessment Report.

Status: The *2001 Pima County Comprehensive Plan Update* designates the area surrounding Ryan Airfield as Urban Industrial (I). This Industrial classification supports rezoning to Commercial (CB-1 & CB-2) and Industrial (CPI, CI-1, & CI-2). The airport vicinity also contains Special Area Plan Policy 2-01, for encouraging specific airport-related land uses.

LU-2: Pima County should maintain existing airport environs overlay zoning. Make adjustments in zoning boundaries to reflect runway layout recommendations of the Airport Master Plan. Consider prohibiting residential use or increasing the minimum lot size for residences in the CUZ-2 zone.

Status: Pima County has continued to maintain airport environs overlay zoning in conjunction with Ryan Airfield. This was updated in 1992 and included an expansion of the RSZ and CUZ-1 overlay zoning areas to reflect airport configuration changes adopted from the previous Airport Master Plan.

Pima County chose to increase the minimum lot size to one acre instead of prohibiting residential development in the CUZ-2 zone.

The *Pima County Southwest Infrastructure Plan* recommends adoption of a new overlay zone concept, approved by the Tucson Airport Authority, to further encourage compatible development within the airport vicinity.

LU-3: Pima County should adopt the recommendation of the Black Wash Drainage Analysis and Policy Assessment Report, defining a regulatory floodway north and east of Ryan Airfield and promoting the preservation of that area in its natural state.

Status: The *Black Wash Drainage Analysis and Policy Report* was adopted by the county in September 1990. The area surrounding the wash is designated as Resource Conservation (RC) in the *Pima County Comprehensive Plan*. This designation supports rezonings to Institutional Reserve (IR), Rural Homestead (RH), and Suburban Ranch (SH).

LU-4: Pima County should amend subdivision regulations to require the recording of a note with the final plat review within the AE and CUZ-2 overlay zones stating the risk of aircraft overflights and high noise level.

Status: Subdivision reviews require a note stating the potential of high noise, on the final plat, if the subdivision is located in an Airport Environs Zone (AE) or Compatible Use Zone (CUZ). A note specifically stating risks associated with close proximity to the airport is not required. As previously discussed, the City of Tucson has adopted an Airport Disclosure Map (**Exhibit C1**) which indicates the area surrounding the airport where the issuance of avigation easements and fair disclosure notices is required for development.

LU-5: Pima County should amend the *Southwest Area Plan* by adopting the Part 150 Noise Compatibility Plan, or parts of the 150 Plan. An alternative could be the adoption of the Part 150 Plan as a general planning guideline.

Status: The *Southwest Area Plan* was superseded by the *Pima County Comprehensive Plan* in 1992. The Comprehensive Plan doesn't specifically address issues pertaining to noise compatibility issues. Pima County also has not officially adopted the previous Part 150 Plan for general planning guidance.

LU-6: Pima County should consider special review procedures for evaluating subdivision, rezoning, special use, conditional use, and variance request within the airport environs overlay zones.

Status: Special review procedures have not been adopted for evaluating requests within the Airport Environs Zone. Considerations pertaining to development in this zone have been integrated into the standard review procedures.

RECOMMENDATIONS FROM 1999 REVIEW

Property Acquisition: The review of the *1990 Noise Compatibility Plan* included as part of the *1999 Airport Master Plan* supported the acquisition of three parcels located west of the primary airport facilities. These parcels were completely surrounded by airport property and had the potential to be developed with noise-sensitive land uses.

Status: These parcels have been acquired by the TAA.

Adopt Noise Compatibility Plan for Guidance: The review also recommended that Pima County amend its Comprehensive Plan to reflect recommendations in the Ryan Airfield Master Plan and Noise Compatibility Plan or to adopt the Noise Compatibility Plan as a general planning guideline.

Status: A land use compatibility plan for Ryan Airfield was adopted by TAA. There are additional comprehensive plan policies affecting the area in the vicinity of Ryan Airfield (to the east, west, and south) that were approved by the Pima County Board of Supervisors. These policies are contained in resolutions (Co7-06-12, Co7-06-14, Co7-06-16, and Co7-07-32) for the various 2007 Comprehensive Plan amendments. The policies, in combination with planned land use designations as shown on the 2007 Southwest Area Comprehensive Plan amendments map, essentially set compliance with the airport overlay zoning shown on **Exhibit C18**.

RECOMMENDATIONS FOR NOISE ABATEMENT AND LAND USE STRATEGIES

The previous Noise Compatibility Plan, completed in July 1990 and subsequently reviewed in 1999, presented a number of alternatives for Noise Abatement, Land Use Management, and Program Implementation. Of the recommendations from these two documents, only the encouragement of Pima County to amend the Southwest Area Plan to adopt the Noise Compatibility Plan as a general planning guideline has not been implemented. Efforts to pursue implementation of this measure should still be considered. In addition, following noise abatement and land use management measures should be considered.

Noise Abatement

TAA should consider preparing a pilot guide and other noise abatement promotional materials to inform pilots of current noise abatement procedures. The guide should include an aerial photo showing the airport and the surrounding area, pointing out noise-sensitive land uses, good neighbor policies such as Aircraft Owners and Pilots Association (AOPA) noise awareness steps, and preferred noise abatement procedures. **Exhibit C19** depicts the AOPA noise awareness steps. It could also include other information about the airport that pilots would find useful. The guide should be suitable for insertion into a Jeppesen manual so that pilots will be able to conveniently use it.

Land Use Management

First, an amendment to the Pima County Airport Environs Zone should be considered. This would include adoption of the Land Use Compatibility Map approved by TAA, an update to the Height Overlay Zone to reflect current Part 77 surfaces, and adoption of TAA's Avigation Easement Policy.

Second, the TAA should continue their community outreach efforts. This includes airport user meetings, staff participation in neighborhood meetings, and coordination with City and County staff on all planning efforts in proximity of Ryan Airfield.

Finally, TAA should review the Noise Compatibility Program and consider revisions and refinements as necessary. A complete plan update will be needed periodically to respond to changing conditions in the local area and in the aviation industry. This can be anticipated every seven to ten years. An update may be needed sooner, however, if major changes in noise conditions or surrounding development occur. Even if the NCP does not need to be updated, it may become necessary to update the noise exposure contours. Part 150 requires the noise exposure contours to be updated if any change in the operation of the airport would create a substantial, new non-compatible use. The Federal Aviation Administration interprets this to mean an increase in noise levels of 1.5 DNL or more, above 65 DNL, over non-compatible areas that had formerly been compatible.

SUMMARY

This appendix has analyzed the impacts of existing and projected future aircraft noise on noise-sensitive land uses and population in the vicinity of Ryan Airfield. With the relatively remote location, in addition to the adoption of recommended property acquisition, no land use or population is expected to be impacted by airport-related noise around Ryan Airfield.

While a majority of the Noise Compatibility Program recommendations have been implemented, four additional measures should be considered to insure the long term compatibility of Ryan Airfield. These include amending the Pima County zoning ordinance with the proposed airport overlay zone, implementation of a pilot and public education program, monitoring the implementation of the program, and updating the noise exposure contours and program as needed in the future.

07MP02-C19-4/15/09

A.O.P.A. NOISE AWARENESS STEPS

1. If practical, avoid noise-sensitive areas such as residential areas, open-air assemblies (e.g., sporting events and concerts), and national park areas. Make every effort to fly at or above 2,000 feet over the surface of such areas when overflight cannot be avoided.

2. Consider using a reduced power setting if flight must be low because of cloud cover or overlying controlled airspace or when approaching the airport of destination. Propellers generate more noise than engines; flying with the lowest practical rpm setting will reduce the aircraft's noise level substantially.

3. Perform stalls, spins, and other practice maneuvers over uninhabited terrain.

4. Many airports have established specific noise abatement procedures. Familiarize yourself and comply with these procedures.

5. Work with airport managers and fixed-base operators to develop procedures to reduce the impact on noise-sensitive areas.

6. To contain aircraft noise within airport boundaries, avoid performing engine runups at the ends of runways near housing developments. Instead, select a location for engine runup closer to the center of the field.

7. On takeoff, gain altitude as quickly as possible without compromising safety. Begin takeoffs at the start of a runway, not at an intersection.

8. Retract the landing gear either as soon as a landing straight ahead on the runway can no longer be accomplished or as soon as the aircraft achieves a positive rate of climb. If practical, maintain best-angle-of-climb airspeed until reaching 50 feet or an altitude that provides clearance from terrain or obstacles. Then accelerate to best-rate-of-climb airspeed. If consistent with safety, make the first power reduction at 500 feet.

9. Fly a tight landing pattern to keep noise as close to the airport as possible. Practice descent to the runway at low power settings and with as few power changes as possible.

10. If a VASI or other visual approach guidance system is available, use it. These devices will indicate a safe glidepath and allow a smooth, quiet descent to the runway.

11. If possible, do not adjust the propeller control for flat pitch on the downwind leg; instead, wait until short final. This practice not only provides a quieter approach, but also reduces stress on the engine and propeller governor.

12. Avoid low-level, high-power approaches, which not only create high noise impacts, but also limit options in the event of engine failure.

13. Flying between 11 p.m. and 7 a.m. should be avoided whenever possible. (Most aircraft noise complaints are registered by residents whose sleep has been disturbed by noisy, low-flying aircraft.)

Note: These recommendations are general in nature; some may not be advisable for every aircraft in every situation. No noise reduction procedure should be allowed to compromise flight safety.

RYAN AIRFIELD
TUCSON AIRPORT AUTHORITY

Exhibit C19
A.O.P.A. NOISE AWARENESS STEPS

DOCUMENT SOURCES

A variety of different documents were referenced in the inventory process. The following listing reflects a partial compilation of these sources. The listing does not include the data provided directly by the Tucson Airport Authority staff or airport drawings which were referenced for information. An on-site inventory was also conducted to review the existing facilities for the master planning effort.

Airport Facility Directory, Southwest United States; U.S. Department of Commerce, National Oceanic and Atmospheric Administration, July 31, 2008 Edition.

Pima County Comprehensive Plan; Pima County Development Services Department, Planning Division, adopted December 2001.

Ryan Airfield Airport Master Plan; Tucson Airport Authority, Coffman Associates, June 1999.

The following Web pages were also visited for information during the preparation of the inventory:

www.airnav.com
www.ci.tucson.az.us
www.co.pima.az.us
www.dot.co.pima.az.us
www.tucsonairport.org

RYAN AIRFIELD
TUCSON AIRPORT AUTHORITY

Appendix D

DRAINAGE AND UTILITIES PLAN

Appendix D
DRAINAGE AND UTILITIES PLAN

INTRODUCTION

This report has been prepared to update the Drainage and Utilities Plan prepared in the *Airport Master Plan for Ryan Airfield* that was approved in June 1999. The following discussion will summarize existing utilities located at Ryan Airfield and conceptually address future utility needs for proposed development onsite. Utilities include sanitary sewer, electricity, gas, telephone, water, and drainage structures.

The utilities depicted on the following exhibits are based on information provided by the various utility companies and the Tucson Airport Authority (TAA). Best effort has been made to depict the utilities, but these locations should be considered approximate.

DRAINAGE

The "Ryan Airfield Airport-Wide Basin Study Update," (Master Drainage Plan) dated March 20, 2006, identifies seven upstream watersheds impacting the subject property's southern boundary line. Offsite runoff is conveyed north in a network of braided channels and sheet flow to Ajo Highway. Runoff enters the site via existing culverts located under Ajo Highway. It is then conveyed onsite in a northerly manner via existing earthen channels and sheet flow located east and west of the airport-related development areas. Onsite, a portion of the site gently slopes to the northeast as the remainder of the parcel generally slopes to the northwest.

The study area is located within a Federal Emergency Management Agency (FEMA) mapped Special Flood Hazard area (100-year floodplain) per the current Flood Insurance Rate Map (FIRM), Community Panel No. 04019C-2200K, dated February 8, 1999 for Pima County and Incorporated Areas. The parcel is located within Zone AO with associated depth of flow of one foot as well as Zone A (Special Flood Hazard Area, no base flood elevations determined).

On the eastern portion of the site, runoff enters from the south via culverts under Ajo Way. Relocation of an existing levee located approximately 700 feet east of Airfield Drive, just north of Ajo Highway, was presented in the Master Drainage Plan, and the proposed location is shown on **Exhibit D1**. The existing levee confines the 100-year flow for a tributary to the Black Wash; however, the existing earthen levee does not have the freeboard required by FEMA standards and is not certified per FEMA standards. An uncertified levee is assumed to fail by FEMA standards; therefore, the 100-year floodplain for the tributary would extend with the adjacent airport-related development areas and airfield operations areas and flow north into the airfield. The 100-year peak discharge for the tributary to Black Wash was obtained from HEC-1 modeling and is 4,578 cfs, for an approximately 16 square mile watershed. A new levee alignment has been designed (30%) and a request for a Conditional Letter of Map Revision (CLOMR) has been submitted (December 22, 2009) to FEMA to remove the airfield and aviation support areas from the A and AO Zones. In addition, construction of a low flow channel for the tributary wash is proposed in conjunction with the levee.

On the western portion of the site, runoff also enters from the south via culverts under Ajo Way. Per the Master Drainage Plan, the 100-year floodplains for the unnamed streams which lie west of the airfield operations areas do not impact the existing airfield and aviation support areas. The Master Drainage Plan addressed the possibility of channelizing the 100-year flow for two streams (channels 1 and 2) on the western portion of the site to provide additional developable area and conveyance to proposed culverts for future runway and taxiway expansion.

SANITARY SEWER

Existing sewage disposal is by septic system. The existing system consists of eight onsite individual septic systems as well as one community septic system, as shown on **Exhibit D2**. These systems were reported to be in good condition, per the 1996 Parson Brinckerhoff *Sanitary Sewer Study*. Soil conditions were found to be suitable for utilization of a sanitary septic system.

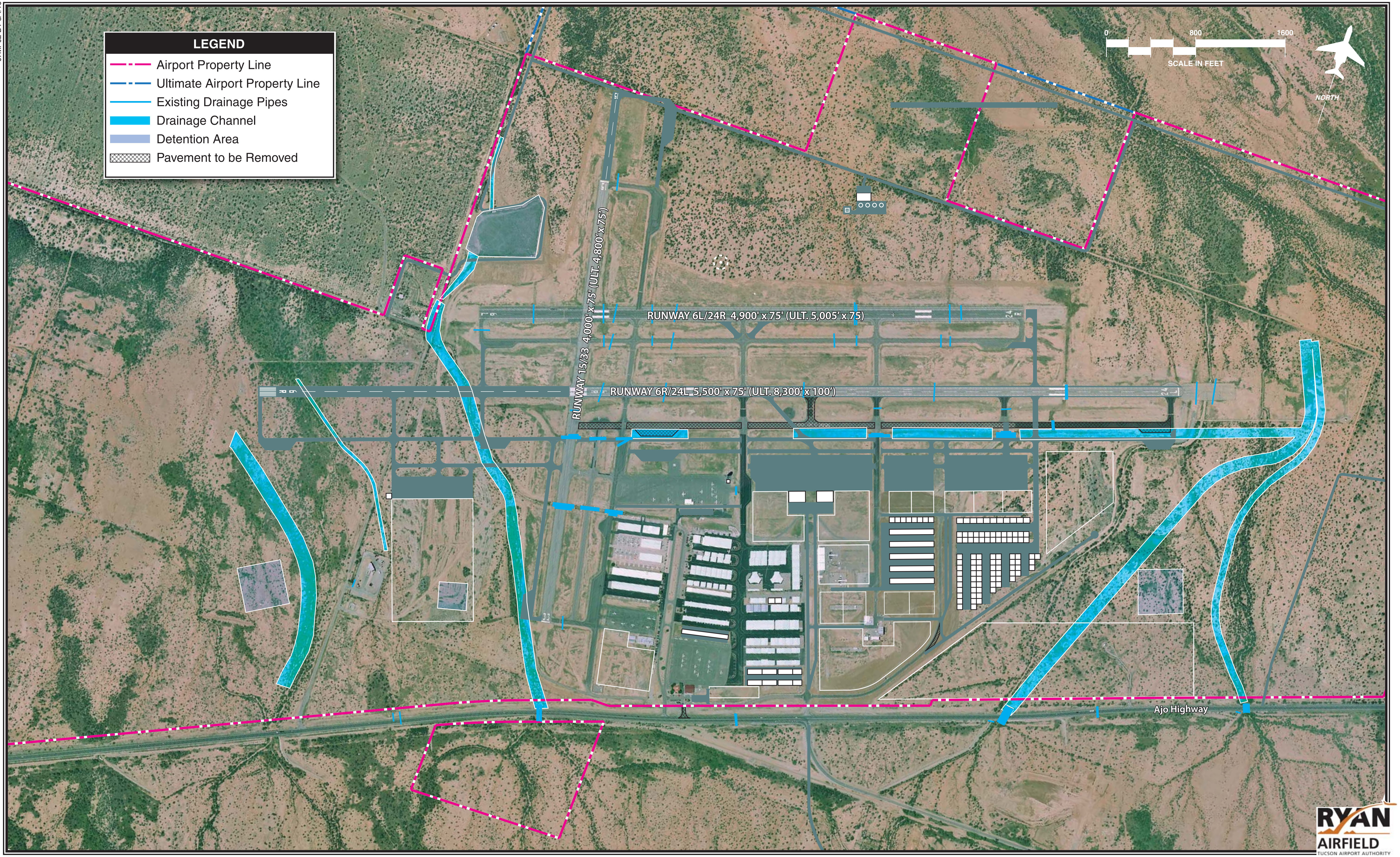


Exhibit D1
EXISTING AND PROPOSED
DRAINAGE

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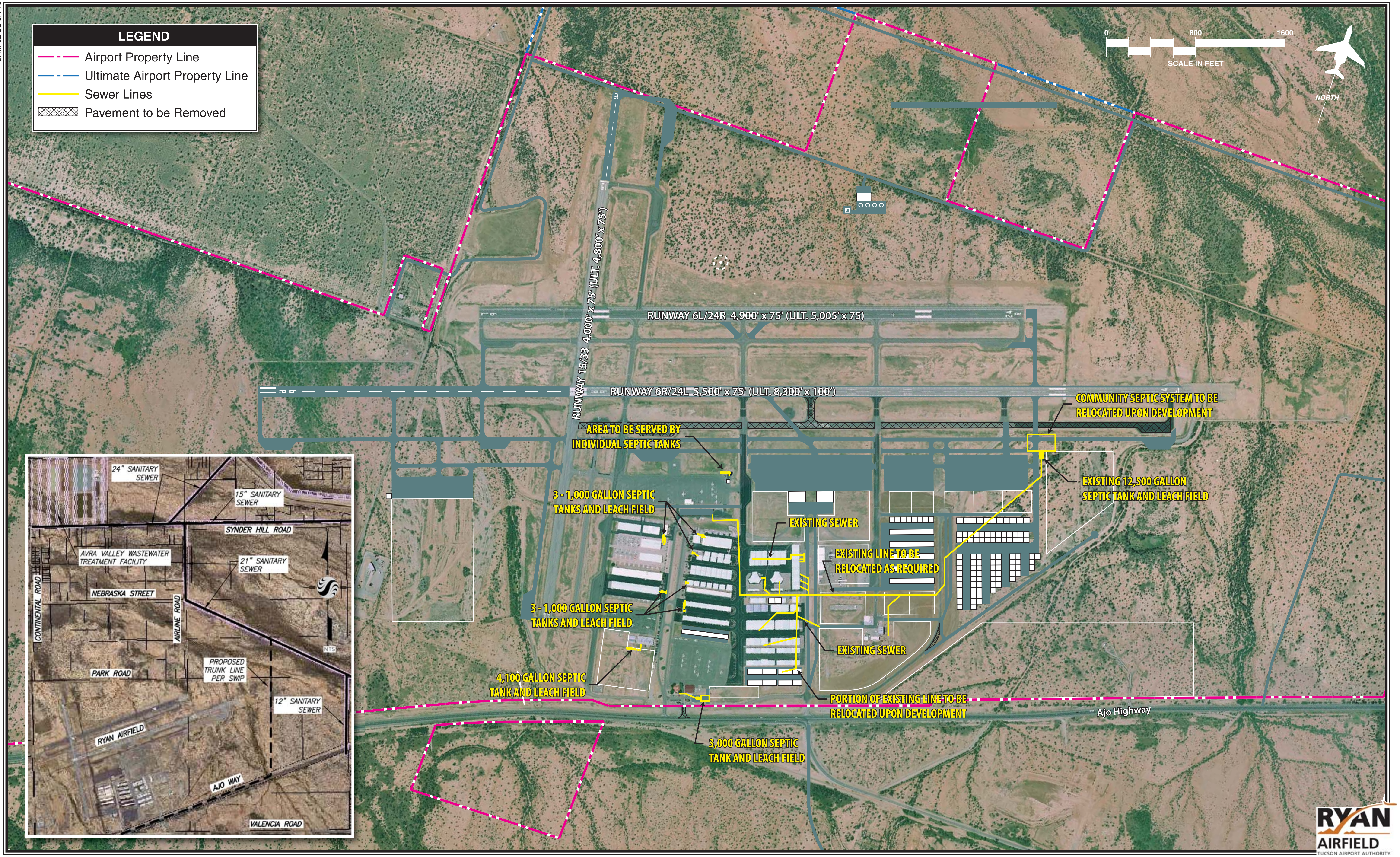

Exhibit D2
SANITARY SEWER

The disposal of sewage east of an onsite topographic ridge line is provided predominantly by the community septic system. The western portion is mostly provided through the individual septic systems. At the completion of the sanitary sewer study, the remaining life of the 12,500-gallon tank of the community septic system was projected to be 37 years, and it was estimated that approximately 30 acres of future development could be added to the collective system. However, depending on the density of the development proposed, this information could change with respect to the 30 acres of additional use. The septic tank and leach field will also need to be evaluated each time a sewer connection is added.

Four alternatives were presented in the previously mentioned report to address future sewer needs. They included:

1. Individual septic tanks
2. Connection to the existing Snyder Hill Treatment Facility
3. Community septic tank/leach field system
4. On-airport treatment facility

The first alternative consisted of maintaining the existing individual septic systems for each leasehold. The connection to the Snyder Hill Facility consisted of connecting directly to the treatment facility or connecting to the existing 21-inch sewer main. The third option considered was to build a community sewage system throughout the airfield, identical to the system currently in place for the east side of the airfield. The last alternative studied the possibility of constructing an onsite sewage disposal system.

The following issues need to be considered in the evaluation of sewer alternatives:

1. Right-of-way
2. Environmental permitting requirements
3. Construction phasing flexibility
4. System capacity utilization

Advantages and disadvantages of the alternatives are summarized in **Table D1**. The recommended option of the *Sanitary Sewer Study* consists of the community septic tank/leach field system.

In the new term, the sewage disposal will continue to be by septic system (individual or collective system). The possibility of connecting to the existing 21-inch main which is located 1,250 feet to the northeast of the airport and discharges into the Avra Valley Wastewater Treatment Plant is still a feasible alternative. However, it is not currently an economical alternative.

The option could become economical if the Southwest Infrastructure Plan (SWIP) is constructed as it currently is planned. The SWIP has a trunk line which ties into the existing 21-inch main and runs southerly near the eastern portion of Ryan Airfield until reaching Ajo Way. At Ajo Way, the trunk line turns and parallels Ajo Way's right-of-way in a southwesterly direction past Ryan Airfield. If and when the SWIP is realized, the possibility of connecting into the 21-inch main which runs into the Avra Valley Wastewater Treatment Plant will be more economical.

In addition, the "Sanitary Sewer Study" recommended that any new leach fields should not be placed adjacent to existing airfield pavement. TAA has indicated that it may tie into sewer facilities serviced by Pima County Waste Water once available via private development and if economically feasible.

Table D1
Sanitary Sewer Alternatives
Ryan Airfield

	Advantages	Disadvantages
Individual septic tanks	• Construction phasing flexibility. • Developer is responsible for installation. • Permitting is minimal.	• Low capacity utilization.
Connection to the existing Snyder Hill Treatment Facility	• High utilization of available capacity. • Eliminates installation of individual septic system and its maintenance.	• High right-of-way and construction costs. • Low construction phasing. • Environmental permit requirements.
Community septic tank/leach field system (Recommended)	• **Maximize system capacity.** • **Construction phasing flexibility.** • **High land availability.**	• **Potentially developed property needs to be dedicated to the system.**
On-airport treatment facility	• High utilization capacity. • Eliminates maintenance of individual septic system.	• Permitting extensive. • Low potential source for disposal of effluent. • High maintenance requires operator and constant monitoring and is expensive to operate. • High construction costs due to need for closed system. • Potentially developed property needs to be dedicated to the system.

POWER

Existing and proposed electric power lines are presented on **Exhibit D3**. Electric lines are depicted in accordance with drawings provided by Tucson Electric Power Company and information from the TAA maps. Trico Electric Cooperative has electrical facilities on the west side of Ryan Airfield.

TEP and TRICO should review all new development.

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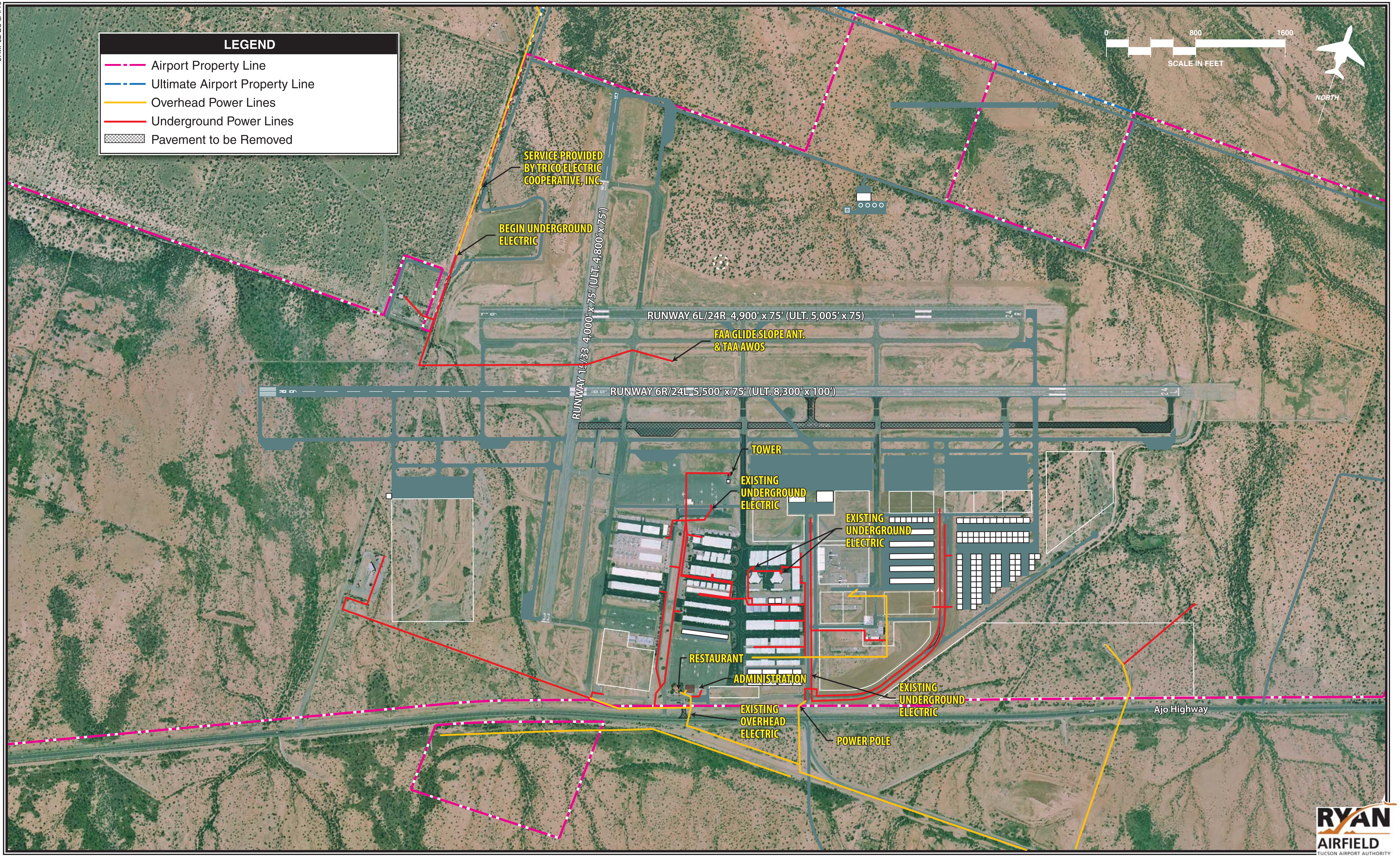

Exhibit D3
POWER FACILITIES

GAS

Southwest Gas Corporation, Inc. serves Ryan Airfield. The existing and proposed gas lines are depicted on **Exhibit D4**. Southwest Gas should review all new development.

The gas facilities that serve Ryan Airfield run parallel and just north of Ajo Highway (State Route 86). From this line, additional lines run parallel with and centered in both Aviator Lane and Airfield Drive. The lines running in Aviator Lane and Airfield Drive feed multiple hangars and buildings.

TELEPHONE

Qwest provides Ryan Airfield with telephone services. The existing telephone lines are depicted on **Exhibit D5**. Information relating to location of existing lines was provided solely by the TAA and was depicted according to TAA maps. For technical reasons, Qwest does not provide the public with maps depicting the location of existing services. Qwest should review all new development.

The majority of telephone facilities are underground. A portion of the airfield west of Airfield Drive has overhead lines. The telephone facilities that serve Ryan Airfield run parallel and just north of Ajo Highway. From this line, additional lines run parallel with and are centered in Aviator Lane, Airfield Drive, and Connector Road. The lines running in Aviator Lane and Airfield Drive feed multiple hangars and buildings.

WATER

The existing water system at Ryan Airfield consists of looped 12-inch and 8-inch mains; however, there are dead-end lines in the northeastern portion of the water system. The existing water facilities system is depicted on **Exhibit D6**. The proposed system will loop with the proposed extensions. The existing supply is from Tucson Water transmission mains and wells as follows:

• Existing City of Tucson 42" water transmission main along Ajo Way and Valencia Road.

• Existing City of Tucson Wells AV9 and AV8 (or AV27) with a production of 1,000 GPM (gallons per minute) and 700 GPM respectively.

These wells and the 42" water main are located in the COT Pressure Zone "B," Highwater Elevation 2,600 feet, Service Boundaries Elevation 2,416 feet and 2,490 feet (80 and 48 pounds per square inch [psi]). Site Average Elevation is 2,420 feet. Estimated average pressure at the site is approximately 71-78 psi.

Tucson Water does not have a future plan regarding Ryan Airfield. Tucson Water growth is based on new development. Proposed additions should be presented to Tucson Water as they are identified.

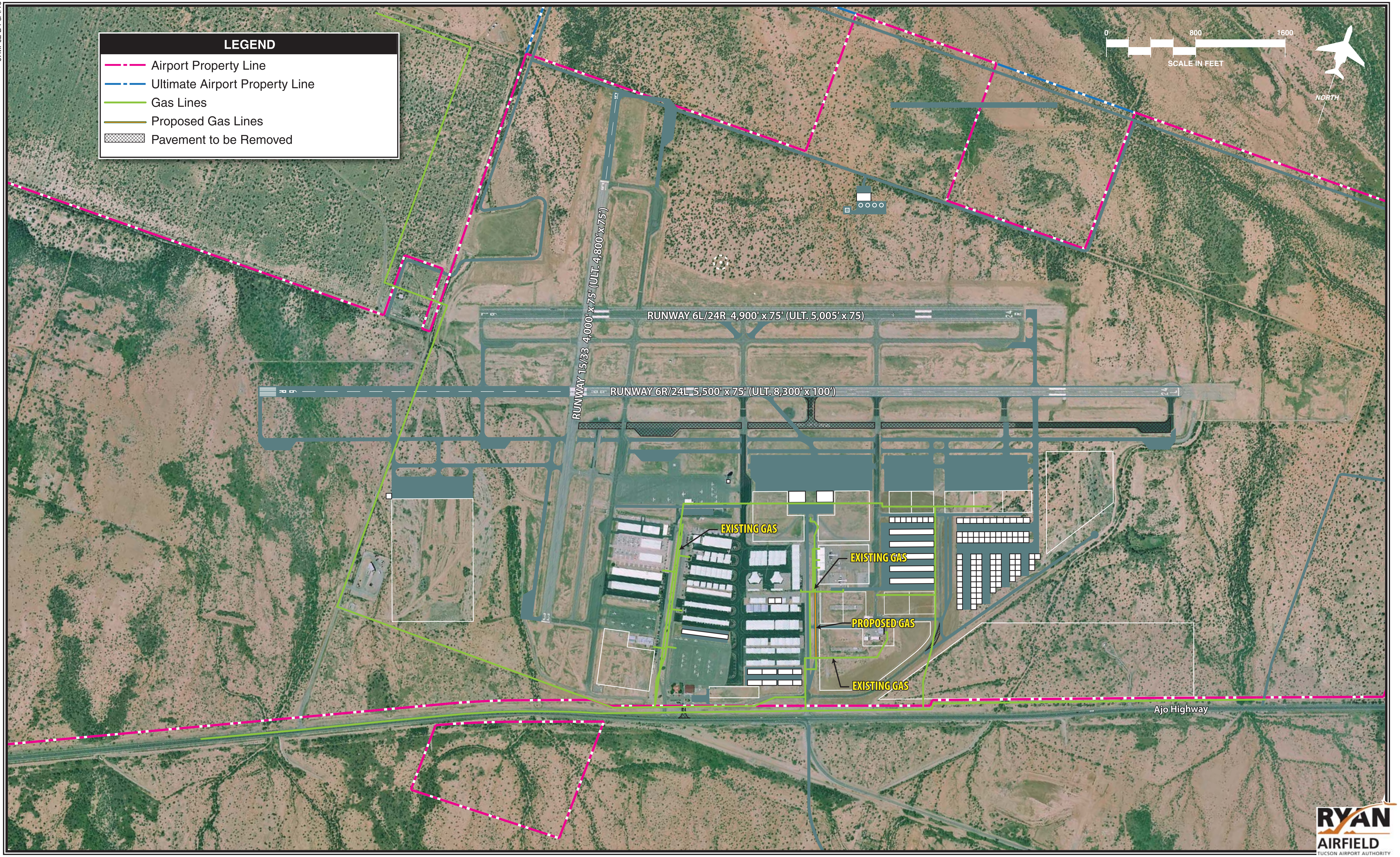

Exhibit D4
EXISTING AND PROPOSED
GAS LINES

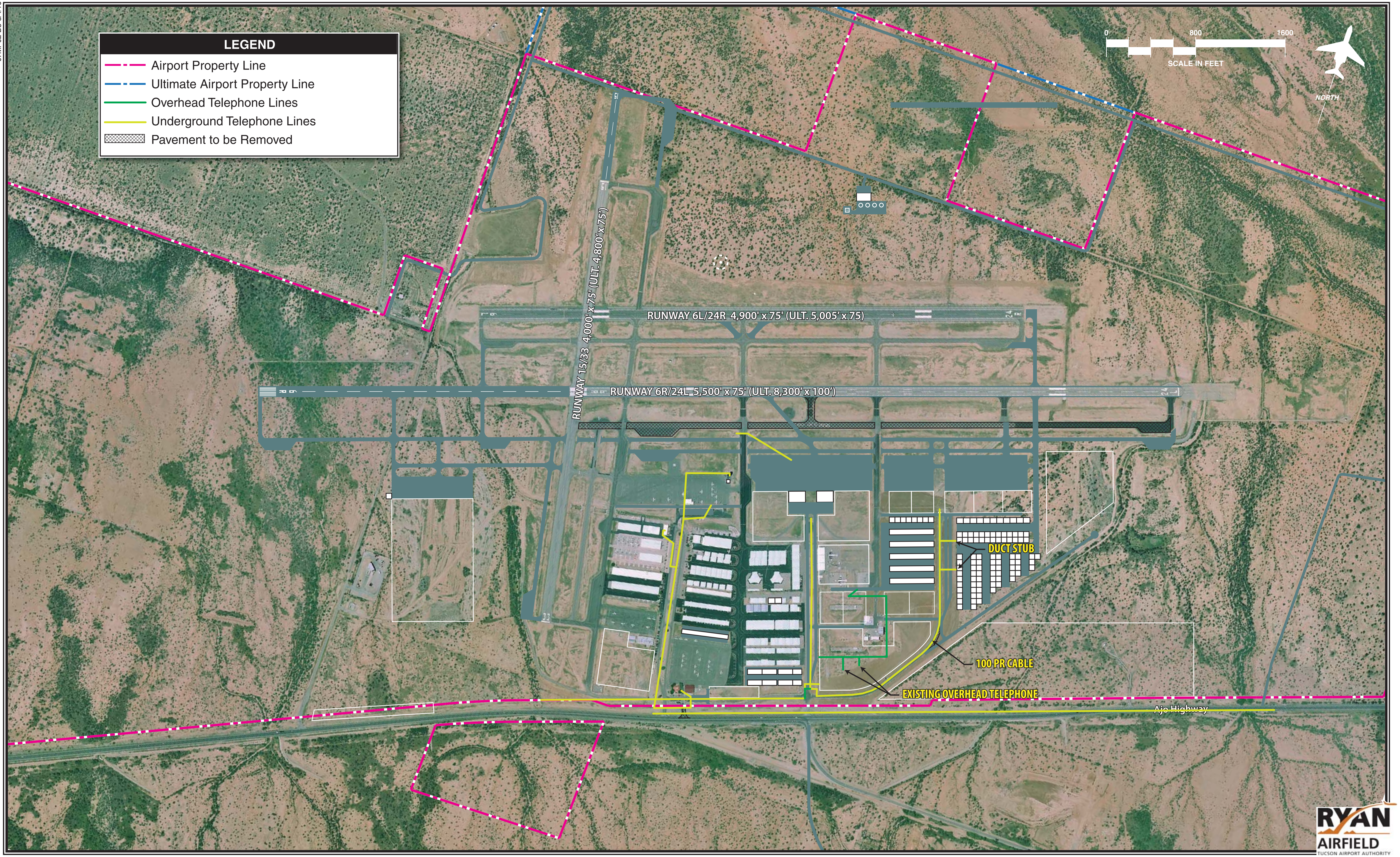

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Exhibit D5
TELEPHONE LINES

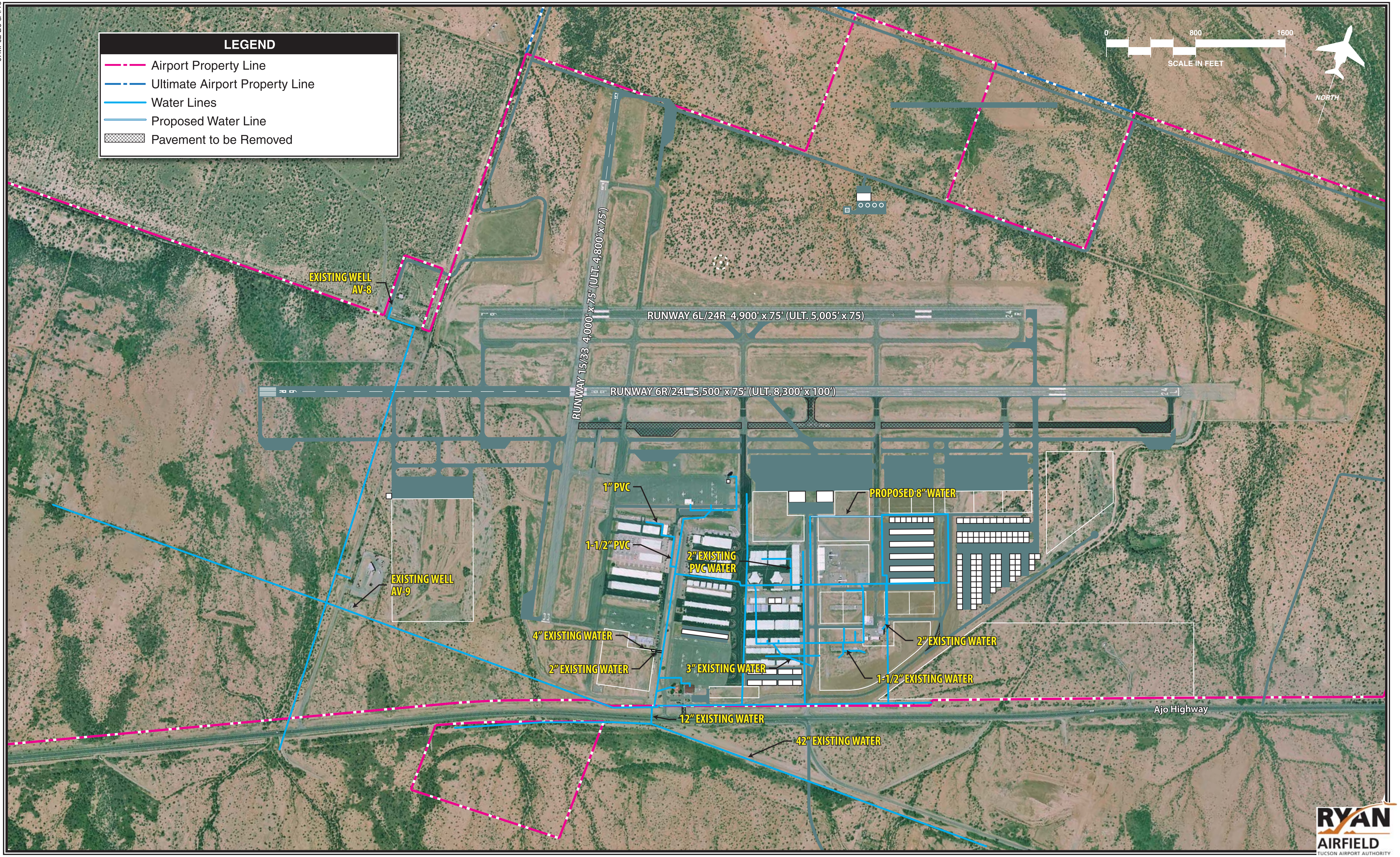

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Exhibit D6
EXISTING AND PROPOSED
WATER LINES

Coffman Associates
Airport Consultants

www.coffmanassociates.com

Stantec