Phoenix Deer Valley Airport

Master Plan Update

PHOENIX DEER VALLEY AIRPORT

June 2015

HNTB

City of Phoenix

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Introduction

Intro.1 Master Plan Goals and Objectives

A master plan is a planning document that evaluates the current and future needs of the airport over a 20 year planning horizon. A master plan typically includes a forecast of aviation activity, associated airport facility requirements and plans to accommodate the projected demand over the 20 year horizon. The recommended plan is used to update the Airport Layout Plan (ALP) which the Federal Aviation Administration (FAA) approves. The FAA recommends that airport sponsors update the master plan for their airport every 5 to 10 years.

The previous Master Plan Update for Phoenix Deer Valley Airport (DVT) was completed in 2007 just before the economic downturn in 2008. A number of projects have also been implemented since the completion of the previous Master Plan Update, including Taxiway A reconstruction and relocation, runway and taxiway safety area improvements, drainage improvements and ramp improvements and reconstruction. As a result, the forecast of aviation activity and associated recommended plans developed under the previous Master Plan Update have been updated under this current Phoenix Deer Valley Airport Master Plan Update (the Master Plan). The FAA's current design advisory circular (AC) 150/5300-13A, published after the completion of the previous Master Plan Update, was also taken into account and drives the airfield alternatives reviewed. The AC outlines new design standards focused on safety enhancements and improving airfield geometry that can result in incursions.

The development of this Master Plan, prepared in accordance with FAA A 150/5070-6B: Airport Master Plans, was an iterative process involving many airport and community stakeholders and was customized to accommodate specific aviation demands while remaining economically and environmentally feasible. The objectives of the Master Plan set forth at the onset of the project and that were adhered to during the master planning process included:

- Identifying DVT's historical activities and past challenges as well as aviation trends that have impacted the airport since the last master plan
- Developing forecasts of future aviation demand levels at the airport over the next 20 years
- Assessing community land use goals and regional aviation needs as well as identifying what adjacent land uses may hinder future growth
- Working with the public and other airport stakeholders to gain feedback on airport development
- Determining the airport's facility requirements through the next 20 years, including additional facilities and expansion of existing facilities
- Evaluating the facility layout for conformance with FAA airport design regulations
- Developing ALP drawings that graphically depict proposed capital improvements

- Updating the Capital Improvement Program to reflect recommended projects including the business case for these improvements
- Recommending sustainability initiatives that may result in reduced energy consumption and/or environmental impact

Working with City of Phoenix Aviation Department Staff and airport and community stakeholders a set of Master Plan goals was identified at the onset of the project and revisited throughout the planning process. These goals were meant to drive the planning process and were used to evaluate proposed Master Plan concepts during alternatives development. The primary goals, as identified in this Master Plan, are to:

- Improve safety
- Enhance operational efficiency
- Right-size the development at DVT
- Meet current FAA airport design standards
- Accommodate forecast demand at a high level of service
- Balance the utilization of the airfield (north and south)
- Implement financially responsible development

Intro.2 Coordination

The Master Plan included a robust public and stakeholder coordination process. The coordination effort was comprised of three parts: a Technical Advisory Committee (TAC), a Public Advisory Committee (PAC), and open public workshops.

The TAC was comprised of individuals representing primary airport tenants, users and groups with strong technical understanding of the airport operations. This group is technically focused and familiar with aviation procedures providing focused discussions and technical feedback on airport facility needs and operations. The TAC met five times throughout the project covering the following topics:

- Meeting 1: Project kick-off
- Meeting 2: Inventory
- Meeting 3: Facility Requirements
- Meeting 4: Development Concepts
- Meeting 5: Final Recommended Plan

The City of Phoenix Aviation Department would like to acknowledge the time and effort put forth by the members of the TAC. Representatives from the following groups were members of the TAC:

- City of Phoenix Aviation Department
- Cutter Aviation
- Atlantic Aviation/Westwind School of Aeronautics
- TransPac Aviation Academy
- Phoenix Police Department Air Support Unit
- Phoenix Fire Department

- Deer Valley Pilots Association
- Honeywell
- FAA Air Traffic Control
- FAA PHX Airport District Office
- FAASTeam

The PAC was comprised of individuals representing organizations, agencies, and groups with a vested interest in the airport. The primary purpose of the PAC is to inform the community on the status of the project and solicit feedback on how the plans will affect the members represented constituents. The PAC met four times throughout the project covering the following topics:

- Meeting 1: Project Kick-off (project background, approach and inventory)
- Meeting 2: Facility Requirements
- Meeting 3: Development Concepts
- Meeting 4: Final Recommended Plan

The City of Phoenix Aviation Department would like to acknowledge the time and effort put forth by the members of the PAC. Representatives from the following groups were members of the PAC:

- City of Phoenix Aviation Department
- Arizona Department of Transportation – Aeronautics Division
- Deer Valley Village Planning Committee
- Phoenix Community and Economic Development Department
- Phoenix Planning and Development Department
- Luke Air Force Base
- Arizona Pilots Association
- Aircraft Owners and Pilots Association
- Phoenix City Council Representative
- Phoenix Aviation Advisory Board

In addition to the two committees, there were a total of four public meetings throughout the project which are open to the community at large. The meetings were held in the evenings at the Deer Valley Village Community Center. The purpose of the public meetings was to inform the public about the project and solicit feedback throughout the process. The meetings were held in a workshop format with boards displaying project information and Master Plan team members and City of Phoenix Aviation Department staff available to walk through the material and answer community questions and concerns. Input from community members and airport users that attended the meetings was incorporated into the final Master Plan Recommended Alternative.

1.0 Inventory of Existing Conditions

1.1 Airport Setting

Phoenix Deer Valley Airport is located within the northern limits of the City of Phoenix (the City), approximately 20 miles north of downtown (**Figure 1-1**) near the intersection of Interstate 17 and Loop 101, and adjacent to the cities of Glendale, Peoria and Scottsdale. DVT spans 914 acres and is located in Maricopa County which consists of 23 other incorporated cities and towns in addition to the City of Phoenix.

Maricopa County is located in the Sonoran Desert with elevations ranging from 500 to 2,500 feet above mean sea level (MSL). DVT's elevation is 1,478 feet MSL with surrounding environment encompassing both urban/sub-urban development and desert. South side access to DVT is provided from Deer Valley Road and north side access is provided via Airport Boulevard which connects to 7th Street on the east. The west end of DVT is bounded by 19th Avenue.

1.2 Airport History

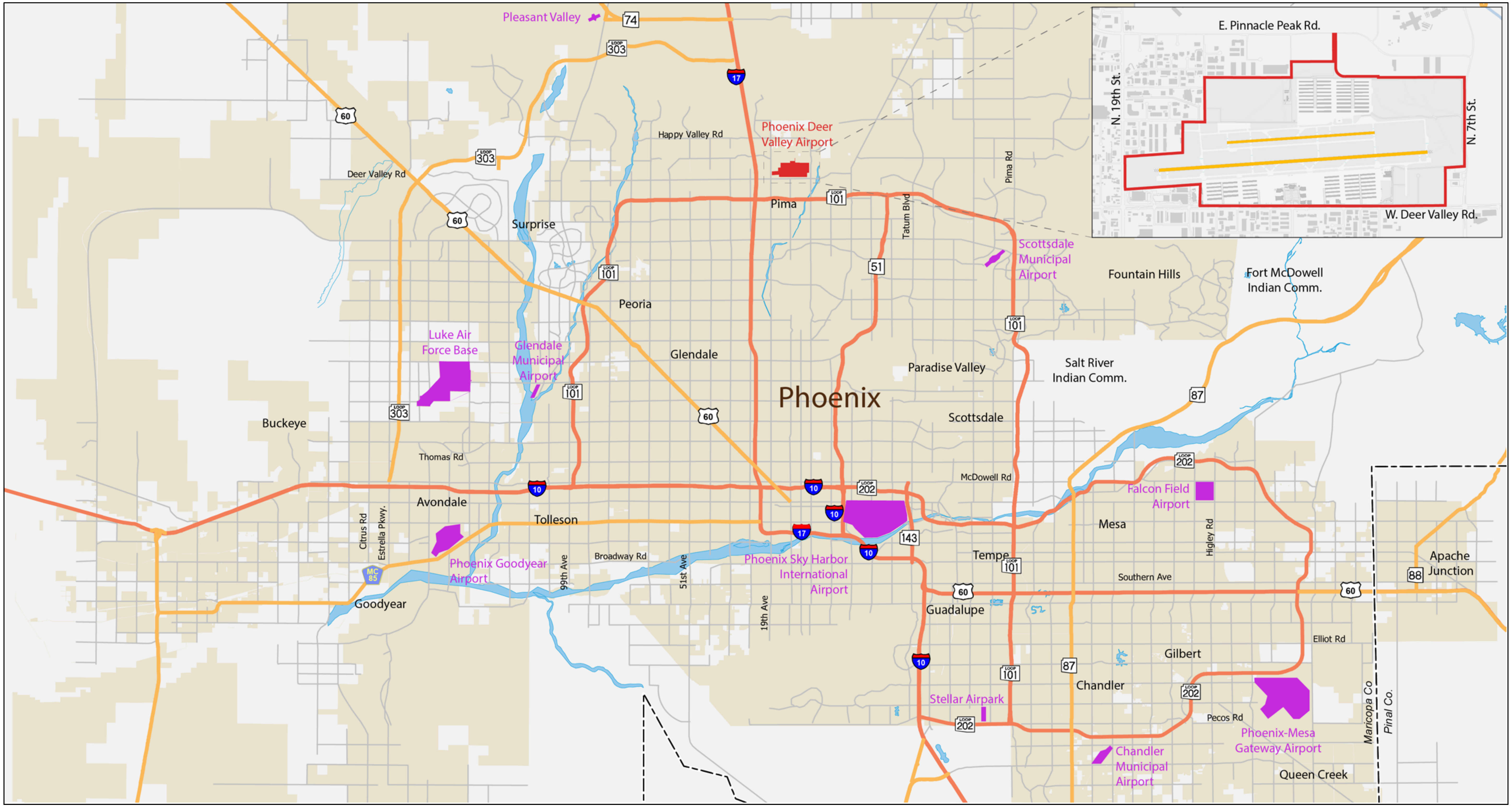
Phoenix Deer Valley Airport was founded in 1960 as a private airfield with a single runway on 482 acres of land. There was no control tower and limited support facilities and amenities were available.

The City purchased DVT eleven years later in 1971 and began operations with a temporary air traffic control tower (ATCT) sitting atop a four foot mound of dirt. In 1975 a new terminal and ATCT were constructed at which time the FAA assumed air traffic control (ATC) functions. At the same time the runway was widened and a parallel runway was built north of the existing runway. The first Master Plan for DVT was adopted by the Phoenix City Council in 1986. Projects coming out of the plan included lengthening of the south runway, construction of general aviation hangars and tie downs, and extension of the north runway/taxiway system.

Currently DVT is one of the United States' busiest general aviation airports and in 2012 DVT, with 355,000 operations, ranked ahead of Van Nuys Airport, with 268,000 operations, as the busiest general aviation airport in the country.

1.2.1 Recent Capital Improvements

The FAA has provided funding assistance to support projects at DVT through the Airport Improvement Program (AIP). In addition, the Arizona Department of Transportation (ADOT) has provided grant funding for projects at DVT. Over the past 10 years, the projects in **Table 1-1** have been financed and implemented through AIP grants, ADOT grants, and local funds.



DVT Vicinity Map

Figure 1-1

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Table 1-1: DVT AIP and ADOT Funded Projects FY 2004 to 2014

Federal Fiscal Year	Project Description	AIP Grant Number	FAA Grant Funds	ADOT Grant Number	ADOT Grant Funds
2004	Taxiway Development and Utilities	AIP 3-04-0028-19	$1,821,200		
2004	Land Acquisition 177.5 acres (Pro-rated 8.04 acres)			ADOT E4S37	$550,000
2005	Acquire Land for Development (Reimbursement of 7.5 acres)	AIP 3-04-0028-20	$442,500		
2005	Land Acquisition 177.5 acres (Pro-rated 7.85 acres)			ADOT E5S25	$585,000
2006	Acquire Land for Development (Reimbursement of 19 acres)	AIP 3-01-0028-21	$3,000,000		
2006	Land Acquisition 177.5 acres (Pro-rated amount)			ADOT E6S43	$1,305,000
2007	Acquire Land for Development (Final Reimbursement)	AIP 3-04-0028-22	$900,000		
2007	Land Acquisition 177.5 acres (Pro-rated 20.11 acres)			ADOT E7S17	$1,500,000
2007	Reconstruct South Apron (Phase I)	AIP 3-04-0028-23	$3,500,799	ADOT E7S87	$900,000
2008 FAA/ 2009 ADOT	Improve Runway Safety Area – 07R/25L Hill Removal	AIP 3-04-0028-24	$1,093,316	ADOT E9F19	$28,773
2008	Install airfield signage entry points into movement area adjacent to non-movement area boundary markings			ADOT E8S02	$180,000
2008	Install apron security lighting at several locations			ADOT E8S07	$810,000
2009	Reconstruct South Apron – South and Northwest Areas (Phase II)	AIP 3-04-0028-25	$5,094,521	ADOT E9F63	$134,067

Federal Fiscal Year	Project Description	AIP Grant Number	FAA Grant Funds	ADOT Grant Number	ADOT Grant Funds
2009 FAA/ 2011 ADOT	Install Airfield Guidance Signs and Relocate holdlines, Install Northwest Apron Lighting, Install Runways Incursion Caution Bars, Reconstruct South and Northwest Apron [Phase III], Rehabilitate Runway Lighting and Electrical Vault - 7R/25L	AIP 3-04-0028-26	$3,136,441	ADOT E1F33	$82,538
2010 FAA/ 2011 ADOT	Improve Runway Safety Area - 7L/25R, Improve Runway Safety Area - 7R/25L	AIP 3-04-0028-27	$11,590,000	ADOT E1F44	$305,000
2011 FAA/ 2012 ADOT	Improve Airport Drainage (Drainage and Erosion Control)	AIP 3-04-0028-28	$5,540,800	ADOT E2F2D	$145,800
2011 FAA/ 2012 ADOT	Collect Airport Data for Airports Geographic Information System	AIP 3-04-0028-29	$748,600	ADOT E2F2A	$19,700
2012	Crack Seal & Rubberized Asphalt Emulsion Seal Coat: (R07R Sect. 1-6); (TC05 Sect. 2); (TC13 Section 1); (TC12 Sect. 1); (TC06 Sect. 1); (TC03 Sect. 1)			ADOT E2S65	$245,811
2012 FAA/ 2013 ADOT	Rehabilitate Runway – 7L/25R	AIP 3-04-0028-30	$1,135,600	ADOT E3F2U	$50,000
2012 FAA/ 2013 ADOT	Rehabilitate Runway – 7L/25R	AIP 3-04-0028-31	$2,103,699	ADOT E3F2V	$103,000
2013 FAA/ 2014 ADOT	Reconstruct Taxiway A (Phase II)	AIP 3-04-0028-32	$1,931,051	ADOT E4F3W	$94,793
2013	Reconstruct aircraft run-up area adjacent to Taxiway A			ADOT E3S2T	$1,800,000
2013 FAA/ 2014 ADOT	Airport Master Plan Update Study	AIP 3-04-0028-33	$398,350	ADOT E4F3V	$19,555
2014	Thin Asphalt Overlay/PFC			ADOT E4S1I	$487,457

Source: City of Phoenix Aviation Department and FAA AIP Grant Funding

1.3 Ownership and Management

Phoenix Deer Valley Airport is owned by the City and operated by the City of Phoenix Aviation Department (Aviation Department). The City also owns and operates Phoenix Sky Harbor International Airport (PHX) and Phoenix Goodyear Airport (GYR). The executive management team consisting of the Aviation Director and two Assistant Directors manage day-to-day operations and development at the three airports. The DVT Airport Manager oversees daily operations at DVT.

The Phoenix City Council and Mayor are the governing entity over DVT and appoint members to the Phoenix Aviation Advisory Board (PAAB) to review and submit to the City Council recommendations on basic airport policies, major airport projects, and concession contracts and leases. The PAAB consists of nine regular members appointed to four year terms along with the Aviation Director and current Chairman of the Airline Station Managers Council serving as non-voting ex-officio members.

1.4 Airport System Role

The 2008 Arizona State Airports System Plan (AZSAS) identifies DVT as a Public Use, National Plan of Integrated Airport Systems (NPIAS) Reliever airport. DVT serves to relieve general aviation air traffic from PHX. While DVT's facilities are physically capable of accommodating all segments of civil aviation, the City chooses not to provide commercial passenger service operations at DVT with the exception of air taxi service provided by fixed base operators (FBO). The City has identified PHX as the sole commercial passenger service airport within the three airports in their system.

1.5 Airport Facilities

Airport facilities described in the following sections include airside facilities, airspace control, and landside facilities.

1.5.1 Airside Facilities

DVT's airside facilities include the major functions that directly support aviation operations such as the runways, taxiways, aprons, navigational aids (NAVAIDs), and hangars.

1.5.1.1 Runways

DVT has two parallel runways, which are designated as 7L-25R and 7R-25L. The north parallel runway, Runway 7L-25R, measures 4,500 feet long by 75 feet wide, and the south parallel runway, Runway 7R-25L, measures 8,196 feet long by 100 feet wide. Runway 7R-25L has a displaced arrival threshold on each end of the runway. The west end of the runway, Runway 7R, has an 898 foot displaced landing threshold and the east end of the runway, Runway 25L, has a 915 foot displaced threshold. The east side is displaced due to nearby terrain and the west side is displaced in order to keep the arrival Runway Protection Zone (RPZ) on airport property. The two parallel runways are separated by a centerline to centerline separation of 700 feet.

The FAA defines a Runway Design Code (RDC) for every runway that is in the National Airspace System (NAS). The RDC identifies the design standards that a runway is built to and is made up of three components: Airplane Design Group (ADG), Aircraft Approach Category (AAC), and approach visibility minimums for a specific runway's critical aircraft. The AAC, summarized in **Table 1-2,** identifies the range of final approach speeds that can be accommodated by the runway. The ADG, summarized in **Table 1-3** and graphically depicted in **Figure 1-2**, is a function of the wingspan and tail height dimensions of the critical aircraft. The approach visibility minimum is defined as the approved minimum horizontal and vertical visibility that the specific runway accommodates.

Table 1-2: Aircraft Approach Category

Category	Approach Speed	Example
A	Speed less than 91 knots	Cessna 172
B	Speed greater than or equal to 91 knots, but less than 121 knots	Beech King Air, Citation X
C	Speed greater than or equal to 121 knots, but less than 141 knots	Gulfstream II, Gulfstream III, Boeing Business Jet (BBJ) I
D	Speed greater than or equal to 141 knots, but less than 166 knots	BBJ II, Gulfstream IV, Gulfstream V, Global Express
E	Speed greater than or equal to 166 knots	Certain military aircraft

Source: FAA AC 150/5300-13A, Change 1

Table 1-3: Airport Design Group

Group	Tail Height	Wingspan
I	Less than 20 feet	Less than 49 feet
II	Greater than or equal to 20 feet, but less than 30 feet	Greater than or equal to 49 feet, but less than 79 feet
III	Greater than or equal to 30 feet, but less than 45 feet	Greater than or equal to 79 feet, but less than 118 feet
IV	Greater than or equal to 45 feet, but less than 60 feet	Greater than or equal to 118 feet, but less than 171 feet
V	Greater than or equal to 60 feet, but less than 66 feet	Greater than or equal to 171 feet, but less than 214 feet
VI	Greater than or equal to 66 feet, but less than 80 feet	Greater than or equal to 214 feet, but less than 262 feet

Source: FAA AC 150/5300-13A, Change 1

ADG – I
Small Propeller Aircraft
Flight Training
Recreational Flight
Regional Air-Taxi

Examples:
Cessna 172
Piper PA-30 Twin Comanche
Beechcraft King Air

ADG – II
Medium & Small Business Jet
Large Propeller Aircraft

Examples:
Cessna Citation X
Dassault Falcon 900EX

ADG – III
Narrowbody Commercial Jet
Large Business Jet

Examples:
Boeing 737
Gulfstream G-VI

ADG – IV
Widebody Commercial Jet
Medium Range Heavy Jet

Examples:
Boeing 767
Airbus A300/A310

ADG – V
Widebody Commercial Jet
Long Range Jumbo Jet

Examples:
Boeing 777
Boeing 747-400

ADG – VI
Widebody Commercial Jet
Long Range “Super” Aicraft

Examples:
Airbus A380
Boeing 747-8

Aircraft Types Segmented by FAA Aircraft Design Group

Figure 1-2

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Table 1-4 includes a summary of the various approach visibility minimums. The RDC is written as a combination of the three elements: AAC/ADG/Approach Visibility Minimum. The existing RDCs for Runways 7L-25R and 7R-25L are B/I/VIS and C/II/5000, respectively.

Table 1-4: Approach Visibility Minimums

Runway Visual Range (RVR)	Instrument Flight Visibility Category (Statute Miles)
VIS	Greater than 3 miles[1]
5000	Not lower than 1 mile
4000	Lower than 1 mile, but not lower than ¾ mile
2400	Lower than ¾ mile, but not lower than ½ mile
1600	Lower than ½ mile, but not lower than ¼ mile
1200	Lower than ¼ mile

Source: FAA AC 150/5300-13A, Change 1. For Categories A and B, the VIS component translates to a visibility of no less than 1.5 mile

1.5.1.2 Runway Protected Areas

Various areas surrounding, near or adjacent to runways must be protected according to FAA to ensure the safety of airfield operations. The specific types of areas are described below.

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 undershooting, overshooting or veering off of the runway. All existing runway safety areas currently meet design standard dimensions. The RSA must be graded, free of surface variations, and capable of supporting aircraft or rescue equipment on an emergency basis.

Runway Object Free Area (ROFA): An area centered on the runway provided to enhance the safety of aircraft operations by being free of objects, except for those required for air navigation or aircraft ground maneuvering purposes.

Runway Protection Zone (RPZ): A trapezoidal area off the runway end to enhance the protection of people and property on the ground. The RPZ begins 200 feet beyond the end of the runway threshold.

Runway Obstacle Free Zone (OFZ): The Runway OFZ is the airspace above and adjacent to the runway but below the 150 foot floor of the horizontal surface as identified in Federal Aviation Regulation (FAR) Part 77. The OFZ is required to be clear of all objects, with the exception of frangible visual navigation aids that are required to provide clearance protection for aircraft landing or taking off and missed approaches.

Runway Blast Pad: The surface adjacent to the ends of runways provided to reduce the erosive effect of jet blast and propeller wash.

A summary of the specific runway protected area dimensions provided at DVT are presented in **Table 1-5** and depicted on **Figure 1-3**. The protected areas are generally based on the size of the aircraft utilizing the runway and approach visibility minimums, with larger aircraft and lower approach visibility minimums resulting in larger required protected areas.

Table 1-5: Runway Dimensional Standards

Geometry Element	Runway 7R-25L	Runway 7L-25R
Runway Length	8,196'	4,500'
Runway Width	100'	75'
Runway Design Code	**C/II/5000**	**B/I/VIS**
Approach Visibility Minimum	1.25 mile	1.25 mile
Runway Shoulder Width	10'	10'
Runway Blast Pad Width	120'	95'
Runway Blast Pad Length	150'	150'
Maximum Crosswind Component	16 knots	10.5 knots
Runway Safety Area Width[1]	500'	120'
Runway Safety Area Length Beyond Stop End	1,000'	240'
Runway Safety Area Length Prior to Landing Threshold	600'	240'
Runway Object Free Area Width	800'	400'
Runway Object Free Area Length Beyond Stop End	1,000'	240'
Runway Object Free Area Length Prior to Landing Threshold	600'	240'
Runway Obstacle Free Zone Width	400'	400'
Runway Obstacle Free Zone Length Beyond Stop End	200'	200'
Arrival Runway Protection Zone Length	1,700'	1,000'
Arrival Runway Protection Zone Inner Width	500'	500'
Arrival Runway Protection Zone Outer Width	1,010'	700'
Departure Runway Protection Zone Length	1,700'	1,000'
Departure Runway Protection Zone Inner Width	500'	500'
Departure Runway Protection Zone Outer Width	1,010'	700'

Source: FAA AC 150/5300-13A, Change 1 and HNTB analysis
Note: For Airport Reference Code C-I, C-II, and D-II a RSA Width of 400' is Permissible (AC 150/5300-13A, Table 3-5)

Existing Runway/Taxiways and related Safety Areas

Figure 1-3

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Note: Per guidance from the FAA Western-Pacific Region, the OFAs are depicted to extend to the back of the RPZ.

Legend

- Runway Pavement
- Taxiway/Apron Pavement
- Holdbar
- Building
- Airport Property
- Runway Safety Area (RSA)
- Runway/Taxiway Object Free Area (OFA)
- Runway Obstacle Free Zone (OFZ)
- Runway Protection Zone (RPZ)

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1.5.1.3 Runway Use Configuration

DVT's two parallel runways are oriented east-west with magnetic compass headings of 74 and 254 degrees and operate in one of two flow patterns at all times, east flow or west flow. East flow is characterized by all takeoffs and landings originating from the west towards the east using Runways 7L and 7R. West flow is characterized by all takeoffs and landings originating from the east towards the west using Runways 25L and 25R. The flow pattern at DVT is dictated largely by the flow pattern that is in use at PHX. Typically, east flow is in use through late morning and subsequently changes to west flow for the remainder of the day.

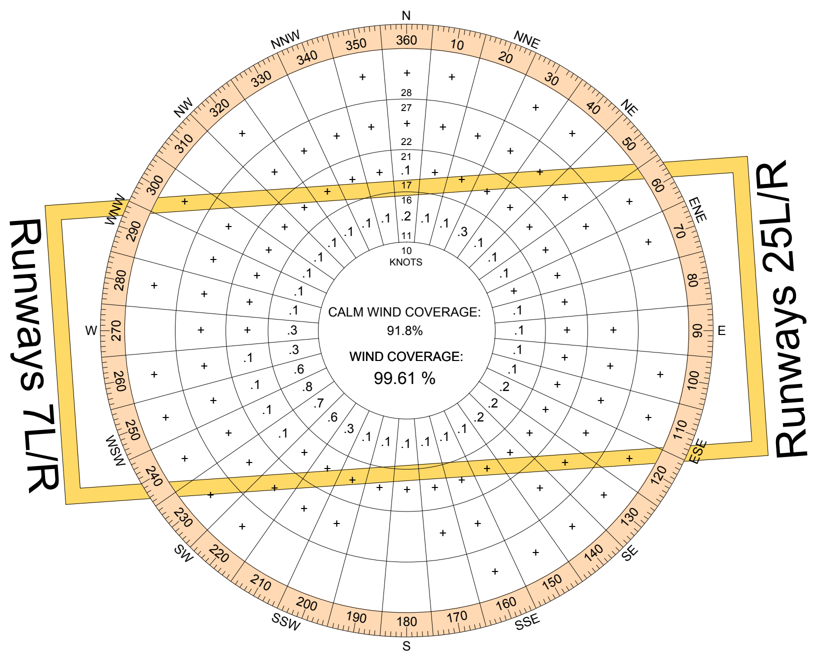
Generally, the most important consideration in determining runway use configuration is the speed and direction of the wind which affects both takeoff and landing distances. Operationally it is preferable for aircraft to take off and land into the wind. This headwind reduces the amount of groundspeed required by an aircraft to take off and reduces the groundspeed upon touchdown. It is also desirable for aircraft to operate with a minimal cross-wind component. Each aircraft has a different maximum cross-wind velocity limit and, generally, smaller aircraft are more affected by cross-wind components.

When a new runway is being planned, historical wind data are used to create a wind coverage diagram or wind rose which aids in determining the optimal runway direction. The wind rose reflects wind velocity, direction, and frequency of occurrences within a given time frame. **Figure 1-4** shows DVT's wind coverage diagram based on approximately 101,076 observations from the National Oceanographic and Atmospheric Administration's (NOAA) National Climactic Data Center (NCDC) between January 2003 and April 2014.

For an existing runway network the wind coverage indicates the percentage of time cross-wind components are within an acceptable velocity which, per FAA guidelines, must be a minimum of 95% regardless of weather conditions. The weather conditions are a reflection of the cloud ceiling and visibility and dictate which flight rules are used. In visual meteorological conditions (VMC), the cloud ceiling is at least 1,000 feet, the horizontal visibility is at least three statute miles and Visual Flight Rules (VFR) are in effect. In restricted visibility or instrument meteorological conditions (IMC), the cloud ceiling is less than 1,000 feet, the horizontal visibility is less than three statute miles, and Instrument Flight Rules (IFR) are in effect. At DVT, IMC conditions occur approximately 1.04% of the year.

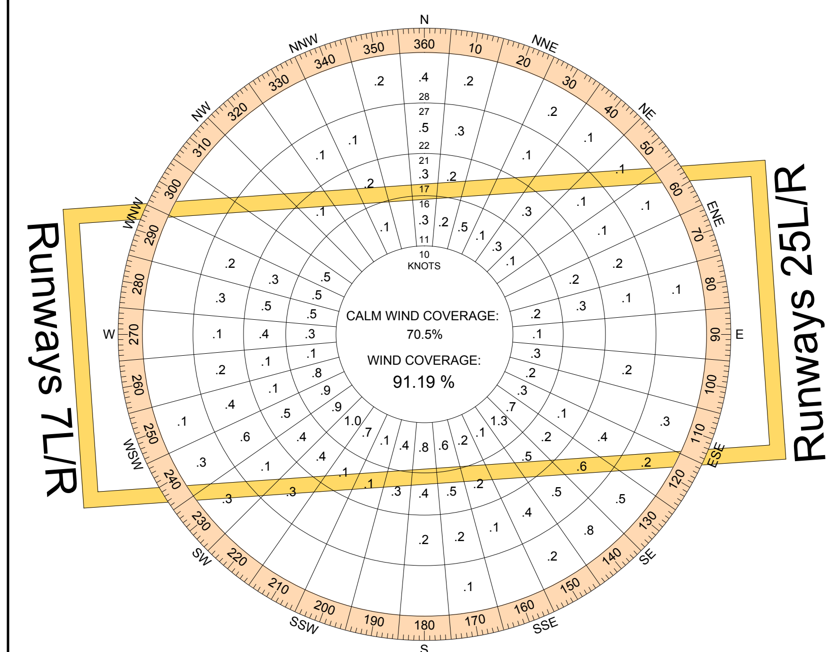
Wind coverage data are shown in **Table 1-6**. Under VFR, DVT runways cover 99.89% of historical wind observations, and under IFR, the runways cover 94.74% of historical wind observations. Under both VFR and IFR, the runways cover 99.83% of historical wind observations. As shown, the existing runway network is oriented to best maximize prevailing wind coverage and minimize cross-wind components. Calm wind coverage allows for a runway operating condition that enables maximum flexibility and operating capacity. During all weather conditions, calm winds occur at DVT approximately 91% of the time.

VFR WIND ROSE



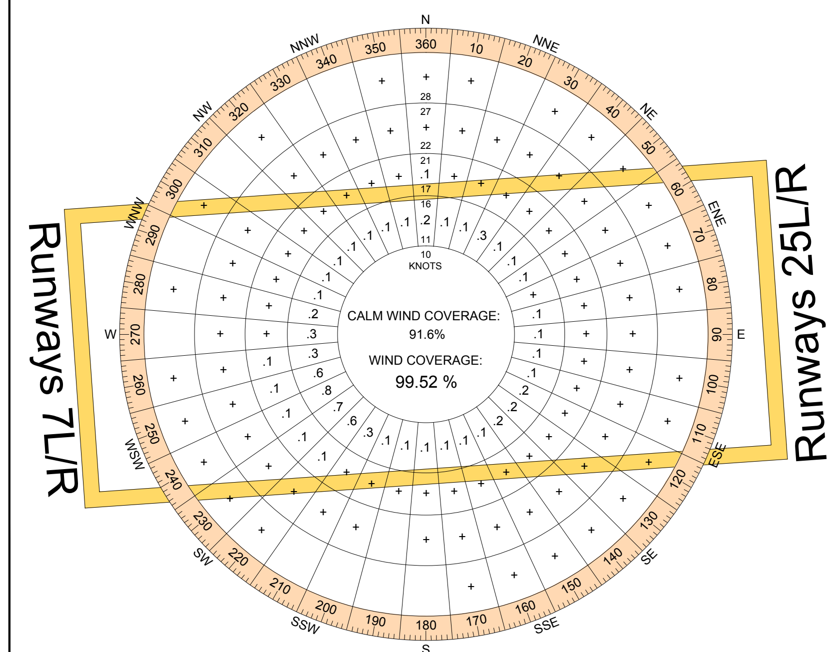
16 Knot Wind Rose - ARC: C-II

IFR WIND ROSE



16 Knot Wind Rose - ARC: C-II

ALL WEATHER WIND ROSE



16 Knot Wind Rose - ARC: C-II

RUNWAYS 7L/R-25L/R WIND COVERAGE

CROSSWIND COMPONENT	VFR COVERAGE	IFR COVERAGE	ALL WEATHER COVERAGE
10.5 Knots	97.15%	83.01%	97.00%
13 Knots	98.67%	87.39%	98.55%
16 Knots	99.61%	91.19%	99.52%
20 Knots	99.89%	94.74%	99.83%

Note: Data collected from the National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center (NCDC); Station: Phoenix Deer Valley; Dates 1/2003 - 4/2014; Number of Observations: 101,076.

Note: IFR conditions occur approximately 1.04% of each year.

DVT Wind Roses and Wind Coverage

Figure 1-4

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Table 1-6: Runways 7L/R-25R/L Wind Coverage

Crosswind Component	VFR Coverage	IFR Coverage	All Weather Coverage
10.5 Knots	97.15%	83.01%	97.00%
13 Knots	98.67%	87.39%	98.55%
16 Knots	99.61%	91.19%	99.52%
20 Knots	99.89%	94.74%	99.83%

Source: NOAA NCDC and HNTB Analysis

Other pertinent climate information for DVT includes the average temperature distribution throughout the year and precipitation, both of which impact runway takeoff and landing length calculations. The average (mean) temperature of the hottest month (July) is 105.1° F. The mean temperature of the coolest month (January) is 65.6° F. The average annual precipitation at DVT is 8.4 inches, with August as the most precipitous month with an average rainfall of 1.35 inches. June is the least precipitous month with an average rainfall of 0.12 inches.

1.5.1.4 Runway Bearing Strengths

Runway pavement bearing strengths define the weight limits at or below which an aircraft may operate on the runways without causing undue stress on the pavement. Bearing strengths are classified by the various main landing gear system configurations that are able to operate on runways at DVT. Single wheel aircraft have one wheel on each side of their main landing gear and are typically characterized by piston aircraft as well as some turboprop and smaller jet aircraft. Double wheel aircraft have two wheels on each side of their main landing gear and are characterized by larger corporate jet and turboprop aircraft. Dual tandem aircraft have four wheels on each side of their main landing gear and are characterized by larger commercial aircraft. **Table 1-7** summarizes the runway pavement bearing strengths for each runway at DVT.

Table 1-7: Runway Pavement Bearing Strengths

Landing Gear System	Runway 7L-25R	Runway 7R-25L
Single Wheel (SW)	119,000 Lbs.	65,000 Lbs.
Double Wheel (DW)	186,000 Lbs.	93,000 Lbs.
Dual Tandem (DTW)	315,000 Lbs.	178,000 Lbs.
Double Dual Tandem (DDTW)	N/A	N/A

Source: Applied Pavement Technology, DVT Final Report, 2014
N/A = Not applicable

1.5.1.5 Taxiways

Taxiways provide a network of pavement for aircraft to move around the airfield, connecting various airfield components and providing access to the runways and aircraft aprons. Taxiways are part of the movement area, which is an area under positive control by ATC. Taxilanes connect aircraft parking positions with taxiways and are generally not part of the movement area. The geometrical design standards for taxiways and taxilanes are derived from the RDC and the Taxiway Design Group (TDG). Similar to the RDC, the FAA has defined the TDG to determine taxiway/taxilane width standards, fillet radii, and some taxiway/taxilane separations[1]. TDG is based on the undercarriage dimensions of the critical aircraft (main gear width and main gear to cockpit distance). The RDC defines most of the separation standards and clearance offsets. **Table 1-8** defines DVT's taxiway/taxilane dimensional standards.

Table 1-8: Taxiway Dimensional Standards

Geometry Element	Runway 7R-25L	Runway 7L-25R
Runway Design Code	C/II/5000	B/I/VIS
Taxiway Design Group	1B	1A
Runway Centerline to:		
Holdline	250'	200'
Parallel Taxiway/Taxilane Centerline	300'	225'
Aircraft Parking Area	400'	200'
Taxiway Width	25'	25'
Taxiway Shoulder Width	10'	10'
Taxiway Edge Safety Margin	5'	5'
Taxiway Centerline to:		
Parallel Taxiway/Taxilane Centerline	105'	69'
Fixed or Moveable Object	65.5'	44.5'
Taxiway Safety Area Width	79'	49'
Taxiway Object Free Area Width	131'	89'
Taxiway Wingtip Clearance	26'	20'
Taxilane Centerline to:		
Parallel Taxilane Centerline	97'	64'
Fixed or Moveable Object	57.5'	39.5'
Taxilane Object Free Area Width	115'	79'
Taxilane Wingtip Clearance	18'	15'

Source: FAA AC 150/5300-13A, Change 1 and HNTB analysis

As depicted in **Figure 1-3,** Taxiways A, B, and C run parallel to the two runways and are the busiest taxiways at DVT. Taxiway A is located north of Runway 7L-25R and primarily serves aircraft originating or terminating their flights at the north side t-hangars. Taxiway A has a centerline to centerline separation with Runway 7L-25R of 300 feet. Taxiway B is located between the two parallel runways and has a centerline to centerline separation with Runway 7L-25R of 200 feet. Taxiway C, which is DVT's busiest taxiway, is located south of Runway 7R-25L and has a centerline to centerline separation with Runway 7R-25L of 300 feet. The complete taxiway network at DVT is depicted in **Figure 1-3** and the width and description of each taxiway is provided in **Table 1-9**.

[1] FAA *Advisory Circular 150/5300-13A Change 1, Figure 1-1*

Table 1-9: Existing Taxiways

Taxiway	Width (Feet)	Function
A	35	Parallel Taxiway
B	35	Parallel Taxiway
C	35	Parallel Taxiway
A3	42	Ramp Connector
A4	35	Runway Entrance/Exit
A5	35	Runway Entrance/Exit
A9	35	Runway Entrance/Exit
A10	35	Runway Entrance/Exit
A11	35	Runway Entrance/Exit
A13	35	Runway Entrance/Exit
B3	35	Ramp Connector
B4	35	Runway Entrance/Exit
B5	35	Runway Entrance/Exit
B9	35	Runway Entrance/Exit
B11	40	Runway Entrance/Exit
C1	37	Runway Entrance/Exit
C2	37	Runway Entrance/Exit
C3	37	Runway Entrance/Exit
C6	38	Runway Entrance/Exit
C7	38	Runway Entrance/Exit
C8	38	Runway Entrance/Exit
C9	38	Runway Entrance/Exit
C10	38	Runway Entrance/Exit
C11	37	Runway Entrance/Exit
C12	37	Runway Entrance/Exit
C13	37	Runway Entrance/Exit

Source: 2014 DVT eALP survey prepared by Woolpert

1.5.1.6 Pavement Condition

The Aviation Department commissioned an update to DVT's airport pavement management study (APMS) in 2013 to identify current pavement conditions in order to proactively plan for rehabilitation of failing pavement. Pavements have potential Pavement Condition Index (PCI) values that range from 0 (completely failed pavement) up to a value of 100 (pavements that are in excellent condition). A PCI value greater than 85 is generally considered to be in good condition and requires periodic preventative maintenance to stay in that range. Pavements with PCI values ranging between 56 and 85 generally require more significant maintenance such as mill and overlay or joint resealing. PCI values below 55 typically require significant rehabilitation including replacement of sub-grade material. Runway 7L-25R has a PCI value of 100, having been rehabilitated in 2012. Runway 7R-25L has an average PCI value of 76 indicating average wear. In review of DVT's parallel taxiways, Taxiway C will require the most near-term rehabilitation. Taxiway C's lowest PCI section was reported to be 59, indicating that near-term rehabilitation will be required. Taxiway A was recently reconstructed and relocated, and there are near-term plans to reconstruct and relocate Taxiway B to 300 feet from Runway

7L-25R's centerline. DVT's runway crossing taxiways, B3, B5, B9, and B11, will all require near-term rehabilitation as their PCI scores range between 15 and 42. A significant portion of the apron also requires near-term pavement rehabilitation. Low-scoring areas include: the City of Phoenix Police Air Support Unit (Air Support Unit) apron, Cutter Aviation apron, and Atlantic Aviation apron.

The study also reviewed the pavement classification number (PCN) for DVT's airfield infrastructure. According to the FAA, the PCN is a numerical value that represents relative load capacity of a pavement in terms of a standard single wheel load with a tire pressure of 181 pounds per square inch (psi). As discussed in Applied Pavement Technology's May 2014 Final Report, *Strength Analysis of Airfield Pavements at Phoenix Deer Valley Airport*, a PCN is composed of the following categories:

Pavement Type
- R = Rigid
- F = Flexible

Subgrade Strength Category
- A = High (CBR > 13; k-value > 442 psi/in)
- B = Medium (CBR = 8 to 13; k-value = 221 to 442 psi/in)
- C = Low (CBR = 4 to 8; k-value = 92 to 221 psi/in)
- D = Very Low (CBR < 4; k-value < 92 psi/in)

Maximum Allowable Tire Pressure
- W = High (no limit)
- X = Medium (146 to 218 psi)
- Y = Low (74 to 145 psi)
- Z = Very Low (< 73 psi)

Evaluation Method
- T = Results of technical evaluation
- U = Based on the current using aircraft

The number preceding the letters is the equivalent single wheel load based on the maximum allowable load for the critical aircraft for that pavement. Runway 7L-25R has a PCN designation of 50/F/A/X/T while Runway 7R-25L has a minimum PCN designation of 29/F/C/Y/T. The PCI and PCN information indicate that Runway 7R-25L will require near-term maintenance to continue to serve the fleet mix that use the runway today and into the future.

1.5.1.7 Airfield Lighting and Signage

Runway edge lighting provides aid to pilots in times of low visibility and during nighttime operations. At DVT, both runways have medium intensity runway edge lighting (MIRL), which is consistent with the established approach visibility minimums at DVT. Similarly, DVT's taxiways are equipped with medium intensity taxiway edge lighting (MITL). In addition, DVT has airfield signage to assist pilots in identifying their location on the airfield and to convey critical information to pilots, such as distance remaining on the runway.

1.5.1.8 Aprons and Aircraft Parking

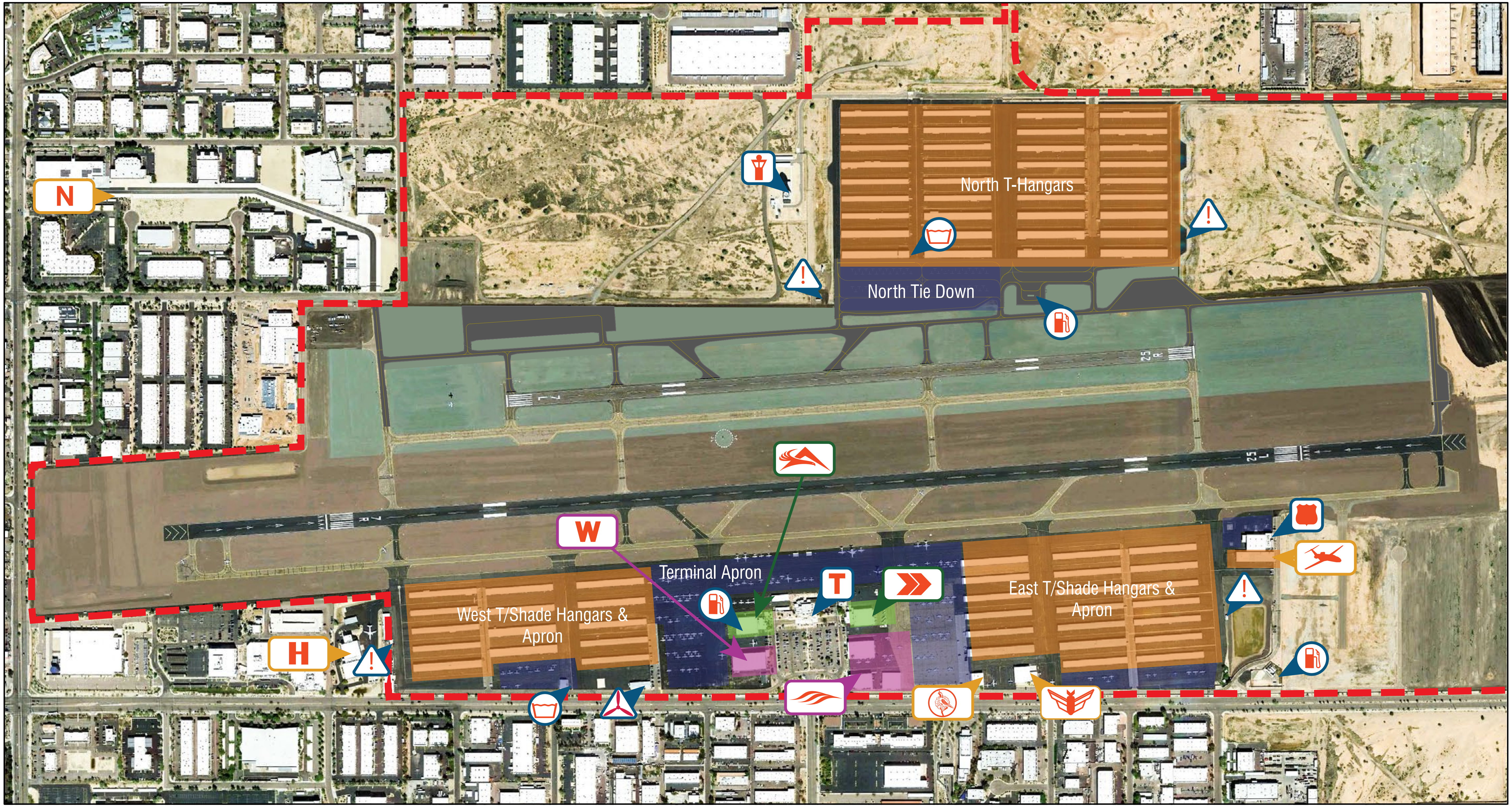
DVT's total aircraft apron area is approximately 247,760 square yards of pavement divided among seven apron areas and includes approximately 372 aircraft parking positions. The seven apron areas (shown on **Figure 1-5**) include: north t-hangar apron, east t-hangar apron, west t-hangar apron, terminal apron, Atlantic Aviation apron, Cutter Aviation apron, and the Police Air Support Unit apron.

The north t-hangar apron is located on the north side of DVT and has approximately 86 aircraft tie-down parking positions spanning nearly 61,000 square yards. This apron also provides access to and from the north t-hangars. The east t-hangar apron is located south of the furthest east t-hangars and provides 21 aircraft tie-down parking positions for based aircraft, including the Arizona Game and Fish Department. The east t-hangar apron is approximately 7,500 square yards. The west t-hangar apron is located south of the west t-hangars and provides 38 aircraft tie-down parking positions for based aircraft, spanning approximately 13,060 square yards. The terminal apron is located directly north of the terminal building and provides 52 aircraft tie-down parking positions, spanning approximately 37,500 square yards. The terminal apron is primarily used by transient aircraft. The Atlantic Aviation apron is located west of the terminal building and provides 70 aircraft tie-down parking positions, spanning approximately 60,600 square yards. The Atlantic Aviation apron is utilized by Atlantic Aviation for FBO operations and by Westwind School of Aeronautics' flight training aircraft. The Cutter Aviation apron is located east of the terminal and provides 96 aircraft tie-down parking positions, spanning approximately 61,800 square yards. The Cutter Aviation apron is utilized by Cutter Aviation for FBO operations and by TransPac Aviation Academy's flight training aircraft. The Police Air Support Unit apron is located east of the furthest t-hangars on the south side of DVT and provides two aircraft tie-down parking positions, spanning approximately 6,300 square yards. A summary of the seven aprons' size and parking positions is presented in **Table 1-10** below.

Table 1-10: Aircraft Aprons

Apron	Size (Square Yards)	Aircraft Parking Positions
North T-Hangar Apron	61,000	86
East T-Hangar Apron	7,500	21
West T-Hangar Apron	13,060	38
Terminal Apron	37,500	52
Atlantic Aviation Apron	60,600	70
Cutter Aviation Apron	61,800	96
Police Air Support Unit Apron	6,300	2
Total	**247,760**	**372**

Source: Coffman and Associates Airport Layout Plan Narrative Report, 2014



DVT Functional Areas

Figure 1-5

DVT

Legend

- Aircraft Hangars
- Aircraft Tie-Down Area
- Fixed Base Operators
- Flight Schools
- Airport Property Boundary
- Fueling Facility
- Aircraft Maintenance
- Wash Rack
- Hazardous Waste Collection Site
- FAA Air Traffic Control Tower
- Terminal Building
- Police Air Support Unit
- Civil Air Patrol

FBOs

- Atlantic Aviation
- Cutter Aviation

Flight Schools

- Westwind School of Aeronautics
- TransPac Aviation Academy

Other Facilities

- Warbirds Hangar
- Honeywell
- Executive Hangars
- Arizona Game & Fish Hangar
- Northwest Industrial Airpark

N

NOT TO SCALE

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1.5.1.9 Aircraft Hangars

In addition to apron parking positions, DVT has three covered aircraft parking options, including t-hangars, shade hangars, and box hangars. T-hangars have the largest supply of the three covered aircraft parking options. There are 22 t-hangar buildings on the south side of DVT and 36 t-hangar buildings on the north side of DVT, totaling approximately 952,950 square feet. DVT offers two configurations of t-hangar buildings, 44 t-hangar buildings with 14 smaller parking positions and 14 t-hangar buildings with 12 larger parking positions. Shade hangars have the next largest supply at DVT. There are 12 shade hangar buildings, all of which are located on the south side of DVT, totaling approximately 221,411 square feet. There are 11 box hangar buildings throughout DVT, totaling approximately 161,317 square feet. DVT currently has a wait list of aircraft for large and small t-hangars, while there is current availability for shade hangars. Box hangars are managed by tenants and as such; they do not have a readily available wait list. A summary of DVT's hangar facilities is presented in **Table 1-11** below.

Table 1-11: Aircraft Hangars

Apron	Buildings	Aircraft Parking Positions	Area (Sq. Feet)
T-Hangars	58	768	952,950
Shade Hangars	12	240	221,411
Box Hangars	11	N/A[1]	161,317
Total	**81**	**1,008**	**1,335,678**

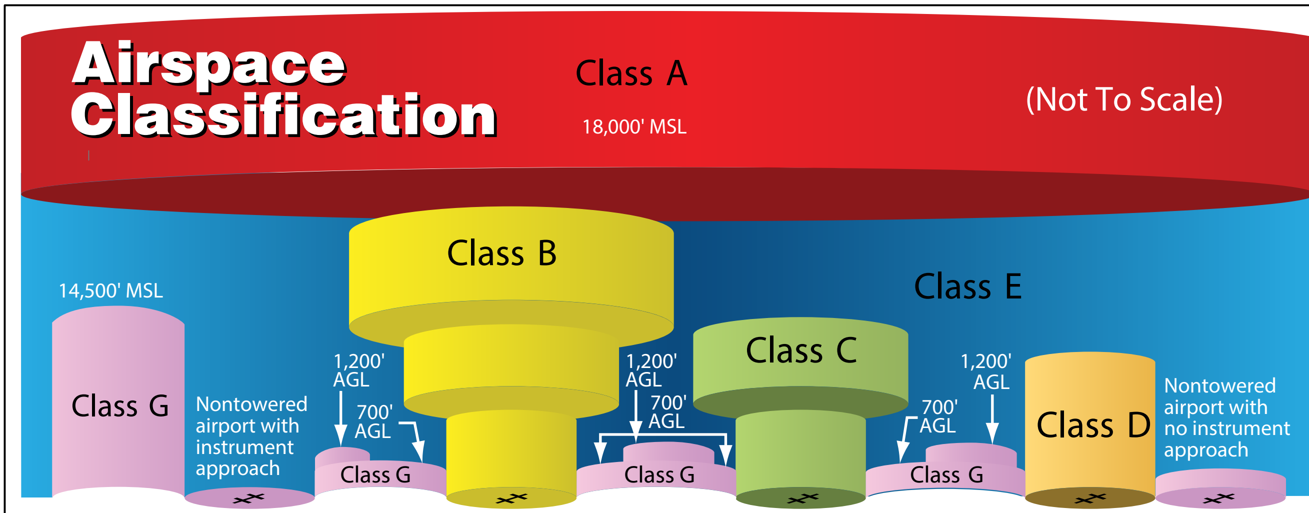
Source: HNTB Analysis and City of Phoenix Aviation Department
Note 1: Aircraft do not have defined parking positions within box hangars.

1.5.2 Area Airspace and Traffic Control

1.5.2.1 Airspace Structure

The National Airspace System is the network of United States airspace which includes air navigation facilities, equipment, procedures, airports, and air traffic controllers. The NAS consists of six, 3-dimensional classes, lettered A, B, C, D, E, and G, that differ based on the flight rules appropriate to the airspace and level of interaction between the aircraft and ATC. **Figure 1-6** shows the NAS classes, entry requirements, pilot qualifications, and visibility minimums.

The classification of airspace above DVT varies depending on whether or not the ATCT is open. During operational hours, which currently range from 6:00 am to 12:00 am (midnight) daily, DVT's airspace is classified as Class D airspace. While the ATCT is closed between 12:00 am (midnight) and 6:00 am, DVT's airspace is classified as Class G. Class D airspace applies to airports with an operational ATCT. DVT's Class D airspace is comprised of a cylinder with a radius of approximately 4.4 miles and a height extending from the surface up to, but not including 4,000 feet above DVT's reported airport elevation of 1,478 feet MSL. Aircraft must establish two-way radio communications with ATC prior to entering the airspace and maintain communications within the airspace. Control within the Class D airspace is handled by ATC controllers stationed at DVT's ATCT, located on the north side of DVT, who are responsible for coordinating arriving and departing aircraft and ground taxi movement on the airport surface.



	Class A	Class B	Class C	Class D	Class E	Class G
Entry Requirements	ATC clearance	ATC clearance	Prior two-way communications	Prior two-way communications	Prior two-way communications*	Prior two-way communications*
Minimum Pilot Qualifications	Instrument Rating	Private or Student certification—local restrictions apply.	Student certificate	Student certificate	Student certificate	Student certificate
Two-Way Radio Communications	Yes	Yes	Yes	Yes	Yes, under IFR flight plan*	Yes*
Special VFR Allowed	No	Yes	Yes	Yes	Yes	N/A
VFR Visibility Minimum	N/A	3 statute miles	3 statute miles	3 statute miles	3 statute miles**	1 statute mile †
VFR Minimum Distance from Clouds	N/A	Clear of clouds	500' below, 1,000' above, 2,000' horizontal	500' below, 1,000' above, 2,000' horizontal	500' below,** 1,000' above, 2,000' horizontal	Clear of clouds †
VFR Aircraft Separation	N/A	All	IFR aircraft	Runway operations	None	None
Traffic Advisories	Yes	Yes	Yes	Workload permitting	Workload permitting	Workload permitting
Airport Application	N/A	• Radar • Instrument approaches • Weather • Control tower • High density	• Radar • Instrument approaches • Weather • Control tower	• Instrument approaches • Weather • Control tower	• Instrument approaches • Weather	• Control tower

*Exception: temporary tower or control tower present
**True only below 10,000 feet
†True only during day at or below 1,200 feet AGL (see 14 CFR part 91)

AGL—above ground level
FL—flight level
MSL—mean sea level

National Airspace Classification

Source: FAA Instrument Flying Handbook (FAA-H-8083-15A), Ch. 8, The National Airspace System, 2009

Figure 1-6

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When Class G airspace is in effect, the airspace in the vicinity of DVT is considered uncontrolled and ATC does not maintain responsibility for providing separation between aircraft. Class G airspace begins at the surface and terminates at the Class E airspace above DVT, approximately up to 1,200 feet above ground level.

Beyond the Class D airspace area at DVT, ATC is provided by the Phoenix Terminal Radar Approach Control (TRACON) facility located at PHX. The Phoenix TRACON controls the airspace within a 40-nautical mile radius around PHX and up to 21,000 feet above MSL excluding Luke Air Force Base's airspace. The Phoenix TRACON also controls airspace north of the valley when Prescott's ATCT is open. Beyond the Phoenix TRACON, aircraft flying en route to or from DVT on an IFR flight plan must correspond with the Air Route Traffic Control Center (ARTCC) in Albuquerque, New Mexico. The Albuquerque ARTCC controls airspace through portions of the southwestern U.S. from the Arizona / California border to Amarillo and El Paso, Texas.

1.5.2.2 Special Use Airspace

In addition to the airspace classifications discussed above, there are additional airspace limitations known as special use airspace (**Figure 1-7**), defined below. Restrictions are often put on aircraft flying through special use airspace depending on the classification of that airspace.

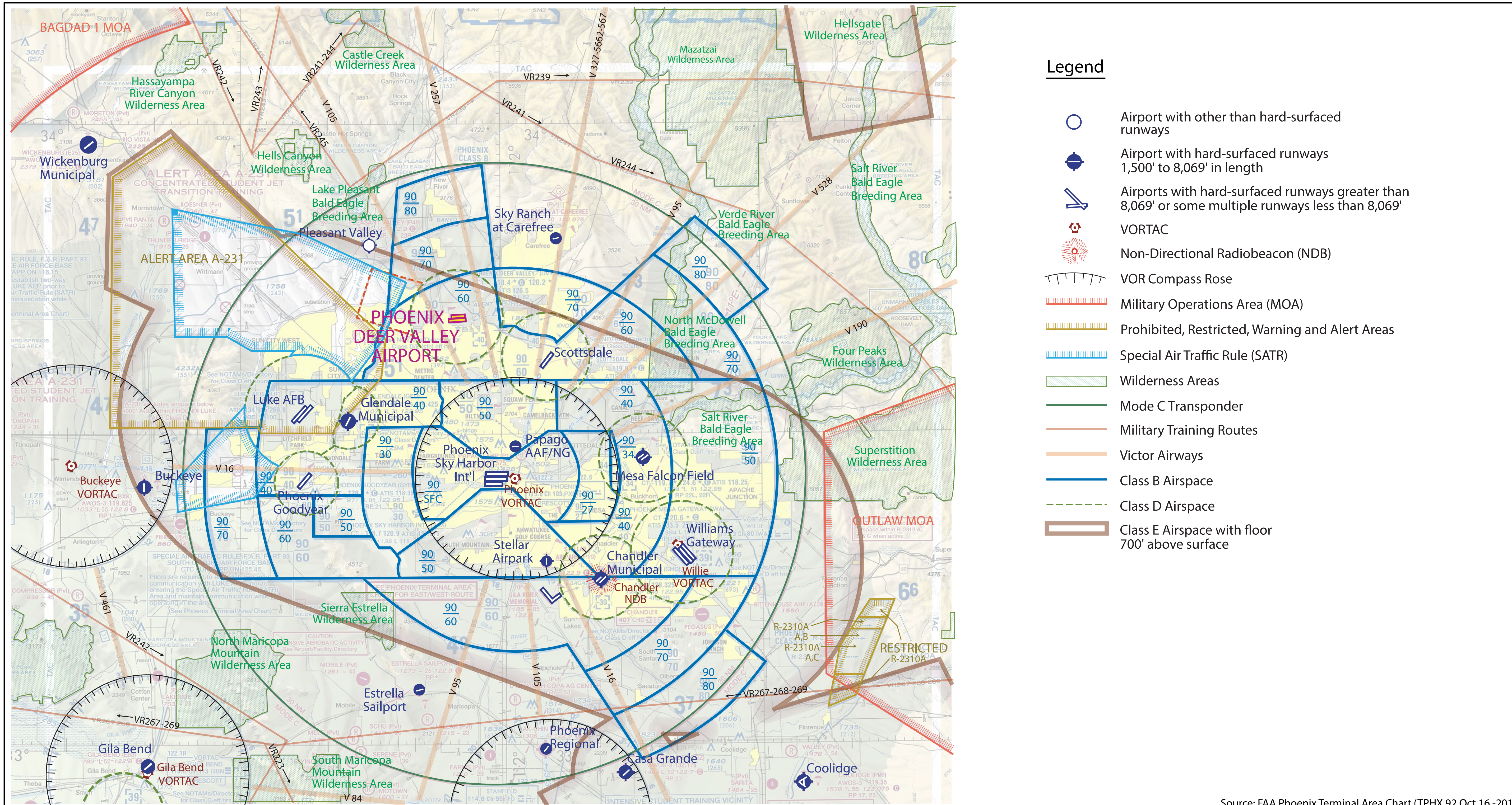
Military Operating Areas (MOAs): Within the vicinity of DVT there are several MOAs including Bagdad 1, Gladden 1, Turtle, and Quail to the northwest, Outlaw and Jackal to the east, and Sells 1 to the south. Aircraft wishing to cross these areas must be in contact with Albuquerque Center.

Military Training Routes: There are many military training routes throughout the Phoenix Metropolitan area, including visual and instrument routes. Aircraft can transit through/along these routes at or below 10,000 feet MSL.

Wilderness Areas: There are a large number of wilderness areas in the Phoenix Metropolitan area including national parks and protected-species breeding grounds. Aircraft are advised to maintain a minimum of 2,000 AGL over these locations. The Lake Pleasant Bald Eagle Breeding Area is located north of DVT.

Alert Areas: Alert Areas have large concentrations of aircraft, often for training purposes. The closest alert area to DVT is Alert Area A-231, which is located west of DVT surrounding Luke Air Force Base. Due to the volume of military training activity, a Special Air Traffic Rule (SATR) was established which requires aircraft to maintain two-way contact with Luke Air Force Base's Approach Control when entering or while in the airspace. The SATR does not prevent aircraft from entering the airspace.

Restricted Airspace: Restricted Airspace includes airspace closed to unauthorized aircraft and often includes potential hazard areas such as gunnery ranges, bomb ranges, and other military activities. Restricted Airspace is located to the far south and west of the Phoenix Metropolitan area.



DVT/ Phoenix Airspace

Figure 1-7

DVT

1.5.2.3 Navigational Aids

Navigational Aids enhance the wayfinding ability and approach visibility of an airport. NAVAIDs are generally classified into three categories, precision NAVAIDs, non-precision NAVAIDs and visual NAVAIDs. Precision NAVAIDs include the components of a precision instrument approach: vertical and horizontal instrument guidance. These usually include: glideslope, localizer, precision approach radar (PAR), and select Global Positioning Systems (GPS). DVT does not have any existing NAVAIDs that would be considered as precision systems. DVT does have a wide variety of NAVAIDs that are considered non-precision systems. These include GPS, Airport Surveillance Radar 9 (ASR-9), near-by very high frequency (VHF) omni-directional range (VOR) with or without distance measuring equipment (DME), and tactical air navigation (TAC). DVT's visual NAVAIDs include precision approach path indicator (PAPI), medium intensity runway lighting (RITL), MITL, and non-precision runway markings.

1.5.2.4 Instrument Procedures

There are four existing instrument approach procedures (IAPs) published by the FAA for DVT, each with different approach visibility minima and decision altitudes depending on the aircraft approach category of the aircraft using the IAP and the specific approach used. **Table 1-12** lists the available IAPs for DVT and presents the lowest minimums for each approach. The minimums listed within the table are provided for Aircraft Approach Category C aircraft, consistent with DVT's existing airport reference code. The IAPs include the following approaches: Localizer Performance with Vertical Guidance (LPV), Lateral Navigation/Vertical Navigation (LNAV/VNAV), Lateral Navigation (LNAV) only, and circling approaches. It is important to note that there are not any existing straight-in approaches to Runway 7L-25R. Pilots can use a circling approach to either end of the runway provided the visibility is within the lowest published minimums.

In addition to the IAPs, DVT has a published instrument departure procedure, *Deer Valley One Departure (Obstacle)*, which presides over each of the four runway ends.

Table 1-12: Published Instrument Approach Procedures

Approach	Horizontal Visibility Minima (miles)	Vertical Decision Height (feet)
RNAV (GPS) Runway 7R		
LPV	1.25	400
LNAV/VNAV	2.25	700
LNAV	1.50	600
Circling	2.75	1,000
RNAV (GPS) Runway 25L		
LPV	1.25	400
LNAV	2.75	900
Circling	2.75	1,000
RNAV (GPS)-B	2.75	1,000
RNAV (GPS)-C	2.75	1,000

Source: FAA Instrument Approach Procedures – 8/13/2014

1.5.2.5 Visual Flight Procedures

Aircraft that are not operating under Instrument Flight Rules will operate under Visual Flight Rules. VFR aircraft have the responsibility of maintaining their own separations from other aircraft and obstacles. Given the flight training nature of DVT and the large number of based aircraft, DVT has many VFR flights daily.

1.5.2.6 Regional Airports

The Phoenix Metropolitan area has many airports in close proximity to each other (shown on **Figure 1-1**) that serve various purposes to the region, state, and NAS. In order of proximity to DVT, other regional airports and their associated primary role include:

- Scottsdale Municipal Airport – General Aviation Reliever - Primarily jet / corporate traffic
- Glendale Municipal Airport – General Aviation Reliever - Primarily light GA traffic
- Phoenix Sky Harbor International Airport – Primary Commercial Service Airport
- Luke Air Force Base – Active Air Force Base
- Phoenix-Goodyear Airport - General Aviation Reliever – Role is evolving to maintenance, repair, and overhaul
- Pleasant Valley Airport – General Aviation Reliever – Primarily light GA traffic including gliders
- Falcon Field Airport – General Aviation Reliever – Primarily light GA traffic and Boeing military helicopters
- Phoenix-Mesa Gateway Airport – Commercial Service Airport – Commercial service alternative for the Phoenix area
- Chandler Municipal Airport – General Aviation Reliever – Primarily light GA traffic

1.5.3 Landside Facilities

The landside facilities at DVT include the terminal building, Cutter Aviation and Atlantic Aviation FBOs, Westwind School of Aeronautics and TransPac Aviation Academy flight schools, fueling facilities, major utilities, and support facilities. DVT's landside facilities, including tenant locations, are illustrated in **Figure 1-5**.

1.5.3.1 Terminal Building

The Terminal Building is located on the south side of DVT between the Atlantic Aviation and Cutter Aviation FBOs. The Terminal Building is a two level structure with a total building area of approximately 20,800 square feet. The Terminal Building features several facilities including the Deer Valley Airport Restaurant, TeeBird Air Pilot Shop, Airport Administration and Operations, conference room, lounge, vending machines, outdoor observation areas, and a pilot briefing room.

1.5.3.2 Fixed Base Operators

There are two FBOs that are currently based at DVT: Atlantic Aviation and Cutter Aviation. Atlantic Aviation is located west of the Terminal Building and subleases space to the Westwind School of Aeronautics. Atlantic Aviation's terminal building is approximately 2,000 square feet and includes a wide variety of amenities, including: pilot's lounge, waiting area/lounge, weather station, restroom, showers, kitchenette, and conference rooms. In addition to its FBO terminal, Atlantic Aviation provides a myriad of services to its clients including: charter flights, rental car, aircraft sales, aircraft rental, aircraft maintenance and parts supply, hangar rental, aircraft tie-down parking, avionics sales/repair, and aircraft fueling.

Cutter Aviation is located east of the terminal building and subleases space to the TransPac Aviation Academy. Cutter's terminal building is approximately 30,000 square feet and includes the following amenities: pilot's lounge, sleep room, lobby, restrooms, flight planning, and weather station. In addition to its FBO terminal, Cutter Aviation provides the following services to its clients: rental car, aircraft sales, hangar rental, aircraft tie-down parking, aircraft maintenance, avionics sales/repair, and aircraft fueling. A large portion of Cutter's apron is in poor condition and is in need of near-term pavement rehabilitation.

1.5.3.3 Flight Schools

There are two flight schools currently based at DVT, the Westwind School of Aeronautics and the TransPac Aviation Academy. Both flight schools offer comprehensive flight training programs for private pilots and career airline pilots. The Westwind School of Aeronautics operates from Atlantic Aviation's leasehold while the TransPac Aviation Academy operates from Cutter Aviation's leasehold. Both flight schools support significant foreign pilot training from rapidly growing countries including China, South Korea, and Vietnam. The flight schools operate daily, year-round, but are typically busiest Monday through Friday.

1.5.3.4 Other Tenants

The Police Air Support Unit includes fixed wing and rotor-craft aircraft to support the Police Department's mission within the City. The Air Support Unit is conveniently located on the southeast side of DVT, allowing the unit to rapidly respond to calls within the City without having to cross-over arriving/departing air traffic. Sections of the Air Support Unit's aircraft apron as well as main operations building are in poor condition. Fire and emergency support services are provided by the City of Phoenix Fire Department Station 36, located at the intersection of W. Melinda Lane and N. 9th Avenue just south of DVT.

DVT has two through-the-fence agreements in place. Through-the-fence operations have access to the airfield from private property not contained within the Airport Operations Area (AOA). Honeywell has a through-the-fence operation on the south side of DVT, located west of the west t-hangar apron. Aircraft have direct access to Taxilane R1 from Honeywell's property. The Northwest Industrial Air Park is the second through-the-fence operation and is located at the northwest corner of DVT. Aircraft must taxi across Williams Drive to enter the AOA.

1.5.3.5 Fueling Facilities

There are three on-airport fueling facilities at DVT, including the Sibran self-fueling station on the north side of DVT and fueling at both the Atlantic Aviation and Cutter

Aviation FBOs. Fuel providers generally supply only two varieties of aviation fuel, 100-Low Lead (AVGAS) and Jet-A fuel. AVGAS is used mainly by piston-powered general aviation aircraft while Jet-A is typically used by turboprop and jet-powered aircraft. The Sibran self-fueling station includes a single above-ground 15,000 gallon AVGAS tank. Atlantic Aviation's full-service fueling facilities include a single above-ground 17,000 gallon AVGAS tank and a single above-ground 25,000 gallon Jet-A tank. Cutter Aviation's full service fueling facilities include a single above-ground 20,000 gallon Jet-A tank, one above-ground 20,000 gallon AVGAS tank, one below-ground 20,000 gallon AVGAS tank, and a single below-ground 2,000 gallon red-dye diesel tank for ground service equipment. A summary of the various fuel tanks is provided in **Table 1-13** below.

Table 1-13: Fuel Tank Inventory

Provider	Type	Above/Below Ground	Volume (Gallons)
Sibran	AVGAS	Above	15,000
Atlantic Aviation	AVGAS	Above	17,000
Atlantic Aviation	Jet-A	Above	25,000
Cutter Aviation	AVGAS	Above/Below	40,000
Cutter Aviation	Jet-A	Above	20,000
Cutter Aviation	Red-Dye Diesel	Below	2,000
Total			**119,000**

Source: City of Phoenix Aviation Department and Tenant Interviews

1.5.3.6 Aircraft Rescue and Firefighting

DVT does not have an on-airport Aircraft Rescue and Firefighting (ARFF) station. Existing City of Phoenix Fire Station 36, which is located at the intersection of West Melinda Lane and North 9th Avenue, is the station assigned to respond to on-airport emergencies. It should be noted that Station 36 is approaching the end of its service life and will require significant reconstruction or relocation within the next 10 years.

1.5.3.7 Airport Maintenance

DVT operates a small area for airport related maintenance in the southwest corner of airport property between Honeywell and the southwest t-hangars. The area includes a building and maintenance yard to store equipment and vehicles.

1.5.3.8 Utilities

Major utilities serving DVT include water, sanitary sewer, electrical, phone, and data services. The City of Phoenix Water Department provides all water and sanitary sewer services for DVT. Electric service is provided by Arizona Public Service Corporation. Telephone and data services are provided by CenturyLink.

1.6 Vehicle Access and Circulation

1.6.1 Regional Access

Regional access to DVT is provided from Interstate 17 two miles west of DVT and Arizona (AZ) Highway 101 Loop one mile south of DVT which intersects with

Interstate 17 southwest of DVT. DVT is bordered by 19th Avenue to the west; Deer Valley Road to the south, and 7th Street to the east. Pinnacle Peak Road connects 7th Street and 19th Avenue north of DVT. An exit off Interstate 17 at Deer Valley Road and an exit off AZ Highway 101 Loop at 7th Avenue provide primary access to DVT while the Pinnacle Peak exit off Interstate 17 and the 7th Street exit off AZ Highway 101 Loop provide secondary access to DVT and facilities on the north side.

Adjacent to DVT, Deer Valley Road is an east-west six-lane thoroughfare with a median, sidewalks, bike lanes, and curbs. Running north-south, 19th Avenue has five-lanes plus a center turn lane (three northbound lanes and two southbound lanes) with bike lanes and sidewalks near DVT. To the east 7th Street is a two lane roadway running north-south with no curbs, sidewalks, or bike lanes. Extending from AZ Highway 101 Loop across Deer Valley Road, 7th Avenue provides access from the south directly to DVTs south entrance. It has four-lanes, a center turn lane, bike lanes, and sidewalks.

1.6.2 Access Roadways

There are two primary vehicular access points at DVT. The south entrance is located at Deer Valley Road and 7th Avenue, leading to the Terminal Building, FBO's and flight schools. Airport Boulevard runs from 7th Street to the north t-hangar area and FAA ATCT along the northern boundary of DVT. There is no direct access to the north area from 19th Avenue or Pinnacle Peak Road and vehicles coming from all directions must traverse 7th Avenue on the east side of DVT to reach Airport Boulevard.

Recently a short segment of 7th Avenue was constructed on the north side of DVT connecting Pinnacle Peak Road with the FedEx Ground Facility. This portion of the roadway is 850 feet long and 23 feet wide. If the roadway was widened and extended it would connect directly with the north-south alignment of Airport Boulevard connecting directly into the ATCT.

1.6.3 Internal Circulation

Internal circulation is provided through a combination of perimeter roads, the Terminal Building parking lot, taxilanes and aprons. To access facilities on the south side of DVT, vehicles can travel along the paved airport perimeter road running parallel with Deer Valley Road to both the east and west of the main Terminal Building parking lot. Airfield gates are positioned at either end of the perimeter road to restrict access to the airfield to authorized users. On the east end, the gate is located outside of the Police Air Support Unit.

On the north side of DVT, internal circulation is provided to the t-hangar facilities and FAA ATCT from Airport Boulevard. Past the airfield gates on the secure side of DVT, the airport perimeter road provides internal access around both ends of the runways, to the airport maintenance facility, and to all hangar and apron areas.

1.6.4 Parking and Transportation Options

1.6.4.1 Terminal Parking Lot

The primary general parking area is located south of the terminal and is 179,200 square feet, providing 361 parking spaces including 14 designated handicapped spaces. This parking area is used by employees and visitors to the terminal building as well as employees and customers of the FBOs and flight schools located near the terminal building.

1.6.4.2 Rental Cars

Enterprise offers rental car services from the Cutter Aviation facility Monday through Friday from 8:00 am to 5:00 pm and weekends from 10:00 am to 4:00 pm. Hertz Local Edition offers rental car services from the Atlantic Aviation facility Monday through Friday from 8:00 am to 5:30 pm and weekends from 08:00 am to 12:00 pm.

1.6.4.3 Bus

The Valley Metro transit system stops near DVT. Bus Route 19 runs from the west side of downtown Phoenix to DVT and has a stop located at 19th Avenue and Deer Valley Road. Route 19 operates Monday through Friday northbound from 6:18 am to 11:21 pm and southbound from 4:42 am to 9:10 pm. On the weekend, Route 19 operates northbound from 7:24 am to 8:57 pm and southbound from 5:36 am to 7:10 pm.

Bus Route 7 also runs from downtown Phoenix, on the east side, to DVT and stops along Deer Valley Road at both 19th Avenue and 7th Street. Route 7 operates Monday through Friday northbound from 7:01 am to 11:13 pm and southbound from 5:01 am to 10:02 pm. On the weekend, Route 7 operates northbound from 7:23 am to 9:01 pm and southbound from 6:04 am to 7:44 pm.

1.6.4.4 Hangar Parking

Vehicular parking is provided at the hangar facilities with 213 spaces provided near the west t-hangars off of the south perimeter road. An additional 275 spaces are provided near the east t-hangars also accessed off the south perimeter road. In the north 269 spaces are provided for the north t-hangars accessed from Airport Boulevard.

1.7 Environmental Inventory

This section summarizes the environmental factors considered in the evaluation of alternative development options. Available information about the existing environmental conditions at DVT has been derived from the previous Master Plan Update and confirmed through City and agency resources.

1.7.1 Wetlands

The U.S. Army Corps of Engineers (ACOE) regulates the discharge of dredge and/or fill material into waters of the United States, including adjacent wetlands, under Section 404 of the Clean Water Act.

Wetlands are defined by *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 seasonally 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 area, 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 ACOE previously determined there were no wetlands on DVT property. A review of National Wetland Inventory (NWI) maps prepared by the U.S. Fish and Wildlife Service also indicate a lack of wetland resources within the DVT environs.

1.7.2 Floodplains

As defined in *FAA Order 1050.1E,* floodplains consist of "lowland and relatively flat areas adjoining inland and coastal water including flood prone areas of offshore islands, including at a minimum, that area subject to one percent or greater chance of flooding in any given year." Federal agencies are directed to take action to reduce the risk of flood loss, minimize the impact of floods on human safety, health and welfare, and restore and preserve the natural and beneficial values served by floodplains. Floodplains have natural and beneficial values, such as providing groundwater recharge, water quality maintenance, fish, wildlife, plants, open space, natural beauty, outdoor recreation, agriculture and forestry. *FAA Order 1050.1E (12) (*c) indicates that "if the proposed action and reasonable alternatives are not within the limits of a base floodplain (100-year flood area)," that it may be assumed that there are no floodplain impacts. The limits of base floodplains are determined by Flood Insurance Rate Maps (FIRM) prepared by the Federal Emergency Management Agency (FEMA). According to the City of Phoenix General Plan, DVT is not located within a floodplain.

1.7.3 Water Supply and Quality

The City maintains a Water Facilities Master Plan that is updated approximately every five years. Water supplies for DVT are provided by the City of Phoenix Water Services Department. The City currently operates and maintains approximately 5,600 miles of water mains and operates five water treatment plants, including one near DVT.

The stormwater permitting process provides a mechanism to require the implementation of controls designed to prevent harmful pollutants from being washed into local water bodies by stormwater runoff. The City is currently regulated under the Arizona Pollutant Discharge Elimination System (AZPDES) Stormwater Multi-Sector General Permit for Industrial Activities AZMSGP2010-002 (MSGP-2010) released by the Arizona Department of Environmental Quality (ADEQ) for its stormwater runoff. The Aviation Department prepared a Stormwater Pollution Prevention Plan (SWPPP) in accordance with MSGP-2010 for DVT in April 2014. The

Aviation Department has identified airport tenants that conduct industrial activities at DVT as co-permittees and in addition to co-permittees, the Aviation Department requires all airport tenants and operators conducting activities with the potential to cause stormwater pollution to comply with the SWPPP. Entities potentially subject to the MSGP-2010 include tenants such as FBOs and others providing on-site services, such as aircraft, vehicle and equipment wash service providers and aircraft, vehicle and equipment maintenance providers. Companies requiring MSGP-2010 coverage for industrial activities and choosing not to participate as co-permittees must develop and implement their own SWPPPs which are required to be as stringent as the Aviation Department's SWPPP.

There are also entities doing business at DVT whose activities may impact stormwater quality but that are not covered by the MSGP-2010, such as private general aviation tenants and car rental agencies. These entities are not co-permittees but must comply with the requirements of this SWPPP in order to operate at DVT.

DVT has a Wash Rack Policy that was enacted in the 1990's specifying that only general aviation aircraft and Aviation Department owned vehicles are allowed to be washed on-site and only in Aviation Department provided wash racks because of storm water drainage controls.

1.7.4 Biotic Resources

Biotic resources refer to those flora and fauna (i.e., vegetation and wildlife) habitats which are present in an area. Impacts to biotic communities are determined based on whether a proposal would cause a minor permanent alteration of existing habitat or whether it would involve the removal of a sizable amount of habitat, habitat which supports a rare species, or a small, sensitive tract.

DVT is located in the Sonoran Desert which is home to a wide variety of wildlife and the most diversely populated vegetative growth of any desert in the world. The desert is home to numerous threatened and endangered plant and animal species. **Table 1-14** depicts federally-registered threatened and endangered species and species of special concern listed for Maricopa County.

In 1999, two biological evaluations were completed for parcels located adjacent to DVT. During these studies, specifically for the Southwestern willow flycatcher and the Cactus ferruginous pygmy owl (a previously listed endangered species), it was determined the habitats required by the species listed at that time did do not exist on DVT property.

Table 1-14: Threatened and Endangered Species of Maricopa County

Common Name	Scientific Name	Status
Birds		
Bald eagle	Haliaeetus leucocephalus	Recovery
Yuma clapper rail	Rallus longirostris yumanensis	Endangered
American peregrine falcon	Falco peregrinus anatum	Recovery
Brown pelican	Pelecanus occidentalis	Recovery
California least tern	Sterna antillarum browni	Endangered
Yellow-billed Cuckoo	Coccyzus americanus	Proposed Threatened
Mexican spotted owl	Strix occidentalis lucida	Threatened
Southwestern willow flycatcher	Empidonax traillii extimus	Endangered
Sprague's pipit	Anthus spragueii	Candidate
Fishes		
Colorado pikeminnow	Ptychocheilus lucius	Endangered
Gila topminnow	Poeciliopsis occidentalis	Endangered
Woundfin	Plagopterus argentissimus	Experimental Population
Roundtail chub	Gila robusta	Candidate
Desert pupfish	Cyprinodon macularius	Endangered
Razorback sucker	Xyrauchen texanus	Endangered
Flowering Plants		
Acuna Cactus	Echinomastus erectocentrus	Endangered
Arizona Cliff-rose	Purshia subintegra	Endangered
Mammals		
Sonoran pronghorn	Antilocapra americana sonoriensis	Endangered
Lesser long-nosed bat	Leptonycteris curasoae yerbabuenae	Endangered
Reptiles		
Tucson shovel-nosed Snake	Chionactis occipitalis klauberi	Candidate
Sonoran desert tortoise	Gopherus morafkai	Candidate

Source: U.S Fish and Wildlife Service, Maricopa County Species online report, August 2014

The Southwestern willow flycatcher breeds in dense riparian areas and most nests found have been located near water or saturated soil conditions. It is likely that some transient flycatchers of varying subspecies may be observed in the project area; however, breeding habitat for this species is not present in the project area. The previously listed Cactus ferruginous pygmy owl (removed from the federally-registered threatened and endangered species list in 2011) is known to occur in desert-scrub habitats. This habitat is found near DVT; however, the vegetation sparsely covers the area and is not dense enough to constitute the vegetation structure required by the pygmy owl.

According to the Arizona Game and Fish Department's HabiMap™ tool, distributions of the federally-registered threatened and endangered species do not occur on DVT property. A Breeding Bird Query showed that none of the birds listed as threatened or endangered are determined to be possible, probable, or confirmed breeding bird species in the DVT map quadrant. A Heritage Data Query which creates a sensitive species list generated from the Heritage Data Management System based on known occurrences also showed no listed species as occurring in the DVT map quadrant.

It should be noted that the occurrence of federally listed transient species may appear in the project area, however, such appearances would be expected to be infrequent, as the habitat which supports most of the species identified consists of treed areas or locations near rivers, streams, or marshes. Field surveys would be needed to verify this determination.

DVT does not currently have a wildlife management plan, although new FAA requirements specify that general aviation airports perform a wildlife hazard assessment. The results of the assessment may require a wildlife management plan. ADOT is conducting a state effort that will assess each general aviation airport in its plan, which includes DVT. The project kicked-off in September 2014 and will continue with one year of observations. In 2012, there was only one bird strike at DVT.

The protection of birds is regulated by the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA). Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). The U.S. Fish and Wildlife Service provides a list of migratory birds within their Information, Planning, and Conservation System (IPaC) tool. As shown in **Table 1-15**, 16 birds are on the migratory birds of concern list for the DVT vicinity.

1.7.5 Air Quality

The 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 seven criteria pollutants which include: Ozone (O_3), Carbon Monoxide (CO), Sulfur Dioxide (SO_2), Nitrogen Dioxide (NO_2), Particulate Matter (PM_{10}), Fine Particulate Matter ($PM_{2.5}$), and Lead (Pb). The PM_{10} and $PM_{2.5}$ are cited as Particle Pollution.

Primary air quality standards are established at levels to protect the public health and welfare from any known or anticipated adverse effects of a pollutant. The Phoenix area is designated as a nonattainment area for Particulate Matter (as PM_{10}) and Ozone (8-hour), and is designated as a maintenance area for CO. In 2008, the EPA lowered the primary air quality standard for lead and required mandatory lead monitoring for certain facilities including DVT. Maricopa County installed a lead monitor and began collecting samples in July 2010. The observed lead values through February 2014 are significantly less than the primary air quality standard.

Table 1-15: Migratory Birds of Concern in Airport Vicinity

Species Name	Bird of Conservation Concern (BCC)	Seasonal Occurrence in Project Area
Bald eagle (*Haliaeetus leucocephalus*)	Yes	Wintering
Bell's Vireo (*Vireo bellii*)	Yes	Breeding
Bendire's Thrasher (*Toxostoma bendirei*)	Yes	Year-round
Black-chinned Sparrow (*Spizella atrogularis*)	Yes	Breeding
Brewer's Sparrow (*Spizella breweri*)	Yes	Wintering
Burrowing Owl (*Athene cunicularia*)	Yes	Year-round
Chestnut-collared Longspur (*Calcarius ornatus*)	Yes	Wintering
Costa's Hummingbird (*Calypte costae*)	Yes	Breeding
Gila Woodpecker (*Melanerpes uropygialis*)	Yes	Year-round
Golden eagle (*Aquila chrysaetos*)	Yes	Year-round
Lucy's warbler (*Vermivora luciae*)	Yes	Breeding
Mountain plover (*Charadrius montanus*)	Yes	Wintering
Prairie Falcon (*Falco mexicanus*)	Yes	Year-round
Red-faced Warbler (*Cardellina rubrifrons*)	Yes	Breeding
Sonoran Yellow Warbler (*Dendroica petechia ssp. sonorana*)	Yes	Breeding
Williamson's Sapsucker (*Sphyrapicus thyroideus*)	Yes	Wintering

Source: U.S. Fish and Wildlife Service IPaC Initial Project Scoping Tool (DVT Vicinity), August 2014

Air contaminants increase the aggravation and the production of respiratory and cardiopulmonary diseases. The standards also establish the level of air quality which is necessary to protect the public health and welfare, including among other things, effects on crops, vegetation, wildlife, visibility, and climate, as well as effects on materials, economic values, and on personal comfort and well-being.

As part of the EPA’s review of impacts of low lead AVGAS at general aviation airports, the Maricopa County Air Quality Department installed a lead monitor at DVT. Lead levels have consistently been below regulated levels.

1.7.6 Hazardous Materials and Solid Waste

The latest environmental agency database review of possible hazardous materials issues at DVT was completed in September 2008 during the acquisition of the 40-acre vacant land parcel located near the southeast corner of Deer Valley Road on 7th Street. The only issues noted in this report were that DVT is listed as a Small Quantity Generator of hazardous waste; ten underground storage tanks (USTs) were formerly operated on DVT property; and two leaking UST (LUST) cases were located on DVT property but remediated in 1997 and Lone Cactus Landfill didn't receive hazardous waste, hazardous spills, or illegally dumped materials.

Information on fuel facilities can be found in the Section 1.5.3.5. Small amounts of regulated materials are stored on DVT property in the Aviation Department's maintenance yard, and at each of the larger tenant sites.

Solid waste disposal facilities are known to attract large numbers of hazardous wildlife, particularly birds, and landfills are considered hazards to aircraft if they are within 5,000 feet of an airport. Lone Cactus Landfill is located approximately 1,000 feet south of the DVT property boundary; however, it is identified as a Construction and Demolition Debris Landfill. According to FAA's AC 150/5200-33B (*Hazardous Wildlife Attractants on or Near Airports*), Construction and Demolition Debris landfills are less likely to attract hazardous wildlife and are acceptable if maintained in an orderly manner, admit no putrescible waste, and are not co-located with other waste disposal operations. The 2008 Phase I report indicated that the Lone Cactus Landfill accepts primarily construction and demolition debris and indicated that it does monitor for methane gas.

The Skunk Creek Municipal Solid Waste Landfill, closed in 2006, was located northwest of DVT on Happy Valley Road, west of I-17 approximately four miles (21,120 feet) from DVT. The landfill was replaced with the Phoenix North Transfer Station, located east of I-17 approximately seven miles from DVT. The Cave Creek Transfer Station is located approximately 2.5 miles (13,200 feet) east of DVT and the Deer Valley Transfer Station is located approximately 1.5 miles (7,920 feet) west of DVT. A transfer station is where municipal solid waste is consolidated from local collection vehicles and reloaded into larger trailers for shipment to disposal sites. These transfer stations are all located more than 5,000 feet from DVT and therefore do not qualify as a wildlife hazard to aircraft operating at DVT.

There are four hazardous waste accumulation sites provided at DVT located at the far west end of the west t-hangar apron, the far east end of the east t-hangar ramp, and at the east and west ends of the north t-hangar apron (shown on **Figure 1-5**). These sites are places for DVT's users to deposit wastes, including: oil, batteries, hydraulic fluids, solvents, aircraft tires and other waste. These wastes are deposited into proper containers inside containment. The Aviation Department monitors the sites weekly and arranges for proper waste determination, waste profiling, waste manifesting, and waste transport for treatment or disposal.

1.7.7 Historical and Cultural Resources

Two cultural resource surveys were completed on DVT property in 2004. The first survey was conducted on a 40-acre parcel planned for hangar development. Nine isolated resource sites were recorded in this area. The second survey consisted of an 80-acre parcel for the ATCT. This survey indicated four isolated sites. These sites represent a scatter of prehistoric ceramics and lithics and are associated with the general prehistoric use of the area. No significant archaeological resources were identified during either survey.

As noted above, no significant archaeological resources were found during previous cultural resource surveys; however, the area does have a rich prehistory. The possibility of artifacts being uncovered on DVT property that has not been previously disturbed cannot be ruled out.

1.8 Sustainability

As part of this Master Plan an evaluation of possible sustainability initiatives was conducted (Chapter 8, Sustainability Considerations). Sustainability initiatives focus on those, which if implemented, may result in reduced energy consumption and/or environmental impacts from normal airport development and operation. The Aviation Department is committed to incorporating sustainability principles and practices into their operational, management and administrative processes as witnessed by the Aviation Department's development of a Sustainability Management Plan. Likewise the Aviation Department's use of the U.S. Green Building Council's Leadership in Energy Environmental Design (LEED®) standards and has developed a *Sustainable Horizontal Design and Construction Green Guide* (DCS Green Guide) prepared by CDM in December 2010. Specific sustainability considerations and initiatives at DVT are discussed in the following sections.

1.8.1 Design and Construction

In 2010 the Aviation Department developed the DCS Green Guide addressing horizontal construction projects (e.g. non-building design and construction where LEED® standards do not apply) to reduce impacts and resource use. The DCS Green Guide outlines performance standards for heavy civil design and construction and was intended to be consistent with the sustainability initiatives developed by the City for vertical construction through implementation of Leadership in Energy and Environmental Design (LEED®) standards. The DCS Green Guide includes Life Cycle Analysis and Life Cycle Cost Analysis tools for use during project development.

Specific construction related goals are also applied to each project, such as recycling pavement materials. Where feasible, excavated soils, asphalts, and concrete removed during rehabilitation projects are reused in new pavement designs, reducing waste and debris transportation emissions.

1.8.2 Waste Management and Recycling

At DVT, some metals and green waste are recycled. Recyclables collected in the terminal are collected by the City's Public Works Department and landfilled waste is collected by Waste Management Inc. The Aviation Department has a dedicated Recycling Coordinator who manages and plans to expand the existing recycling program and provide recycling to tenants.

1.8.3 Air Quality

Currently none of the eight fleet vehicles operated by the Aviation Department at DVT are powered using alternative fuels. At this time the alternative fuel fleet is limited due a lack of alternative fuel infrastructure at DVT and adding the infrastructure for a small vehicle fleet is not cost effective, however, the Aviation Department is always looking for opportunities to increase the sustainable fleet. The Aviation Department manages an on-airport fueling facility for Aviation Department vehicles and equipment. The fueling facility is located at the maintenance facility on the far west end of DVT property.

The Aviation Department uses a number of methods to reduce airborne dust at DVT. Leftover millings from other aviation projects are used to create roadway surfaces and gravel is applied to disturbed soil areas. During construction, water is applied to disturbed soil and dust palliatives are applied to soil stockpiles per dust control plans. Gravel mulch has been applied to the infields so that mowing is avoided.

1.8.4 Water Management and Water Quality

DVT is conducting a water audit as part of the Sustainability Management Plan and is developing an action plan for water conservation. As part of this process DVT will be a member airport of the water conservation task force.

Water conservation is a priority for the City and the Aviation Department has implemented water conservation measures to support City goals and future sustainability planning. As part of the Sustainability Management Plan to support the Aviation Department's water conservation goals and future sustainability planning, the City conducted an inventory of all metered water use at DVT in order to establish a water usage baseline. The inventory included all Aviation Department water meters for active accounts listed by the Aviation Department and City Water Services Finance Department. Additionally, a high level evaluation of water usage was conducted to identify monthly water use per meter, categorical use by City cost center code, and sub-metering recommendations for large water demand equipment near meters inventoried.

As part of the inventory, baseline usage was separated among the 14 water meters inventoried as commercial and landscape consumption. Commercial refers to building or inside airport use, while landscape refers to outside use. There were 13 meters identified as commercial and one meter representative of landscape use. A summary of annual water usage for both commercial and landscape meters identified in the water inventory is presented in **Table 1-16**.

Table 1-16: DVT Annual Water Usage Summary

Use Category	PCY 2010[1] (gallons)	CY 2011 (gallons)	CY 2012 (gallons)	CY 2013 (gallons)	PCY 2014[2] (gallons)
Commercial	3,193,960	3,766,180	5,826,172	3,205,180	543,048
Landscape	88,264	191,488	258,808	163,064	62,084
Total	**3,282,224**	**3,957,668**	**6,084,980**	**3,368,244**	**605,132**

Source: Weston Solutions, Inc - Water Meter Inventory, Phoenix Deer Valley Airport, Water Meter Report Compilation, March 2015

CY: Calendar Year
PCY: Partial Calendar Year
1) The term PCY 2010 represents a partial calendar year for the usage period between March 2010 and December 2010.
2) The term PCY 2014 represents a partial calendar year for the water usage period of January 2014 and June 2014.

The inventory shows an increase of 54% year over year in 2012, dropping 55% in 2013. DVT staff report that breaks in the landscape irrigation lines in the terminal parking lot may have led to increased usage in 2012, along with meters on the North Ramp reporting incorrect information. The irrigation lines have since been repaired and meter repairs have been completed resolving those issues and reducing reported water usage.

1.8.5 Energy Management

DVT purchases its electricity from Arizona Public Service (APS) Company. The only natural gas used on-site is at the restaurant in the terminal building. A summary of the annual energy usage as presented in the 2013 LeighFisher *Sustainability Baseline Report – Phoenix Airport System* is provided by cost center in **Table 1-17**. The total annual energy consumption, not including utilities paid for directly by tenants, for calendar year 2012 is approximately 2,031,405 kWh, with a corresponding annual utility cost of $242,670. Approximately 85% of the energy used is associated with the main terminal building and the hangars. Due to varying APS rate structures the cost for the hangars is higher than the main terminal although the terminal uses slightly more electricity.

In recent years the following energy initiatives have been implemented at DVT:

- Lighting has been upgraded and lights are turned off when not in use, either manually or via occupancy sensors
- Hangar buildings are low energy use (no air conditioning) limiting their use to aircraft storage

Table 1-17: DVT 2012 Energy Usage by Service Area

Service	kWh	Cost ($)	Percent
Runway Lights	36,768	$6,563	1.8%
Covered Wash Area	55,801	$8,169	2.7%
Police Air Support Unit Hangar	2,088	$595	0.1%
Main Terminal	877,080	$92,354	43.2%
Hangars (tenants)	848,760	$105,938	41.8%
Jet Fuel Storage	9,327	$1,684	0.5%
Aircraft Maintenance Bays	105,520	$13,211	5.2%
Maintenance Building	64,720	$10,412	3.2%
Arizona Public Service (APS) Company	Est. kWh 31,341	$3,744	1.5%
Total	**2,031,405**	**$242,670**	**100%**

Source: LeighFisher Sustainability Baseline Report – Phoenix Airport System based on City of Phoenix, PWD data, 2013

Note: The 'Estimated APS kWh' represents an estimate of electricity purchased that has not yet been attributable to a specific meter or cost center. It is calculated using the cost difference between APS payment history and the City's database of kWh usage by meter.

2.0 Aviation Activity Forecast

The previous FAA approved forecast for DVT was prepared and approved June 9, 2006 for the 2007 Phoenix Deer Valley Airport Master Plan Update. Since that time, the aviation sector has been buffeted by a number of events, most importantly the Great Recession and fuel price volatility. Changes in DVT and the environment within which it functions warrant a new examination of projected airport activity.

This chapter contains the annual and derivative activity forecasts for DVT. Except where noted, the forecasts contained herein are unconstrained; they assume landside and airfield capacity will be available to accommodate the anticipated demand. Aviation Activity Forecasts (Forecast) are presented for the base year (2013) and future years: 2018, 2023, and 2033. The chapter begins with a discussion of recent aviation activity at DVT and current local and national industry trends. The Forecast reviews historical and projected socioeconomic activity levels along with fuel costs. Key assumptions are then presented, followed by the forecasts of based aircraft and annual aircraft operations. More detailed derivative forecasts, including fleet mix and peak activity estimates follow. The chapter concludes with a summary of the forecasts, comparison with other forecasts, and a presentation of alternative forecast scenarios.

2.1 Historical Activity and Industry Trends

Measured in terms of aircraft operations, DVT is the busiest general aviation facility in the country. In addition to serving a large part of the general aviation community in Phoenix, DVT is also a major training center for commercial pilots throughout the world. Since it serves a wide variety of users, historical activity at DVT has been subject to many factors, including economic, cost, and competition, and as a result, future activity will also be determined by these factors.

Table 2-1 presents the recent history of based aircraft at DVT. The two sources that are presented include Airport Records maintained by the Aviation Department and FAA's Terminal Area Forecast (TAF) records that were originally drawn from FAA 5010 Airport Master Records. The two sources vary in that they are updated at differing times with varying frequency and sometimes are based on actual counts (Aviation Department) and other times on estimates (FAA). Although they differ in the specifics, both sources agree that the number of aircraft at DVT have been increasing at a moderate rate with a peak occurring prior to the recent recession and fuel spike, followed by a decline, and then a more recent turnaround.

Table 2-1: Historical Based Aircraft at DVT

Year	Previous Master Plan and Airport Records Based Aircraft (a)	FAA Terminal Area Forecast Based Aircraft (b)
1983	657	548
1984	669	548
1985	638	698
1986	764	698
1987	754	820
1988	716	806
1989	637	820
1990	815	820
1991	778	722
1992	796	722
1993	805	722
1994	803	684
1995	898	748
1996	903	748
1997	918	918
1998	912	918
1999	918	918
2000	1,206	918
2001	1,046	923
2002	1,275	923
2003	1,250	946
2004	1,252	923
2005	n/a	923
2006	n/a	1149
2007	n/a	1149
2008	1,212	943
2009	1,190	943
2010	987	981
2011	1,181	981
2012	964	995
2013	1,033	n/a
2014	1,058	n/a
1983-2012	1.3%	2.1%
1983-2014	1.5%	

Sources: As noted and HNTB analysis; n/a = not available; (a) Phoenix Deer Valley Master Plan Update, 2007, and City of Phoenix Aviation Department records; (b) FAA, 2013 Terminal Area Forecast, 2014

As a comparison, active general aviation aircraft in the U.S. declined slightly over the same period, from 213,292 in 1983 to 202,865 in 2013.[2]

Table 2-2 presents historical aircraft operations at DVT over the past 23 years. Total operations decreased during the early 1990's, then increased rapidly over the next ten years. Operations remained at a high level from 2002 through 2009, peaking at 406,507 in 2006. Operations then declined significantly during the most recent recession. Operations have recovered since 2011, but are not yet back to pre-recession levels.

Among the various operating categories, general aviation operations have been increasing over the long term, military activity has been declining, and there is no discernible trend in commercial activity (air carrier and air taxi).

Table 2-3 demonstrates how DVT operations have compared to other towered general aviation airports serving the Phoenix Metropolitan area. The table also includes general aviation operations associated with PHX. Some of the airports either did not have control towers or were operated by the military in the early part of the comparison period, and therefore show no data for those years. The table indicates that since 1998, when all airports began reporting, the DVT share of general aviation, military, and non-scheduled air taxi operations, has been gradually increasing, from 20% in 1998 to 26% in 2013.

Total general aviation operations at U.S. towered airports have declined over the same period, falling from 38.0 million operations in 1998 to 25.8 million in 2013.[3] The Phoenix area in general and DVT in particular, have been increasing their share of U.S. general aviation operations. This increase in share resulted from the rapid population and economic growth in the Phoenix area, and the continuing development of the area as a center for pilot training.

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[2] General Aviation Manufacturers Association, *2012 General Aviation Statistical Databook & Industry Outlook*, and FAA, *FAA Aerospace Forecast Fiscal Years 2014-2034*.

[3] FAA Aerospace Forecasts: Fiscal Years 2002-2013, and FAA Aerospace Forecast Fiscal Years 2014-2034.

Table 2-2: Historical Aircraft Operations at DVT

Calendar Year	Itinerant Air Carrier	Itinerant Air Taxi	Itinerant General Aviation	Itinerant Military	Itinerant Total	Local Civil	Local Military	Local Total	Total Operations
1990	5	1,933	103,836	631	106,405	171,079	342	171,421	277,826
1991	2	993	99,735	554	101,284	159,394	391	159,785	261,069
1992	-	3,545	98,693	759	102,997	117,619	236	117,855	220,852
1993	30	7,313	99,570	1,034	107,947	103,122	95	103,217	211,164
1994	-	5,905	101,113	680	107,698	104,322	81	104,403	212,101
1995	-	3,675	105,144	563	109,382	106,313	33	106,346	215,728
1996	-	3,539	119,135	515	123,189	127,297	237	127,534	250,723
1997	-	4,598	121,701	237	126,536	140,234	62	140,296	266,832
1998	1	4,782	129,248	208	134,239	147,008	151	147,159	281,398
1999	3	6,385	135,646	478	142,512	144,829	165	144,994	287,506
2000	-	6,783	164,979	610	172,372	198,331	76	198,407	370,779
2001	-	5,869	147,799	343	154,011	185,966	93	186,059	340,070
2002	-	4,990	166,777	55	171,822	217,730	18	217,748	389,570
2003	-	4,153	152,934	55	157,142	232,155	12	232,167	389,309
2004	-	4,079	137,550	44	141,673	198,759	5	198,764	340,437
2005	-	4,584	146,136	51	150,771	226,325	745	227,070	377,841
2006	-	5,216	150,111	52	155,379	251,107	21	251,128	406,507
2007	21	5,676	135,527	11	141,235	236,472	642	237,114	378,349
2008	284	6,217	133,150	40	139,691	236,853	90	236,943	376,634
2009	-	3,804	149,934	11	153,749	248,586	-	248,586	402,335
2010	-	2,973	135,651	389	139,013	229,732	2	229,734	368,747
2011	1	3,832	124,086	89	128,008	189,276	159	189,435	317,443
2012	159	4,690	139,389	54	144,292	221,110	30	221,140	365,432
2013	17	4,518	135,772	56	140,363	214,601	31	214,632	354,995
Average Annual Growth Rate									
1990-2002	-	8.2%	4.0%	-18.4%	4.1%	2.0%	-21.8%	2.0%	2.9%
2002-2013	-	-0.9%	-1.9%	0.2%	-1.8%	-0.1%	5.1%	-0.1%	-0.8%
1990-2013	5.5%	3.8%	1.2%	-10.0%	1.2%	1.0%	-9.9%	1.0%	1.1%

Sources: FAA, Air Traffic Activity System (ATADS) and HNTB analysis

Table 2-3: DVT Share of Regional Air Taxi, General Aviation and Military Operations (Excludes Air Carrier)

Year	Deer Valley (DVT)	Chandler (CHD)	Falcon Field (FFZ)	Glendale (GEU)	Goodyear (GYR)	Mesa Gateway (IWA)	Phoenix Sky Harbor (PHX)	Scottsdale (SDL)	Total	DVT Share
1990	277,821	n/a	203,465	n/a	202,410	n/a	124,736	265,517	1,073,949	25.9%
1991	261,067	n/a	238,700	n/a	180,214	n/a	122,789	234,597	1,037,367	25.2%
1992	220,852	n/a	225,852	n/a	166,037	n/a	116,917	197,577	927,235	23.8%
1993	211,134	n/a	191,536	n/a	138,901	n/a	136,629	184,512	862,712	24.5%
1994	212,101	n/a	194,290	n/a	86,336	n/a	105,701	166,736	765,164	27.7%
1995	215,728	n/a	184,905	n/a	62,106	n/a	116,707	178,109	757,555	28.5%
1996	250,723	156,212	196,353	119,866	92,400	n/a	89,610	183,299	1,088,463	23.0%
1997	266,832	184,139	209,599	130,263	116,153	n/a	91,274	185,108	1,183,368	22.5%
1998	281,397	196,511	220,957	115,056	103,717	194,985	86,268	208,177	1,407,068	20.0%
1999	287,503	221,018	263,945	133,220	136,105	235,197	88,492	230,596	1,596,076	18.0%
2000	370,779	249,811	274,447	112,570	142,258	157,579	134,264	207,024	1,648,732	22.5%
2001	340,070	232,449	251,597	110,631	134,342	160,348	118,003	184,557	1,531,997	22.2%
2002	389,570	230,538	288,338	118,702	138,312	177,647	101,419	195,563	1,640,089	23.8%
2003	389,309	219,671	281,434	88,449	132,392	181,186	106,514	194,468	1,593,423	24.4%
2004	340,437	233,079	261,890	118,140	105,055	239,504	98,228	202,673	1,599,006	21.3%
2005	377,841	235,111	270,136	132,865	100,703	275,544	57,590	212,429	1,662,219	22.7%
2006	406,507	269,059	249,072	150,772	159,078	279,598	47,230	196,298	1,757,614	23.1%
2007	378,328	265,212	314,109	146,208	187,925	294,714	44,273	191,982	1,822,751	20.8%
2008	376,350	236,842	319,413	136,212	177,886	223,550	33,627	191,411	1,695,291	22.2%
2009	402,335	204,370	255,232	104,062	177,949	180,724	24,804	166,435	1,515,911	26.5%
2010	368,747	165,784	214,612	82,198	145,962	171,153	24,450	133,515	1,306,421	28.2%
2011	317,442	161,583	220,075	87,124	138,459	163,418	23,088	141,635	1,252,824	25.3%
2012	365,273	197,427	190,599	76,127	144,036	147,722	24,475	146,082	1,291,741	28.3%
2013	354,978	211,636	263,691	67,811	120,479	178,649	23,250	142,345	1,362,839	26.0%
Average Annual Growth Rate										
1990-2002	2.9%		2.9%		-3.1%		-1.7%	-2.5%		
2002-2013	-0.8%	-0.8%	-0.8%	-5.0%	-1.2%	0.1%	-12.5%	-2.8%		
1990-2013	1.1%		1.1%		-2.2%		-7.0%	-2.7%		

Sources: FAA, Air Traffic Activity System (ATADS) and HNTB analysis

2.2 Socioeconomic Trends

This section discusses the definition of the DVT catchment area, and the historical and projected population and economic trends that are major drivers of aviation demand. Since most socioeconomic projections are based on political units such as counties or metropolitan statistical areas (MSA) it is typically recommended that the defined catchment area follow county boundaries. Most DVT based aircraft are registered in the Phoenix MSA (Maricopa and Pinal Counties) with lesser numbers in Gila and Yavapai Counties (see **Figure 2-1**). Therefore, the DVT catchment area for this Forecast was defined as the complete Phoenix MSA. The previous Master Plan Update defined a generalized service area encompassing the areas that are closer to DVT than other airports with comparable facilities, and was therefore much more restricted. As shown in **Figure 2-1**, many DVT based aircraft are now registered in areas beyond DVT's immediate environs; therefore, a broader catchment area was considered more appropriate for this study.

Population in the catchment area is an indicator of the size of the market and a major driver of general aviation demand. **Table 2-4** shows historical population growth and alternative population forecasts for the Phoenix MSA. Between 2000 and 2012, population grew at an average of 2.36% per year. The Office of Employment and Population Statistics in the Arizona Department of Administration (ADOA) has generated medium, high, and low population forecasts for the Phoenix MSA. Woods & Poole (W&P) is an economic forecasting firm that publishes economic and demographic forecasts for each state, metropolitan area, and county in the U.S. which it updates every year. The W&P forecast is very similar to the ADOA Medium forecast. The Maricopa Association of Governments (MAG) also prepares population forecasts for Maricopa County and divisions within Maricopa County, but none for Pinal County. The ADOA medium population forecast was selected for use in this study because ADOA is more likely to have insight on local Phoenix conditions than W&P and it also includes both counties in the Phoenix MSA.

Total employment (**Table 2-5**) is an indicator of the size and strength of the regional economy and therefore is another useful indicator for aviation activity forecasts. Employment is a more complicated metric than population because different organizations measure employment in different ways. For example, the Bureau of Economic Analysis (BEA) counts all full-time and part-time workers in its numbers, whereas the Bureau of Labor Statistics excludes proprietors, agricultural workers, household workers and the military. The ADOA, the MAG, and W&P all have recently prepared employment forecasts for the region but use differing definitions of employment. The W&P forecast was selected for use in this study because it relies on the more inclusive BEA definition of employment. In addition, the ADOA forecast extends only to 2020 and the MAG forecast excludes Pinal County. This limits their potential application to the DVT Master Plan Forecast.

As shown in **Table 2-5**, employment in the Phoenix MSA grew rapidly until 2007, and then declined significantly during the recession. Although it has begun to grow again, it has not yet recovered to pre-recession levels. Over the long term, employment is projected to grow at a rate consistent with population growth.

Figure 2-1: Total Based Aircraft at DVT by Zip Code of Registration

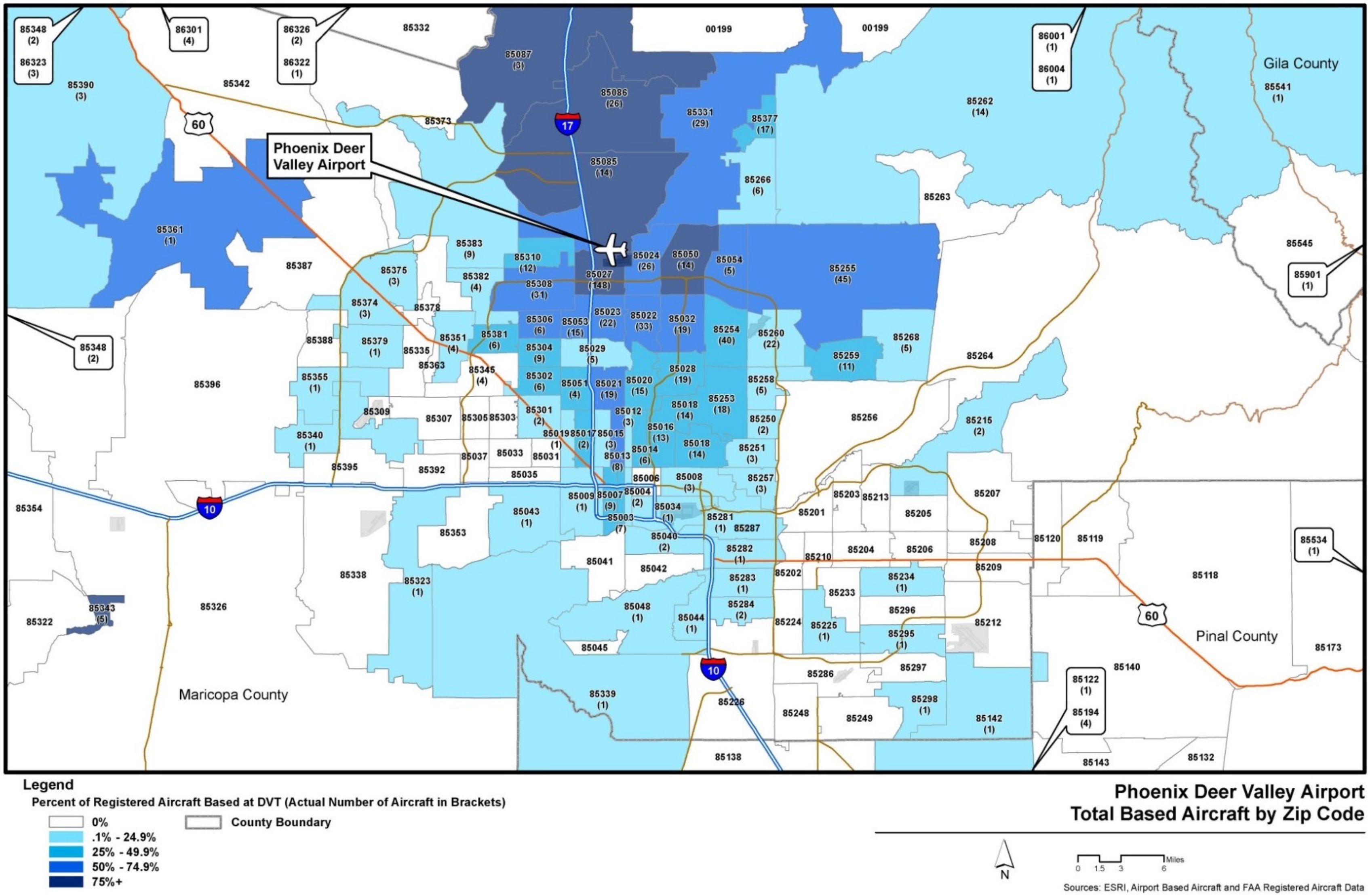


Table 2-4: Population Forecasts (Phoenix MSA)

Year	Actual (a)	Medium (b)	High (b)	Low (b)	W&P (c)
2000	**3,273,477**				
2001	**3,363,736**				
2002	3,452,470				
2003	3,536,388				
2004	3,637,332				
2005	3,774,696				
2006	3,914,212				
2007	4,018,128				
2008	4,106,372				
2009	4,153,609				
2010	4,209,375				
2011	4,252,078				
2012	4,329,534	4,273,900	4,277,300	4,269,700	4,344,587
2018		4,792,000	4,895,100	4,667,300	4,867,021
2023		5,308,700	5,528,100	5,039,500	5,339,825
2033		6,362,300	6,856,600	5,760,500	6,371,231
		Average Annual Growth Rate			
2000-2012	2.36%				
2012-2033		1.91%	2.27%	1.44%	1.84%

Sources: As noted and HNTB analysis; (a) U.S. Department of Commerce, Bureau of Economic Analysis, 2014; (b) Arizona Department of Administration, Office of Employment & Population Statistics, 12/07/2012; (c) Woods & Poole Economics, 2014 State Profile: Arizona and New Mexico, 2014

Table 2-5: Employment Forecasts (Phoenix MSA)

Year	BLS Actual (a)	BEA Actual (b)	ADOA (c)	MAG (d)	W&P (e)
2000	1,609,059	1,925,508			
2001	1,648,750	1,948,119			
2002	1,687,138	1,960,602			
2003	1,727,856	2,009,301			
2004	1,783,726	2,095,792			
2005	1,847,545	2,229,015			
2006	1,930,609	2,346,793			
2007	1,975,503	2,408,578			
2008	1,976,979	2,377,989			
2009	1,900,253	2,249,224			
2010	1,875,333	2,217,888	1,688,905	1,706,300	
2011	1,870,535	2,255,342			
2012	1,889,202	2,301,874	1,767,310	1,827,620	2,301,874
2018		4,792,000	2,002,524	2,191,580	2,601,003
2023		5,308,700		2,543,300	2,878,460
2033		6,362,300		2,936,720	3,521,384
Average Annual Growth Rate					
2000-2012	1.35%	1.50%			
2010-2020			1.72%		
2010-2033				2.39%	2.05%

Sources: As noted and HNTB analysis; (a) Bureau of Labor Statistics, 2014. Excludes proprietors, agricultural workers, household workers, and the military; (b) U.S. Department of Commerce, Bureau of Economic Analysis, 2014. Includes all employment categories; (c) Arizona Department of Administration, Office of Employment & Population Statistics, 2012. Non-farm employment only; (d) Maricopa Association of Governments, Socioeconomic Projections, 2013. Maricopa County only; (e) Woods & Poole Economics, 2014 State Profile: Arizona and New Mexico, 2014

Like employment, total regional income is a significant indicator of the size and health of the local economy. **Table 2-6** presents historical income and two alternative income projections for the Phoenix MSA. Both historical and projected income is presented in constant 2013 prices to net out the effects of inflation. Neither the ADOA nor the MAG publishes independent income forecasts. In addition to the unadjusted W&P forecast, **Table 2-6** includes a hybrid forecast calculated by multiplying the Medium ADOA population forecast by the W&P per capita income forecast. The hybrid forecast of income was selected for use in this study because it is consistent with the ADOA population forecast and, to the extent possible, it incorporates local insight from that forecast.

As shown in **Table 2-6**, regional income, like employment, grew rapidly until 2007 and then dropped significantly during the recession. It began growing again in 2010, but has not yet recovered to pre-recession levels as of 2012. Over the forecast period, income in the Phoenix MSA is projected to grow at about 3.5% per year. As a comparison, real income grew at 4.8% per year between 2000 and 2007.

Tables A-1 through A-5 in **Appendix A** provide more detailed historical socioeconomic information for the Phoenix MSA, including population, employment, unemployment rate, total income, and per capita income.

2.3 Fuel Costs

Fuel prices are an important determinant of general aviation demand since they represent the single greatest component of aircraft operating costs. Turbine operations require jet fuel (known as Jet-A) whereas piston operations require aviation gasoline (known as AVGAS). Both the FAA (from Global Insight, a private economic forecasting firm) and the U.S. Department of Energy (DOE) provide forecasts of jet fuel. Neither source publishes long term forecasts for AVGAS. However, if a practical alternative to leaded AVGAS becomes available, AVGAS prices should track closely with jet fuel prices since they are subject to similar supply and demand considerations.

As shown in **Table 2-7**, the DOE provides medium, high, and low forecasts of jet fuel prices. The base year value for the FAA forecast differs from the other forecasts because it represents a fiscal rather than a calendar year. All of the forecasts except for the DOE high forecast project a decline in real jet fuel costs over the next ten years, primarily because of anticipated increases in domestic oil production. The DOE medium forecast was selected for use in this study because the FAA (Global Insight) forecast is considered to be too optimistic in showing a long-term decline in fuel prices given recent history which has demonstrated a significant increase.

Table A-6 in **Appendix A** shows historical jet fuel prices along with crude oil prices. The table demonstrates the close association between jet fuel costs and crude oil prices.

Table 2-6: Real Income Forecasts (Phoenix MSA) (thousands of dollars in 2013 prices)

Year	Actual (a)	W&P Forecast (b)	Hybrid Forecast (c)
2000	122,239,206		
2001	126,432,950		
2002	129,327,633		
2003	133,360,097		
2004	141,661,932		
2005	152,893,627		
2006	166,209,607		
2007	170,117,208		
2008	165,705,097		
2009	157,888,328		
2010	157,085,037		
2011	162,797,289		
2012	166,410,844	166,410,844	163,703,318
2018		201,633,081	198,525,078
2023		239,440,173	238,044,514
2033		340,591,435	340,114,004
Average Annual Growth Rate			
2000-2012	2.60%		
2012-2033		3.47%	3.54%

Sources: As noted and HNTB analysis; (a) U.S. Department of Commerce, Bureau of Economic Analysis, 2014; (b) Woods & Poole Economics, 2014 State Profile: Arizona and New Mexico, 2014. Converted to 2013 prices; (c) Hybrid forecast consisting of Medium ADOA Population forecast multiplied by W&P per capita income forecast

Table 2-7: Fuel Price Projections (jet fuel price/gallon in 2013 prices)

Year	Actual (a)	Global Insight (b)	DOE Medium (c)	DOE High (c)	DOE Low (c)
2000	1.10				
2001	0.92				
2002	0.86				
2003	1.01				
2004	1.38				
2005	1.99				
2006	2.18				
2007	2.35				
2008	3.18				
2009	1.78				
2010	2.27				
2011	3.09				
2012	3.09	2.99	3.14	3.13	3.13
2018		2.64	2.51	3.99	2.02
2023		2.74	2.87	4.43	2.06
2033		2.70	3.41	5.44	2.17

Sources: As noted and HNTB analysis; (a) Airlines for America, Annual Crude Oil and Jet Fuel Prices, 2014. Converted to 2013 prices by HNTB; (b) FAA Aerospace Forecast: Fiscal Years 2014-2034, 2014. Obtained from Global Insight; (c) U.S. Department of Energy, Energy Information Agency, 2014 Annual Energy Outlook (Medium Case) and 2013 Annual Energy Outlook (High and Low Cases)

2.4 Forecast Assumptions

Forecast assumptions were prepared, with the input of the Aviation Department, for use as inputs to the DVT Master Plan Forecast. The purpose of the assumptions was to provide a reasonable assessment of the key forecast trends and parameters necessary to generate activity forecasts. Some of the background for these assumptions has already been discussed in Sections 2.2 and 2.3. In many instances, multiple outcomes for these trends and parameters are possible. Therefore, in Section 2.10, four independent forecast scenarios are presented to address the impact of potential variations in these factors. The selected Forecast assumptions are presented below.

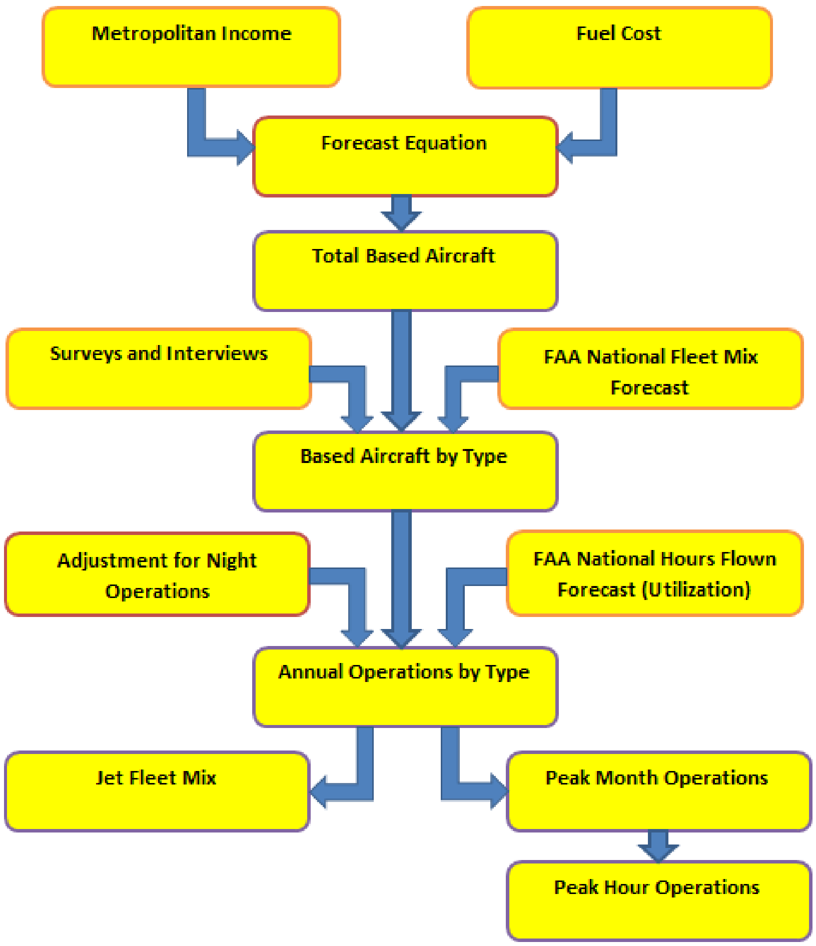
- **Unconstrained Forecast:** Airport infrastructure at DVT is assumed to be sufficient to accommodate projected traffic except where noted. For the purpose of this forecast, it is assumed that infrastructure improvements will be made when necessary without impeding projected activity. Destination airports will have sufficient capacity to accommodate demand from DVT.

- **Airport Role:** DVT's role will evolve in accordance with demand. However, no major changes in DVT's role, such as the introduction of scheduled passenger or cargo service within the forecast period, are assumed.
- **National Airspace System:** FAA will successfully implement any required changes and improvements to the NAS to accommodate the unconstrained forecast of aviation demand. No major bottlenecks will occur that impede normal aviation activity at DVT.
- **Regulatory Assumptions:** No new regulatory restrictions affecting the types of aircraft operating at DVT are assumed. There will be no nighttime restrictions on aircraft operations.
- **General Aviation Taxes and Fees:** Future fuel taxes and other fees related to general aviation at DVT will remain unchanged except for adjustments for inflation.
- **Environmental Factors:** There will be no major changes in the physical environment. It is assumed that global climate changes will not be significant enough to force restrictions on the burning of hydrocarbons or cause major aviation fuel tax increases within the forecast period.
- **Catchment Area:** As discussed in Section 2.2, the DVT catchment area is defined as the Phoenix MSA (**Figure 2-1**).
- **Population Forecasts:** As discussed in Section 2.2, population in the Phoenix MSA is assumed to grow in accordance with the ADOA medium forecast (**Table 2-4**).
- **Employment Forecasts:** As discussed in Section 2.2, Employment in the Phoenix MSA is assumed to grow in accordance with the W&P forecast (**Table 2-5**).
- **Income Forecasts:** As discussed in Section 2.2, real income is projected to grow in accordance with the hybrid income forecast (**Table 2-6**).
- **Fuel Costs:** As discussed in Section 2.3, jet fuel prices are assumed to grow in accordance with the U.S. DOE medium forecast (**Table 2-7**).
- **Flight Training:** Local flight operations from the flight schools are assumed to grow in accordance with past trends. If there are disruptions in demand that would result from Chinese airlines doing more in-country training, the flight schools will back-fill with trainees from other countries.
- **Other Airports:** Other airports serving the Phoenix area, such as GYR, Scottsdale (SDL), Glendale (GEU), and Falcon Field (FFZ) are assumed to continue in their current roles. They will continue to develop their infrastructure to meet local demand and there will be no ATCT closures in the baseline case. PHX will not actively attempt to recapture general aviation activity.

2.5 Forecast Approach Overview

Figure 2-2 graphically describes the overall approach used to develop the Forecast. Assumptions regarding future income growth and fuel prices were incorporated to develop a forecast of total based aircraft (Section 2.6). The based aircraft forecast was then disaggregated by major aircraft category using information from tenant surveys and the FAA's national forecast. FAA projections for aircraft utilization were then applied to the based aircraft forecast to prepare a forecast of annual aircraft operations by category (Section 2.7). The forecast of operations was then adjusted to account for operations that are not tabulated because of the tower closure between midnight and 6 am. The forecast of jet operations was then further disaggregated into a forecast of jet operations by individual aircraft type. In addition, peak month and peak hour operations forecasts were derived from the annual operations forecasts using existing peaking relationships (Section 2.8).

Figure 2-2: Phoenix Deer Valley Airport Forecast Approach



Sources: As noted and HNTB analysis.

2.6 Based Aircraft Forecast

Based aircraft at DVT were projected using a forecast equation developed by applying regression analysis. Regression analysis is a statistical method of generating an equation (or model) which best explains the historical relationship among selected variables, such as based aircraft and real income. If it is assumed that the statistical relationship that best explains historical activity will continue to hold into the future, this equation can be used as a forecasting equation. Several based aircraft forecasting models were tested using historical (1990-2012) data. The potential driving factors tested included socioeconomic variables, aviation industry variables, and instrument variables. The socioeconomic variables included population, employment, and income for the catchment area (see Section 2.2). The aviation industry variables included jet fuel prices, crude oil prices, and the national general aviation fleet. Instrument variables representing the events of September 11, 2001 and ensuing industry recovery were also tested. The model was tested in both linear and logarithmic formulations.

Several of the equations that were calculated showed solid correlations with historical based aircraft at DVT. The model that produced the best results, from both a theoretical and statistical standpoint, was a linear formulation, which specified DVT based aircraft as a function of MSA income and jet fuel prices as independent variables.[4] A further adjustment was made to reconcile the 2012 based aircraft value projected by the equation and the actual based aircraft value for the year. The regression equation and based aircraft forecast is presented in **Table 2-8**.

The forecast equation indicates that based aircraft growth is positively correlated with regional income growth and negatively correlated with increases in jet fuel prices. The R-squared value of 0.68 indicates that 68% of the historical variance in DVT based aircraft can be explained by the income and fuel cost variables. The t-statistics indicate that each of the input variables is statistically significant in explaining the historical variation in based aircraft.

As shown in **Table 2-8**, total DVT based aircraft are projected to increase from 1,058 in 2014 to 1,780 in 2033, resulting in an average annual increase of 2.8%.

[4] Since most based aircraft at DVT are piston-powered, AVGAS prices would be a more relevant variable than jet fuel prices. Unfortunately, as noted in Section 2.3, neither the FAA nor DOE publish forecasts for AVGAS prices. Since AVGAS and jet fuel are both derived from crude oil and serve similar markets, AVGAS and jet fuel price trends have been similar in the past and are expected to be similar in the future. Therefore jet fuel prices serve as a proxy for AVGAS prices in the forecasting equation.

Table 2-8: Based Aircraft Forecast

Year	Income (a)	Jet Fuel Price (b)	Based Aircraft
2000	122,239,206	1.10	1,206
2001	126,432,950	0.92	1,046
2002	129,327,633	0.86	1,275
2003	133,360,097	1.01	1,250
2004	141,661,932	1.38	1,252
2005	152,893,627	1.99	n/a
2006	166,209,607	2.18	n/a
2007	170,117,208	2.35	n/a
2008	165,705,097	3.18	1,212
2009	157,888,328	1.78	1,190
2010	157,085,037	2.27	987
2011	162,797,289	3.09	1,181
2012	166,410,844	3.09	964
2013	n/a	2.92	1,033
2014	n/a	n/a	1,058
2018	198,525,078	2.51	1,167
2023	238,044,514	2.87	1,329
2033	340,114,004	3.41	1,780

Sources: As noted and HNTB analysis; n/a = not available; (a) Table 2-6; (b) Table 2-7; (c) Historical data from Table 2-1, Forecasts based on the Following Equation:
BAC = (479.171 + (.00000567 x INCOME) - (95.6438 x FUEL)) x ADJ, Where:
BAC = Based Aircraft
INCOME = MSA Income (thousands of 2013 dollars)
FUEL = Jet Fuel Cost per gallon (in 2013 dollars)
ADJ = .855 (ratio of actual 2012 based aircraft vs. value calculated by equation)
R-squared = .68
F-statistic = 17.04
t-statistics
intercept = 5.21
income = 5.17
fuel = -2.19

Table 2-9 disaggregates the based aircraft forecast presented in **Table 2-8** by major aircraft type. Each major category was projected to grow at the FAA forecast national growth rate in that category and then adjusted proportionately to sum to the totals projected in **Table 2-8**. An additional adjustment was made to the 2018 forecast of jet aircraft to reflect input provided by DVT airport tenants during the inventory.

Table 2-9: Based Aircraft By Type (a)

Year	SEP	MEP	Turboprop	Jet	Heli	Glider	Other	Total (b)
2012	804	107	(c)	21	26	4	2	964
2013	866	116	(c)	18	23	10	0	1,033
2014	871	104	31	17	24	11	0	1,058
2018	945	113	35	32	30	12	0	1,167
2023	1,066	127	42	40	40	14	0	1,329
2033	1,395	160	72	68	66	19	0	1,780
Average Annual Growth Rate								
2013-2033	(d)	(d)	(d)	6.9%	5.4%	3.3%	0.0%	2.8%
2014-2033	2.5%	2.3%	4.5%	7.6%	5.5%	2.9%	0.0%	2.8%

Sources: As noted and HNTB analysis; (a) Fleet mix based on FAA projected general aviation trends and input from tenant surveys; (b) Table 2-8; (c) Included with single-engine and multi-engine piston; (d) Growth rate could not be calculated because breakout between piston and turboprop was not available for 2013

2.7 Aircraft Operations Forecast

Table 2-10 shows the base year estimate and forecast of DVT aircraft operations by major aircraft type. Historical data by type are not readily available so the base year (2013) distribution was estimated. Operations by more sophisticated aircraft (jets and turboprops) were obtained from data provided by the Aviation Department from their noise monitoring system, and then verified by comparing the results with the FAA's Traffic Flow Management System Counts (TFMSC) and interviews with DVT control tower staff. All jet and turboprop operations were assumed to be itinerant.

Breakouts of smaller piston-powered aircraft types are more difficult to develop because they fly primarily under VFR and therefore are not tabulated by most aircraft monitoring systems. Based on input provided by DVT control tower staff, helicopters were estimated to account for 5% of total operations. Remaining operations were distributed among single engine and twin engine piston aircraft in proportion to their representation in the based aircraft counts.

Table 2-10: Aircraft Operations by Type (a)
(Includes Estimated Operations between Midnight and 6 am) (b)

Year	Itinerant SEP	Itinerant MEP	Itinerant Turboprop	Itinerant Jet	Itinerant Heli	Itinerant Subtotal	Local SEP	Local MEP	Local Heli	Local Subtotal	Total
2013 (c)	120,601	14,400	3,229	2,114	3,323	143,667	182,991	21,850	14,844	219,685	363,352
2018	122,732	14,984	3,669	4,200	4,230	149,815	184,940	22,579	18,766	226,285	376,100
2023	136,715	16,655	4,418	5,662	5,716	169,166	206,010	25,098	25,359	256,467	425,633
2033	185,253	22,363	7,606	9,932	9,609	234,763	279,151	33,698	42,627	355,476	590,239
Average Annual Growth Rate											
2013-2033	2.2%	2.2%	4.4%	8.0%	5.5%	2.5%	2.1%	2.2%	5.4%	2.4%	2.5%

Sources: As noted and HNTB analysis; (a) Projected based on based aircraft forecasts and FAA projected utilization trends; (b) Aircraft operations between midnight and 6 am estimated at 2.3% of daily total based on information provided by the City of Phoenix Aviation Department; (c) Base year distribution of operations based on data provided by City of Phoenix Aviation Department, FAA FTMSC data, and estimates provided by DVT tower

Since the DVT tower does not operate between midnight and 6 am, operations that occur during that time are not tabulated in the official FAA counts. Based on aircraft monitoring data from the Aviation Department, these operations were estimated to account for 2.3% of the daily total. Therefore, the operations in **Table 2-10** were adjusted upwards to compensate for the 2.3% of operations missing from the official totals.

As shown in **Table 2-10**, single and twin engine piston-powered aircraft account for the vast majority of aircraft operations at DVT. Jets and turboprops combined account for less than 2% of the total. Future operations in each aircraft category were assumed to increase based on the growth in the number of based aircraft in that category and the anticipated change in their utilization rate. The future utilization rate within each category was estimated based on the FAA national forecast of hours flown divided by the FAA national activity fleet forecast in that category. The individual operations forecasts within each category were then summed to arrive at a forecast of total annual aircraft operations at DVT.

Also shown in **Table 2-10**, total aircraft operations are projected to increase from 363,352 in 2013 to 590,239 by 2033, an average annual increase of 2.5%. Although jet, turboprop, and helicopter operations are projected to increase more rapidly than piston-powered operations, piston aircraft operations are still expected to account for a large majority of activity at the end of the forecast period.

As noted earlier, the aircraft operations forecast in **Table 2-10** includes operations from midnight to 6 am that are not included in the official ATCT operations counts. To facilitate comparison with the FAA's TAF and actual ATCT counts, **Table 2-11** provides a breakout of the operations forecast between those operations expected to occur between 6 am to midnight, and between midnight and 6 am. As shown, the ATCT counts are projected to increase from 354,995 operations in 2013 to 576,664 in 2033.

Table 2-11: Forecast of Aircraft Operations
(6 am to midnight, and midnight to 6 am)

Year	6 am to Midnight (a)	Midnight to 6 am (b)	Total
2013	354,995	8,357	363,352
2018	367,450	8,650	376,100
2023	415,843	9,790	425,633
2033	576,664	13,575	590,239
Average Annual Growth Rate			
2013-2033	2.5%	2.5%	2.5%

Sources: As noted and HNTB analysis; n/a = not available; (a) Operations counted by ATCT. Comparable to TAF and historical ATCT counts; (b) Estimated operations between midnight and 6 am. Not counted by ATCT; (c) Total from Table 2-10

Table 2-12 provides a breakout of the operations forecast by use category, consistent with the categories the FAA uses to tabulate aircraft operations. Commercial operations include air carrier and air taxi. Air carrier operations consist of intermittent large aircraft operations arriving at DVT for special testing or other infrequent purposes. Air taxi operations consist of for-hire operations by small aircraft operated by the FBOs at DVT. There are no scheduled passenger or cargo operations at DVT. Since the commercial operations at DVT are not scheduled and mostly perform missions typically associated with general aviation, they were assumed to grow at the same rate as general aviation operations.

Combined itinerant and local military activity accounts for less than two operations per week at DVT. Military activity is driven more by national and international policy factors than local economic factors. Since reliable information on the policy factors likely to drive future military operations is not available, military operations at DVT were assumed to remain constant. As shown in **Table 2-12**, the vast majority of activity at DVT consists of general aviation, and is expected to continue to consist of general aviation.

Airfield facility requirements are determined primarily by the number of aircraft operations (**Tables 2-10** through **2-12**) and the performance characteristics of the aircraft operating and projected to operate at DVT. Therefore, a more detailed fleet mix for jet operations at DVT was prepared to help determine the appropriate design standards for DVT.

Table 2-13 provides the detailed fleet mix forecast for jet aircraft at DVT. The individual aircraft types are organized according to their aircraft design group and their approach category. The aircraft design groups relevant to DVT include:

- ADG Group I: tail height less than 20 feet and wingspan less than 49 feet
- ADG Group II: tail height 20 feet to less than 30 feet and wingspan 49 feet to less than 79 feet
- ADG Group III: tail height 30 feet to less than 45 feet and wingspan 79 feet to less than 118 feet
- ADG Group IV: tail height 45 feet to less than 60 feet and wingspan 118 feet to less than 171 feet

The aircraft approach categories are based on the aircraft arrival approach speed and include:

- Category A: less than 91 knots
- Category B: 91 knots to less than 121 knots
- Category C: 121 knots to less than 141 knots
- Category D: 141 knots to less than 166 knots
- Category E: greater than 166 knots

Table 2-12: Aircraft Operations by Use Category
(Includes Estimated Operations between Midnight and 6 am) (a)

Year	Itinerant Air Carrier	Itinerant Air Taxi (b)	Itinerant General Aviation	Itinerant Military (c)	Itinerant Subtotal	Local General Aviation	Local Military (c)	Local Subtotal	Total
2013	17	4,622	138,971	57	143,667	219,653	32	219,685	363,352
2018	18	4,820	144,920	57	149,815	226,253	32	226,285	376,100
2023	20	5,442	163,647	57	169,166	256,435	32	256,467	425,633
2033	28	7,553	227,125	57	234,763	355,444	32	355,476	590,239
Average Annual Growth Rate									
2013-2033	2.5%	2.5%	2.5%	0.0%	2.5%	2.4%	0.0%	2.4%	2.5%

Sources: As noted and HNTB analysis; (a) Aircraft operations between midnight and 6 am estimated at 2.3% of daily total based on information provided by the City of Phoenix Aviation Department; (b) Does not include any scheduled commuter operations. Assumed to increase at same rate as itinerant operations; (c) Assumed to remain constant

Table 2-13: Forecast of Jet Fleet Mix at DVT

Aircraft and ARC	2013	2018	2023	2033
ARC B-I				
Beechcraft Beechjet 400	69	72	86	140
Cessna Citation 500	27	22	20	15
Cessna Citation 501	18	15	13	10
Cessna Citation C525 Twin Jet	112	126	162	294
Cessna Citation Mustang	36	91	170	442
Eclipse	198	415	737	1,155
Embraer Twin Jet	34	71	127	198
Falcon 10	12	10	9	7
Learjet 25 Twin Jet	117	97	88	65
Learjet 55 Twin Jet	41	34	31	23
Raytheon 390 RB-45	90	125	186	402
Westwind Jet	22	18	16	12
Other	6	6	7	11
Subtotal	782	1,103	1,652	2,775
ARC B-II				
BAe HS 125/700-800 Twin Engine Jet	51	50	56	81
Cessna 560 Citation V	111	118	143	240
Cessna Citation 560 Excel	47	59	82	164
Cessna Citation Sovereign	10	17	27	64
Cessna Citation Twin Jet CJ2	49	65	95	200
Cessna Citation Twin Jet CJ3	84	141	229	539
Cessna Citation Twin Jet CJ4	18	106	228	643
Cessna Model 550 Citation Bravo	116	96	87	65
Embraer Twin Jet	18	18	21	32
Falcon 20	28	23	21	16
Falcon 50 Mystere 50	17	14	13	10
Falcon 900 Three Engine Jet	76	78	93	149
Falcon 2000	30	34	45	83
Other	9	9	11	16
Subtotal	664	829	1,150	2,301
ARC B-III				
Other	4	4	5	7
ARC C-I				
Learjet 31 Twin Jet	15	12	11	8
Lear Jet 40 Twin Jet	29	49	79	186
Lear Jet 45 Twin Jet	54	68	94	188
Learjet 60 Twin Jet	12	10	9	7
Subtotal	110	138	193	390

Aircraft and ARC	2013	2018	2023	2033
ARC C-II				
Bombardier Challenger 300	54	790	967	1,558
Bombardier CL600/610 Challenger	31	731	855	1,265
Cessna Citation 10 Twin Jet	164	195	262	504
Cessna Citation 3/6/7	11	9	8	6
Other	10	10	12	18
Subtotal	270	1,736	2,104	3,350
ARC C-III				
Boeing 737-700	11	11	13	19
Embraer 175	50	51	59	88
Gulfstream 5 Twin Jet	15	19	26	52
Other	17	28	46	109
Subtotal	93	109	145	269
ARC C-IV				
Other	1	1	1	2
ARC D-I				
Learjet 35 Twin Jet	90	75	67	50
Other	2	2	2	4
Subtotal	92	77	70	54
ARC D-II				
Gulfstream 4 Twin Jet	82	177	302	702
Other	5	10	17	36
Subtotal	87	188	319	738
ARC D-III				
Other	6	10	16	39
ARC D-IV				
Other	3	3	4	5
ARC E-I				
Other	2	2	2	4
TOTAL	2,114	4,200	5,662	9,932

Sources: City of Phoenix Aviation Department for 2013 data and tenant surveys, aircraft manufacturer data and HNTB analysis for projections

The combination of aircraft within each design group and each approach category determine the appropriate airport runway and airfield design standards. These are reviewed in more detail in Chapter 3, Facility Requirements.

The forecast for each individual aircraft type took several factors into consideration, including the average age of the specific aircraft type, whether or not it was still in production, and any published information on future production rates. As a result, the share of newer aircraft types in the DVT jet fleet are expected to increase and the share of older aircraft types are expected to decrease. Additional adjustments were made in cases where airport tenants were able to provide specific information on new aircraft types anticipated to operate at DVT.

Special attention was devoted to higher performance aircraft likely to impact runway design standards for DVT. Specifically, D-II operations (Aircraft Approach Category D and Aircraft Design Group II) were examined at Phoenix-area general aviation airports for which fleet mix data was available (DVT, GYR, GEU, FFZ, and SDL) and it was determined that D-II operations account for 0.25% of all operations at those airports.

It was assumed, that under unconstrained conditions, the DVT share of D-II operations would gradually increase and conservatively achieve half the regional average (0.125%) by the end of the Forecast period. This assumption is further supported by the fact that DVT had a significantly higher number of these operations back in 2004 and 2007 and has therefore demonstrated the ability to attract these operations in the past.

Table 2-14 summarizes the jet fleet mix forecast by aircraft design group and aircraft approach category. The FAA defines the critical aircraft at an airport as the most demanding aircraft, or group of aircraft, using the airport on a regular basis, defined as 500 or more operations per year. Based on this definition, the current critical aircraft at DVT is category C-II. This aircraft category is projected to remain the critical aircraft in 2018 and 2023. However, by 2033 the critical aircraft is expected to be category D-II. It is important to note that these forecasts are sensitive to the basing decisions of individual aircraft owners. If one or two D-II aircraft owners choose to relocate their aircraft to DVT prior to 2033, the critical aircraft designation would change at that time. The critical aircraft is discussed in more detail in Section 3.3.

2.8 Peak Activity Forecasts

Table 2-15 provides the forecast of peak activity at DVT. March is typically the peak month at DVT and accounts for approximately 10% of annual operations. There is a secondary peak in the fall, around October. Operations are relatively light in mid-winter and mid-summer. Although DVT is busy throughout the week, it is typically busier on weekdays than on weekends because of the high proportion of training activity. Since DVT has no scheduled operations, the peak hour can change from day to day, but typically occurs in the morning between 9 am and 12 am, and accounts for between 10% and 11% of daily operations.

Table 2-14: Jet Aircraft Operations by Airport Reference Code

2013								
		Airplane Design Group						
		I	II	III	IV	V	VI	Total
Aircraft Approach Category	A							
	B	782	664	4				1,450
	C	110	270	78	1			459
	D	92	87	21	3			203
	E	2						2
	Total	*986*	*1,021*	*103*	*4*	*0*	*0*	*2,114*
2018								
		Airplane Design Group						
		I	II	III	IV	V	VI	Total
Aircraft Approach Category	A							
	B	1,103	829	4				1,936
	C	138	1,736	90	1			1,966
	D	77	188	29	3			296
	E	2						2
	Total	*1,320*	*2,753*	*123*	*4*	*0*	*0*	*4,200*
2023								
		Airplane Design Group						
		I	II	III	IV	V	VI	Total
Aircraft Approach Category	A							
	B	1,652	1,150	5				2,807
	C	193	2,104	119	1			2,417
	D	70	319	42	4			435
	E	2						2
	Total	*1,917*	*3,574*	*166*	*5*	*0*	*0*	*5,662*
2033								
		Airplane Design Group						
		I	II	III	IV	V	VI	Total
Aircraft Approach Category	A							
	B	2,775	2,301	7				5,082
	C	390	3,350	216	2			3,958
	D	54	738	91	5			888
	E	4						4
	Total	3,222	6,389	314	7	0	0	9,932

Sources: Table 2-13 and HNTB Analysis

Table 2-15: Forecasts of Peak Month, AWDPM, and Peak Hour Operations

Year	Annual	Peak Month	Average Weekday Peak Month	Peak Hour
2013	363,352	36,246	1,241	133
2018	376,100	37,517	1,284	137
2023	425,633	42,458	1,453	155
2033	590,239	58,878	2,015	215
Average Annual Growth Rate				
2013-2033	2.5%	2.5%	2.5%	2.4%

Source: Table 2-11, FAA ATADS database, City of Phoenix Airport Aviation Department records, and HNTB analysis

The peak activity forecast in **Table 2-15** assumes, that since no major change in DVT's role is anticipated, the peaking relationships will remain largely unchanged. Therefore, the peak month percentage of annual operations, and the peak hour percentage of daily operations were assumed to remain constant. As shown, peak hour operations are expected to increase from 133 in 2013 to 215 by 2033.

2.9 Forecast Summary and Comparisons

Table 2-16 provides a summary of the baseline Forecast, including based aircraft by type, annual operations by use category and type, and peak hour operations. As shown, jets and helicopters are anticipated to be the fastest growing categories, but piston-powered aircraft are still expected to account for the majority of operations in 2033.

Figure 2-3 and **Table 2-17** provide a comparison of the DVT based aircraft forecast with historical activity and with prior forecasts completed for DVT. The other forecasts include:

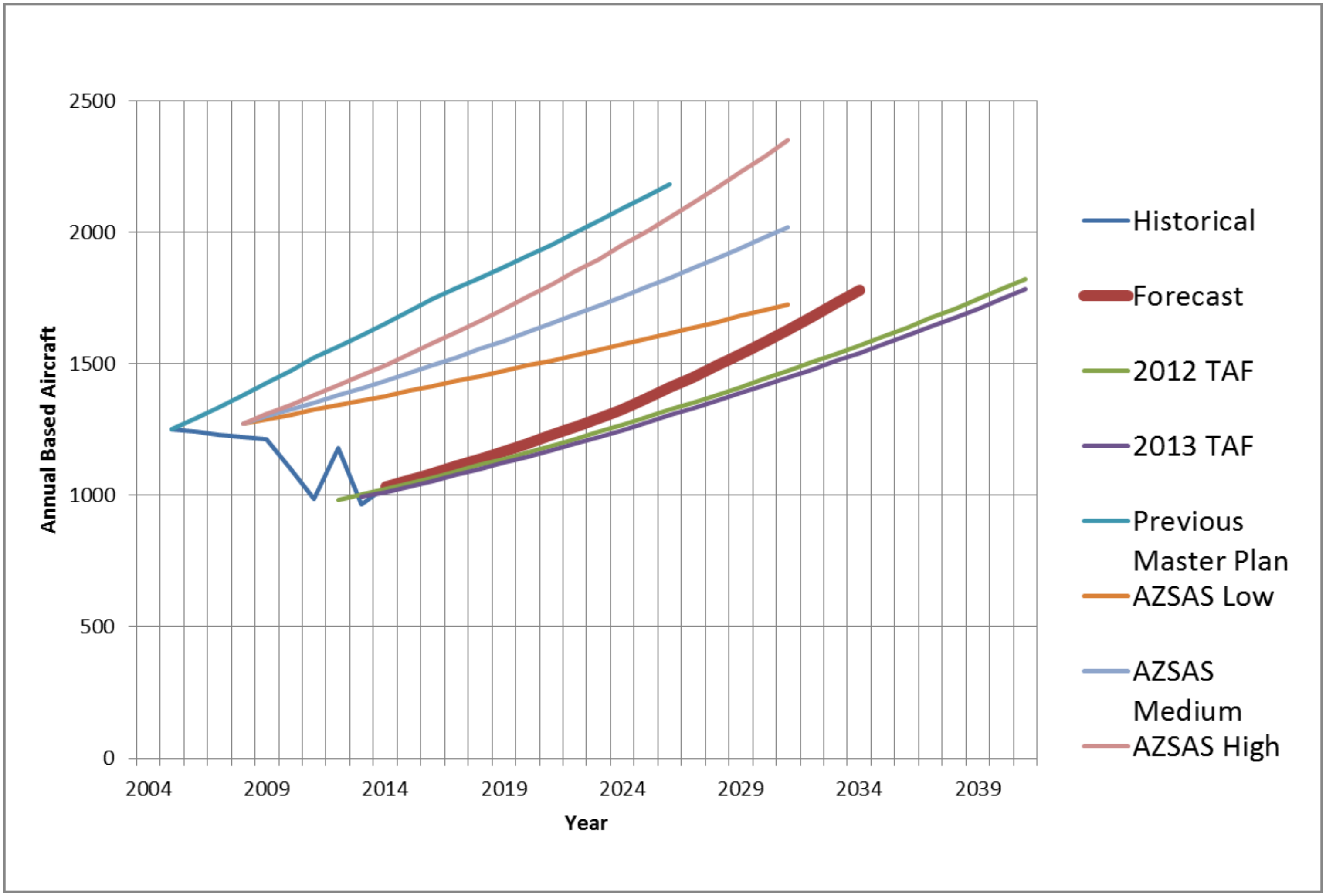
- FAA 2012 TAF (published early 2013)
- FAA 2013 TAF (published early 2014)
- Previous Master Plan Update Forecast (using 2004 as the base year and published in 2007)
- Low, Medium, and High 2008 AZSAS (using 2007 as the base year)

Table 2-16: Forecasts Summary

Category	2013	2018	2023	2028	2033	Average Annual Growth Rate
Based Aircraft						
Single Engine Piston	866	945	1,066	1,220	1,395	2.4%
Multi Engine Piston	116	113	127	143	160	1.6%
Turboprop	(a)	35	42	55	72	4.5%(b)
Jet	18	32	40	52	68	6.9%
Helicopter	23	30	40	51	66	5.4%
Glider	10	12	14	16	19	3.3%
Other	0	0	0	0	0	-
Total	1,033	1,167	1,329	1,538	1,780	2.8%
Annual Operations by FAA Category						
Itinerant						
Air Carrier	17	18	20	24	28	2.5%
Air Taxi	4,622	4,820	5,442	6,407	7,553	2.5%
General Aviation	138,971	144,920	163,647	192,641	227,125	2.5%
Military	57	57	57	79	57	0.0%
Itinerant Subtotal	143,667	149,815	169,166	199,150	234,763	2.5%
Local						
General Aviation	219,653	226,253	256,435	304,481	355,444	2.4%
Military	32	32	32	32	32	0.0%
Local Subtotal	219,685	226,285	256,467	301,940	355,476	2.4%
Total	363,352	376,100	425,633	501,090	590,239	2.5%
Annual Operations by Type (24-hour)						
Itinerant						
Single Engine Piston	120,601	122,732	136,715	159,144	185,253	2.2%
Multi Engine Piston	14,400	14,984	16,655	19,299	22,363	2.2%
Turboprop	3,229	3,669	4,418	5797	7,606	4.4%
Jet	2,114	4,200	5,662	7499	9,932	8.0%
Helicopter	3,323	4,230	5,716	7411	9,609	5.5%
Subtotal Itinerant	143,667	149,815	169,166	199,150	234,763	2.5%
Local						
Single Engine Piston	182,991	184,940	206,010	239,808	279,151	2.1%
Multi Engine Piston	21,850	22,579	25,098	29,082	33,698	2.2%
Helicopter	14,844	18,766	25,359	32,878	42,627	5.4%
Subtotal Local	219,685	226,285	256,467	301,940	355,476	2.4%
Total Annual Ops	363,352	376,100	425,633	501,090	590,239	2.5%
Peak Hour Ops	133	137	155	183	215	2.4%

Sources: Tables 9, 10, and 15; (a) Distributed among single-engine and twin-engine piston during 2013; (b) From 2014

Figure 2-3: Comparison of DVT Based Aircraft Forecasts



Source: Sources: City of Phoenix Aviation Department airport records, FAA 2012 and 2013 Terminal Area Forecasts, Phoenix Deer Valley Airport Master Plan Update, 2007, 2008 Arizona State Airports System Plan, Table 9, and HNTB analysis.
TAF = FAA Terminal Area Forecast
AZSAS = Arizona State Airports System Plan Forecast

Table 2-17: Comparison of Previous Based Aircraft Forecasts

Year	Historical	Forecast	2012 TAF	2013 TAF	Previous MP	AZSAS Low	AZSAS Medium	AZSAS High
2004	1,252				**1,252**			
2005	1,242				1,294			
2006	1,232				1,337			
2007	1,222				1,381	1,274	1,274	1,274
2008	1,212				1,427	1,291	1,300	1,308
2009	1,100				1,475	1,308	1,326	1,344
2010	987				**1,524**	1,326	1,353	1,380
2011	1,181		981		1,566	1,343	1,380	1,418
2012	964		1,003	995	1,610	1,361	1,408	1,456
2013	1,033	**1,033**	1,023	1,014	1,655	1,379	1,437	1,495
2014	1,058	**1,058**	1,044	1,034	1,701	1,397	1,466	1,536
2015		1,084	1,067	1,056	**1,748**	1,416	1,496	1,577
2016		1,111	1,091	1,079	1,787	1,435	1,526	1,619
2017		1,139	1,115	1,102	1,828	1,454	1,557	1,663
2018		**1,167**	1,138	1,124	1,869	1,473	1,589	1,708
2019		1,198	1,162	1,147	1,911	1,493	1,621	1,754
2020		1,229	1,189	1,173	1,954	1,513	1,654	1,801
2021		1,262	1,214	1,197	1,998	1,533	1,687	1,850
2022		1,295	1,242	1,224	2,044	1,553	1,721	1,900
2023		**1,329**	1,268	1,249	2,090	1,574	1,756	1,951
2024		1,368	1,297	1,277	2,137	1,595	1,792	2,004
2025		1,409	1,325	1,304	**2,185**	1,616	1,828	2,058
2026		1,451	1,354	1,332		1,638	1,865	2,113
2027		1,494	1,383	1,360		1,660	1,903	2,170
2028		1,538	1,413	1,389		1,682	1,942	2,229
2029		1,584	1,444	1,419		1,704	1,981	2,289
2030		1,631	1,475	1,449		1,727	2,021	2,351
2031		1,679	1,507	1,480				
2032		1,729	1,539	1,511				
2033		**1,780**	1,572	1,543				
2034			1,605	1,575				
2035			1,639	1,608				
2036			1,674	1,642				
2037			1,709	1,676				
2038			1,745	1,711				
2039			1,783	1,748				
2040			1,821	1,785				
Average Annual Growth Rate								
		2.8%	2.2%	2.1%	2.7%	1.3%	2.0%	2.7%

Source: Sources: City of Phoenix Aviation Department airport records, FAA 2012 and 2013 Terminal Area Forecasts, Phoenix Deer Valley Airport Master Plan Update, 2007, 2008 Arizona State Airports System Plan, Table 9, and HNTB analysis.

TAF = FAA Terminal Area Forecast

AZSAS = Arizona State Airports System Plan Forecast

The previous Master Plan Update forecast and the three AZSAS forecasts were prepared prior to the recession and therefore reflect the much better economic conditions that were anticipated at the time. The two TAFs were prepared much more recently and are therefore more similar to the current Master Plan Forecast. **Figure 2-4** and **Table 2-18** provide a comparison of the current aircraft operations forecasts with the previous Master Plan Update, the AZSAS, and the most recent 2013 TAF.

As was the case with the based aircraft forecasts, the prior Master Plan and AZSAS operations forecasts were developed before the recession, and therefore show higher forecasts than the more recent projections. The current Master Plan Forecast track very closely with the TAF projections initially but then diverge later in the forecast period. This is due in part to the difference in the based aircraft forecast, but also due to the difference in assumptions on average utilization.

Table 2-19 provides a more detailed comparison of the baseline Forecast with the most recent 2013 TAF using the standard FAA format for comparing forecasts. Note that the Master Plan Forecast numbers have been adjusted to include only 6 am to midnight operations, so as to provide a more accurate basis for comparison. According to FAA guidance:

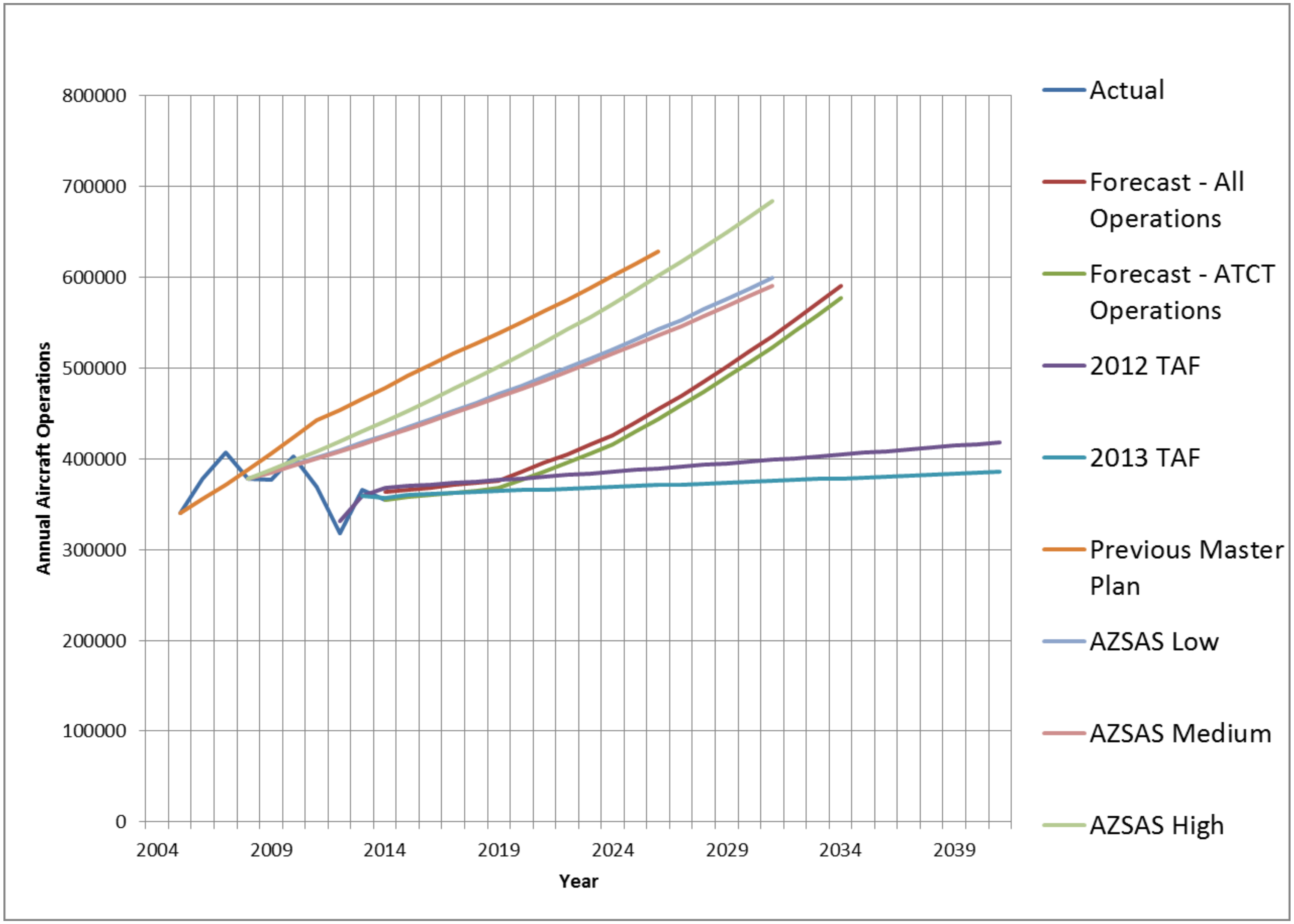
For all classes of airports, forecasts for total enplanements, based aircraft, and total operations are considered consistent with the TAF if they meet the following criterion:

- Forecasts differ by less than 10% in the 5-year forecast period, and 15% in the 10-year forecast period
- If the forecast is not consistent with the TAF, differences must be resolved if the forecast is to be used in FAA decision-making.[5]

Using this criterion, the Master Plan based aircraft forecast is consistent with the TAF. The forecast of commercial operations (air carrier plus air taxi) differs by more than 15% in 2023, mainly because the TAF assumes operations in this category will remain constant. It should be noted that commercial operations at DVT are minimal and by themselves will likely not generate any new facility requirements. They are therefore unlikely to be needed for any FAA decision-making. The Master Plan and TAF projections of total operations are very similar in 2018 and differ by less than 13% in 2023, and therefore meet the criterion for consistency.

[5] FAA, Review and Approval of Aviation Forecasts, June 2008.

Figure 2-4: Comparison of DVT Aircraft Operations Forecasts



Sources: City of Phoenix Aviation Department airport records, FAA 2012 and 2013 Terminal Area Forecasts, 2007 Phoenix Deer Valley Master Plan Update

TAF = FAA Terminal Area Forecast
AZSAS = Arizona State Airports System Plan Forecast

Table 2-18: Comparison of Previous Operations Forecasts

Year	Actual	Forecast – All Operations	Forecast – ATCT Operations	2012 TAF	2013 TAF	Previous Master Plan	AZSAS Low	AZSAS Medium	AZSAS High
2004	340,437					**340,437**			
2005	377,841					355,578			
2006	406,507					371,391			
2007	378,349					387,909	**377,696**	**377,696**	**377,696**
2008	376,634					405,160	385,359	385,101	387,567
2009	402,335					423,180	393,178	392,651	397,696
2010	368,747					**442,000**	401,156	400,348	408,090
2011	317,443			331,377		453,758	409,295	408,197	418,756
2012	365,432			358,731	358,731	465,828	**417,600**	**416,200**	**429,700**
2013	354,995	**363,352**	**354,995**	367,939	356,350	478,219	426,051	424,354	440,919
2014		365,866	357,452	369,655	360,502	490,941	434,673	432,668	452,430
2015		368,398	359,926	371,380	361,417	**504,000**	443,469	441,145	464,242
2016		370,948	362,416	373,117	362,334	515,209	452,444	449,788	476,363
2017		373,515	364,925	374,865	363,254	526,667	**461,600**	**458,600**	**488,800**
2018		**376,100**	**367,450**	376,623	364,177	538,380	470,957	467,581	501,570
2019		385,522	376,656	378,392	365,102	550,354	480,505	476,737	514,674
2020		395,181	386,092	380,173	366,030	562,594	490,245	486,073	528,120
2021		405,082	395,765	381,964	366,960	575,106	500,183	495,591	541,918
2022		415,230	405,680	383,766	367,893	587,897	510,323	505,296	556,076
2023		**425,633**	**415,843**	385,580	368,828	600,971	520,668	515,191	570,604
2024		439,779	429,664	387,405	369,765	614,337	531,223	525,280	585,511
2025		454,395	443,944	389,240	370,705	**628,000**	541,992	535,567	600,808
2026		469,497	458,699	391,087	371,648		552,979	546,054	616,505
2027		485,101	473,944	392,945	372,593		564,189	556,748	632,611
2028		501,224	489,696	394,814	373,542		575,626	567,650	649,139
2029		517,882	505,971	396,694	374,493		587,295	578,766	666,098
2030		535,094	522,787	398,588	375,446		**599,200**	**590,100**	**683,500**
2031		552,878	540,162	400,493	376,403				
2032		571,253	558,115	402,409	377,362				
2033		**590,239**	**576,664**	404,338	378,324				
2034				406,278	379,289				
2035				408,230	380,256				
2036				410,195	381,226				
2037				412,171	382,199				
2038				414,159	383,175				
2039				416,160	384,153				
2040				418,174	385,135				
Average Annual Growth Rate									
		2.5%	2.5%	0.8%	0.3%	3.0%	2.0%	2.0%	2.6%

Sources: City of Phoenix Aviation Department airport records, FAA 2012 and 2013 Terminal Area Forecasts, 2007 Phoenix Deer Valley Master Plan Update

TAF = FAA Terminal Area Forecast
AZSAS = Arizona State Airports System Plan Forecast

Table 2-19: Comparison of Master Plan Forecast and FAA's 2013 Terminal Area Forecast

	Year	Master Plan Forecast	2013 TAF	Master Plan / TAF (% Difference)
Passenger Enplanements	2013	0	0	-
Base Year	2018	0	0	-
Base Year + 5 Years	2023	0	0	-
Base Year + 10 Years	2028	0	0	-
Base Year + 15 Years	2013	0	0	-
Commercial Operations				
Base Year	2013	4,535	4,468	1.5%
Base Year + 5 Years	2018	4,729	4,468	5.8%
Base Year + 10 Years	2023	5,340	4,468	19.5%
Base Year + 15 Years	2028	6,291	4,468	40.8%
Total Operations				
Base Year	2013	354,995	356,350	-0.4%
Base Year + 5 Years	2018	367,450	364,177	0.9%
Base Year + 10 Years	2023	415,843	368,828	12.7%
Base Year + 15 Years	2028	489,695	373,542	31.1%
Based Aircraft				
Base Year	2013	1033	1014	1.9%
Base Year + 5 Years	2018	1167	1124	3.8%
Base Year + 10 Years	2023	1329	1249	6.4%
Base Year + 15 Years	2028	1538	1389	10.7%

Sources: Tables 2-11, 2-16, FAA, and HNTB Analysis

Notes: TAF data is on a U.S. Government fiscal year basis (October through September). Airport operations forecasts are from 6 am – midnight, consistent with FAA ATCT counts.

As noted earlier, there is a significant difference between the Master Plan and TAF total operations forecasts towards the end of the forecast period. There are several reasons for the higher growth rates in the Master Plan baseline Forecast:

- The Master Plan aircraft utilization assumptions are more consistent with the national utilization projections in the FAA's most recent Aerospace Forecast but the TAF projects operations per based aircraft to decline from 351 in 2013 to 245 in 2033. Given the amount of training activity at DVT and the need of the flight schools to fully utilize their aircraft, this decrease in operations per based aircraft is considered unlikely.
- The Phoenix MSA has and is projected to continue to grow more rapidly than the United States average. Since 1990, population in the Phoenix MSA grew

at an average annual rate of 3.0% compared to the overall U.S. annual growth rate of 1.0%. According to the ADOA, population in the Phoenix MSA is projected to grow 1.9% per year compared to their projection of 0.7% per year for the entire U.S. Income forecasts show a similar divergence. According to W&P, real income in the Phoenix MSA is expected to grow 3.5% per year compared to 2.4% per year in the entire U.S.

- Aircraft operations at DVT have paralleled economic trends. Due to the events of September 11, 2001, the spike in fuel costs, and the recession, overall general aviation operations at U.S. towered airports have decreased at a rate of 3.3% per year since 2000. In comparison, over the same period of time operations at DVT have only decreased an average of 0.3% per year, outperforming U.S. operations by 3.0% per year.
- DVT's share of overall Phoenix towered airport operations (general aviation, military, non-scheduled air taxi) has increased from 22.5% in 2000 to 26.0% in 2013. This indicates that in addition to serving a rapidly growing area, DVT is serving an increasing share of this area.
- A large number of DVT's operations are training operations for flight schools serving Asian airlines. The need for these pilots is expected to continue to increase, as both Boeing and Airbus project rapid passenger growth in the Asia/Pacific region (6.3% per year for Boeing and 5.8% per year for Airbus).
- The forecast of operations projected under the TAF for DVT is unusually low and uses a lower growth rate (0.3%) than the national general aviation forecast (0.5%), despite historical trends and the anticipation that the Phoenix area will grow more rapidly than the overall U.S.

As a result of the above factors, the draft baseline forecast of operations is considered more appropriate than the TAF operations forecast for use in planning for facility requirements in the Master Plan.

2.10 Forecast Scenarios

The assumptions used in developing the Master Plan Forecast are likely to vary over the forecast period, and the variations could be material. One way to explore the impact of these variations is to develop alternative scenarios in which the impact on the Forecast of a variation in a critical assumption is evaluated. The baseline Forecast provides the basis for determining what additional facilities or policies will be required at DVT through 2033. The Aviation Department must be able to respond to a range of contingencies that could occur, taking into account political and economic changes, technological changes, and changes in the business plans of individual tenants. The recommended development program must be flexible enough to accommodate these contingencies.

To address these potential changes, four alternative forecast scenarios were selected by the Aviation Department in consultation with stakeholders. Much of the background information used to develop the scenarios is provided in previous sections. The four scenarios differ from the baseline Forecast summarized in Section 2.9 and include:

- Scenario 1: Addition of a New Flight School
- Scenario 2: High Economic Growth Combined with the Loss of an Existing Flight School
- Scenario 3: Low Economic Growth and High Fuel Cost
- Scenario 4: Loss of an Existing Flight School

Table 2-20 and **Tables B-1 through B-4** in **Appendix B** summarize the results of the scenarios. More detailed discussion of the assumptions and results associated with each scenario follow.

Scenario 1: This scenario is a high growth scenario that assumes that a third flight school begins operating at DVT sometime between 2018 and 2023. It was assumed that the based aircraft and operations associated with the new flight school would be similar to those associated with the second largest flight school currently operating at DVT. All other assumptions, such as economic growth and fuel costs, are the same as in the baseline Forecast.

As shown in **Table 2-20** and in **Table B-1**, the scenario results in slightly more based aircraft at DVT when compared to the baseline case. The main difference, however, is in aircraft operations since flight schools tend to fly their aircraft many times per day. Under Scenario 1, total operations at DVT are projected to increase from 363,352 in 2013 to 704,549 by 2033, an average annual increase of 3.4%. The main increase would be among single engine and twin engine piston-powered operations.

Scenario 2: This scenario assumes higher economic growth than in the baseline Forecast. It is also assumed that the additional operations associated with the higher economic growth would increase congestion and thereby induce one of the existing flight schools to relocate to a less busy airport sometime between 2018 and 2023. For the purpose of this scenario, it was assumed that the second largest flight school at DVT would leave DVT. The high economic growth is based on the High ADOA population forecast (see **Table 2-4**).

As shown in **Tables 2-20 and B-2**, Scenario 2 results in slightly more based aircraft than the baseline Forecast, but fewer aircraft operations. Flight schools tend to have very high aircraft utilization rates. The additional economic growth is sufficient to generate enough based aircraft to offset the relatively small number of aircraft lost with the flight school. However, the additional economic growth is not sufficient to offset the relatively large loss in aircraft operations associated with the loss of the flight school. Although total operations are less than in the baseline Forecast, the number of operations by high performance aircraft (jets and turboprops) is greater (see **Table B-2**).

Scenario 3: Scenario 3 is a conservative scenario that assumes lower economic growth and higher fuel costs than in the baseline case. The low economic growth is based on the low ADOA population forecast (**Table 2-4**) and high fuel cost is based on the High DOE fuel price case (**Table 2-7**). High fuel costs often trigger recessions and are therefore frequently associated with them. Examples include recessions in 1974, 1980, 1991, and 2008.

Scenario 3 results in lower based aircraft and aircraft operations totals for DVT when compared to the baseline Forecast, as shown in **Tables 2-20 and B-3**. Based aircraft are projected to grow from 1,033 in 2013 to 1,458 in 2033, an average annual growth rate of 1.7%. Annual aircraft operations are projected to increase from 363,352 in 2013 to 483,417, an average annual increase of 1.4%. Piston and turbine aircraft operations would all decline when compared to the baseline Forecast.

Scenario 4: Like Scenario 2, Scenario 4 assumes the loss of one of the flight training schools. However, unlike Scenario 2, it also assumes no increase in economic growth above the baseline Forecast. For the purpose of this scenario, it was assumed that the second largest flight school at DVT would leave DVT sometime between 2018 and 2023.

Since flight schools account for a much greater share of aircraft operations than based aircraft, Scenario 4 has a significantly greater impact on the operations forecast than the based aircraft forecast. As shown in **Table 2-20**, the average annual growth rate for the based aircraft forecast is 2.6%, slightly lower than the 2.8% associated with the baseline Forecast. However, the average annual growth rate for the operations forecast is 1.4%, much lower than the 2.5% associated with the baseline Forecast.

Table 2-20: Comparison of Baseline Forecast and Forecast Scenarios

	2013	2018	2023	2028	2033	Average Annual Growth Rate
Based Aircraft						
Baseline	1,033	1,167	1,329	1,538	1,780	2.8%
Scenario 1: New Flight School	1,033	1,167	1,377	1,652	1,844	2.9%
Scenario 2: High Growth & Loss of Flight School	1,033	1,188	1,328	1,502	1,839	2.9%
Scenario 3: Low Economic Growth & High Fuel Cost	1,033	1,021	1,143	1,291	1,458	1.7%
Scenario 4: Loss of Flight School	1,033	1,167	1,281	1,422	1,716	2.6%
Annual Operations (24-hour)						
Baseline	363,352	376,100	425,633	501,090	590,239	2.5%
Scenario 1: New Flight School	363,352	376,100	510,076	599,344	704,549	3.4%
Scenario 2: High Growth & Loss of Flight School	363,352	383,073	353,027	424,237	510,145	1.7%
Scenario 3: Low Economic Growth & High Fuel Cost	363,352	328,912	365,810	420,417	483,417	1.4%
Scenario 4: Loss of Flight School	363,352	376,100	341,190	402,832	475,929	1.4%

Sources: Tables 2-16, B-1, B-2, B-3, and B-4

3.0 Facility Requirements

Facility requirements represent the estimated future infrastructure needed to accommodate forecast demand for those facilities based on the anticipated levels of based aircraft and operations as determined in the Forecast. The condition of the existing airport infrastructure and its capability to accommodate this need is also taken into account. Many of the requirements presented in this chapter are quantitatively determined by applying the Forecast to industry standard planning methodologies adjusted for local DVT conditions as discussed in each subsection. The quantitative requirements are supplemented with the qualitative recommendations and feedback of Airport staff, tenants, and other stakeholders gathered during tenant and user interviews along with technical and public advisory committee meetings. This chapter presents the facility requirements for airside, landside, general aviation, and support facilities.

3.1 Planning Horizons

As identified in Chapter 2, the Forecast projects based aircraft and operations through 2033. Using 2013 as the base year, the most recent year of complete operational statistics, the Forecast includes projections for four interim planning horizons each spaced five years apart, 2018, 2023, 2028, and 2033. **Table 3-1** summarizes the forecast of based aircraft and total operations for each of the planning horizons. The planning horizons will be used in subsequent sections to present the facility requirements for each facility analyzed.

Table 3-1: DVT Based Aircraft and Operations Forecast Summary

Year	Based Aircraft	Total Operations	Peak Month Operations
2013 (Existing)	1,033	363,352	36,246
2018	1,167	376,100	37,517
2023	1,329	425,633	42,458
2028	1,538	501,090	49,985
2033	1,780	590,239	58,878

Source: HNTB Analysis

3.2 Peaking Characteristics

The operational peaking characteristics defined in the Forecast are used extensively throughout this facility requirements chapter to analyze facility performance against predicted peak activity. An industry accepted methodology within airport planning is to analyze the facility requirements against an average day of the peak month (ADPM). This level of demand represents an increase over the activity associated with an average annual day (AAD) but does not account for the peak day of the peak month which often results in facilities that are substantially overbuilt. In addition to annual, monthly, and daily metrics, it is also important to understand what the peak hour aircraft operations demand will be on DVT's runways and taxiways to assess whether additional airfield capacity is warranted. **Table 3-2** summarizes the average peak monthly, daily, and hourly demands projected for DVT.

Table 3-2: DVT Peak Demand Forecast Summary

Year	Total Operations	Peak Month Operations	ADPM Operations[1]	Peak Hour Operations
2013 (Existing)	363,352	36,246	1,241	133
2018	376,100	37,517	1,284	137
2023	425,633	42,458	1,453	155
2028	501,090	49,985	1,711	183
2033	590,239	58,878	2,015	215

Source: HNTB Analysis
Note 1: ADPM = Average Day of the Peak Month

3.2.1 Airfield Capacity

Airfield capacity refers to the level of aircraft activity, as defined by hourly or annual aircraft operations that can be accommodated by the existing airfield system with an acceptable level of delay.

The FAA specified metric used for estimating annual airfield capacity is the annual service volume (ASV). The ASV utilizes peak hourly capacities of the airfield and ratios of annual to monthly demand and daily to hourly demand to reasonably estimate the annual capacity of the airfield. The ASV methodology is described in FAA Advisory Circular (AC) 150/5060-5: *Airport Capacity and Delay*, published on September 23, 1983. There are currently two primary methodologies used to estimate hourly airfield capacity for the ASV calculation. Historically AC 150/5060-5 has been used to determine the appropriate graphical layout of the airfield and incorporate assumptions about percentage of touch-and-go operations, flow directions, percentage of VFR and IFR, and location and quantity of runway exit taxiways. The second and significantly newer methodology was developed by the Transportation Research Board's (TRB) Airports Cooperative Research Panel (ACRP) Project 3-17 which utilizes a detailed Microsoft Excel spreadsheet model that takes into account additional inputs that influence capacity, including runway occupancy times, in-trail arrival separation distances, departure separation times, and several other operational dependencies. The results of both methodologies are described in this section.

3.2.1.1 AC 150/5060-5 Capacity Methodology

A description of the inputs needed for the ASV calculation under AC 150/5060-5 follows. The ASV for DVT was determined, in part, using the peak hour fleet mix breakdown from the Forecast. This fleet mix or operational breakdown is split according to the FAA's aircraft weight classifications:

- A: Single engine aircraft weighing 12,500 lbs. or less (e.g. Cessna 172)
- B: Twin engine aircraft weighing 12,500 lbs. or less (e.g. Beechcraft King Air)
- C: Large aircraft weighing greater than 12,500 lbs. but less than 300,000 lbs. (e.g. Boeing 737)
- D: Heavy jet aircraft weighing greater than 300,000 lbs. (e.g. Boeing 747)

DVT's fleet mix index is expressed by the mathematical sum of the percentage of large aircraft operations (Category C) weighing between 12,500 and 300,000 pounds and three times the percentage of heavy aircraft operations (Category D) weighing more than 300,000 pounds. Based on the fleet mix projected in the Forecast, DVT's fleet mix index for both VFR and IFR conditions is 3 (2% [C] + 3 x 0% [D]).

Given the high volume of flight training at DVT, it is important to also consider the extensive number of touch-and-go operations that occur. Touch-and-go operations take place when a pilot lands and departs without coming to a full stop. They are generally used for instructive purposes to expose a student pilot to multiple take offs and landings in a relatively short amount of time and for recurrent pilot training purposes. Officially, a touch-and-go is recorded as two operations by ATC. Similar to the previous Master Plan Update, the VMC touch-and-go factor at DVT is 1.36. It is assumed that touch-and-go procedures would be prohibited during IMC, and therefore, during IMC, the touch-and-go factor is 1.00, however, IMC only occurs approximately less than 2% of the year.

A key component of the runway capacity calculation is the percentage of arrival operations, expressed as the hourly ratio of arrivals (number of arrivals plus one half of the touch-and-go operations) to total operations (number of arrivals plus number of departures plus number of touch-and-go operations). The resultant VMC arrivals percentage is 43% and the resultant IMC arrivals percentage is 42%.

Another important contributor to runway capacity is the location, number, and adequacy of exit taxiways. The location of exit taxiways directly correlates with runway occupancy time. The higher the runway occupancy time, the lower the runway capacity, as it takes longer for aircraft to clear the runway. DVT's exit taxiways are generally located in positions that allow aircraft to efficiently clear the runway, which results in minimizing runway occupancy time. Runway exit taxiways should be located approximately 2,000 to 4,000 feet past the arrival threshold for general aviation and corporate jet aircraft. Based on the guidance provided by AC 150/5060-5 for runway exit factor, the VMC exit factor is 0.90 and the IMC exit factor is 1.00 for both east and west flow operations.

The AC shows that DVT's hourly runway capacity base is approximately 190 aircraft operations during VMC. Applying the 1.36 touch-and-go factor and the 0.90 runway exit factor, the adjusted hourly VMC capacity is 233 aircraft operations. *Figure 3-44* of the AC shows that DVT's hourly runway capacity base is approximately 70 operations during IMC. Applying the 1.00 touch-and-go factor and the 1.00 runway exit factor, the adjusted hourly capacity during IMC is 70 aircraft operations. These runway capacities are the maximum or ideal capacities that can be accomplished under optimal conditions. In practice, the actual runway capacity achieved will be less, and can often be in the range of 80% of the optimum capacity. However, for comparison with the ACRP methodology, the numbers produced by AC 150/5060-5 are carried forward.

The weighted runway capacity is a function of the different runway-use configurations used over the course of a year, the percent of time each runway-use configuration is used, the hourly capacity for each runway-use configuration, and the ASV weighting factor. The weighted capacity expression is:

$$c_w = \left(\frac{(p_1 \cdot c_1 \cdot w_1) + (p_2 \cdot c_2 \cdot w_2) + \cdots + (p_n \cdot c_n \cdot w_n)}{(p_1 \cdot w_1) + (p_2 \cdot w_2) + \cdots + (p_n \cdot w_n)} \right)$$

Where,

C_w = weighted hourly capacity
p_n = percent of time configuration "n" is used
c_n = hourly capacity of configuration "n"
w_n = ASV weighting factor (based on the percent of maximum capacity)

Since the west and east flow hourly capacities are approximately equivalent, only VMC and IMC operations are applied to the weighted capacity expression. The resultant weighted hourly capacity is approximately 230 aircraft operations. As presented in **Table 3-2**, the peak hourly demand in 2033 is projected to be 215 aircraft, which is less than the theoretical hourly capacity of the airfield. As previously stated, the airfield may not be able to achieve its theoretical maximum hourly capacity due to air traffic control constraints, variances in actual runway occupancy time, pilot actions, and many other external factors.

ASV is the mathematical multiplication of the weighted hourly capacity, the ratio of annual demand to average daily demand during the peak month, and the ratio of average daily demand to average peak hour demand during the peak month. The latter two metrics are taken directly from the Forecast. The average daily demand during the peak month in 2013 is approximately 1,241 operations per day. The operations total for 2013 was 363,352 operations. The ratio of annual demand to average daily demand during the peak month is 293 (363,352 ÷ 1,241). The ratio of average daily demand during the peak month to average peak hour demand during the peak month is 9.3 (1,241 ÷ 133). The resultant ASV using the methodology outlined in AC 150/5060-5 is 626,727 operations (230 x 293 x 9.3). The total forecast operational demand of 590,239 aircraft operations through 2033 is within the range of the ASV estimation.

3.2.1.2 ACRP Capacity Methodology

The ACRP spreadsheet method for estimating airfield capacity was developed with the goal to better calibrate hourly capacities to more realistic operating conditions that would be encountered with real-world ATC, pilot, and external constraints. Many of the inputs used in the AC 150/5060-5 calculation are required for input into the ACRP spreadsheet. The ACRP spreadsheet model has modernized options for selecting airfield layouts that best match the subject airport. These include dependencies on which runways are identified for mixed use (departures and arrivals on each runway) or segregated use (defining a runway primarily for departure or arrival only). Both of DVT's runways operate as mixed mode and can accommodate simultaneous arrival and departures under VMC. During IMC, the runways are dependent and cannot be used for simultaneous arrivals. Additional inputs that are broadly assumed under the AC 150/5060-5 calculation and directly taken into account in the ACRP spreadsheet model include arrival-arrival and departure-departure separations, arrival gap spacing buffer, departure hold buffer, runway occupancy time based on the weight class of each aircraft, and number of runway crossings. The peak hourly runway capacity estimated by the ACRP spreadsheet model using the fleet mix from 2013 is approximately 154 operations, which is less than the projected 2033 peak hourly demand of 215 operations. This will result in periods where the airfield exhibits some delay in accommodating peak demand. Utilizing the same ASV demand ratios discussed under the AC 150/5060-5 methodology, the ACRP spreadsheet model yields an ASV capability of approximately 451,300 operations. The ACRP projected ASV exceeds the 2023 annual demand; however, it does not meet the 2028 or 2033 annual demand.

3.2.1.3 Capacity Analysis Conclusions

An ASV is highly dependent on current aviation activity and layout of the airfield. DVT's ASV should be used only as a benchmark for operational characteristics and should be recalculated periodically. It is not intended to be identified as the maximum theoretical capacity of the airfield or as the trigger point for the development of additional airfield capacity. An FAA approved airfield and airspace simulation model, such as Simmod *PRO!*, may be used to better approximate the capacity of an airport at the outset of a major capacity enhancement project. The results of the two ASV methodologies demonstrate DVT's two runway system can accommodate a substantial amount of demand with limited operational constraints. The ACRP model's hourly throughput of 154 operations translates to a round-the-clock annual volume capacity of 1.35 million operations. The AC model's hourly throughput of 230 operations translates to a round-the-clock annual volume capacity of 2.01 million operations. In practice, DVT would never experience round-the-clock peak hourly demand, but the airfield has sufficient capability to accommodate the forecast annual operations through 2033 without additional runways. **Table 3-3** presents a summary of the two methodologies for peak hourly capacity and ASV.

Table 3-3: Peak Hourly Capacity and ASV Summary

Metric	ACRP Model	AC 150/5060-5 Model
2033 Aircraft Operations Demand	590,239 Ops	590,239 Ops
Hourly Capacity	154 Ops/Hr	230 Ops/Hr
Annual Service Volume	451,300 Ops	626,727 Ops

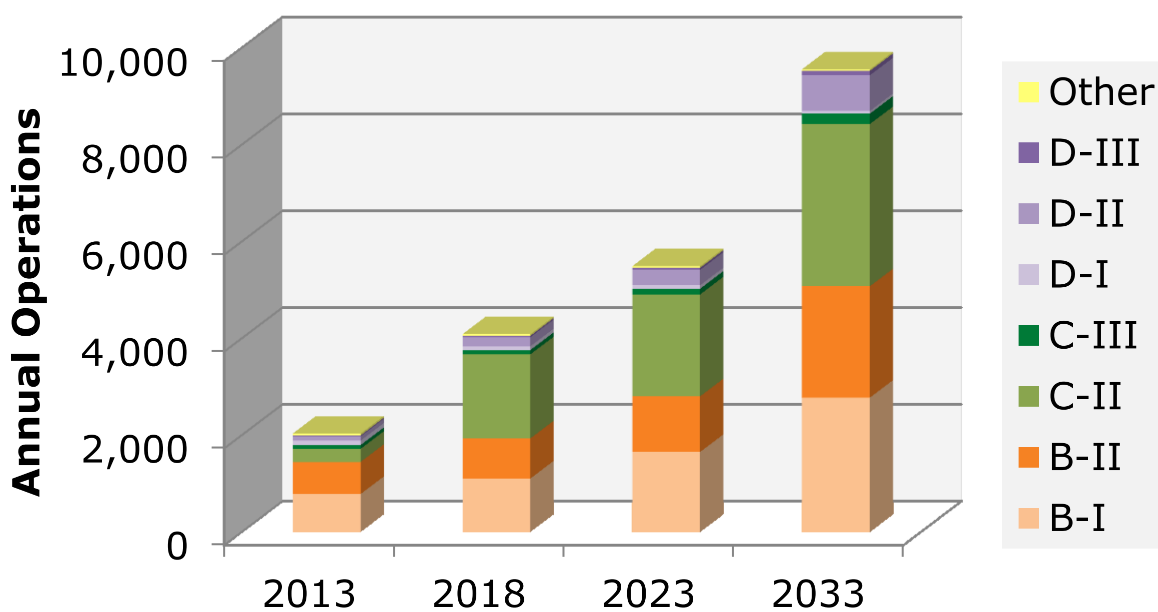
Source: HNTB Analysis

As demand grows, there will be peak periods where users experience arrival and departure delay. This is further exacerbated by the current demand placed on the south runway, Runway 7R-25L, which handles more than 60% of DVT's operations due to the number of facilities on the south side, tenants' locations, and preference for a longer runway. A better balancing of the utilization of the north and south runways would assist in mitigating some of the delay that will be experienced in future years. While not necessarily adding capacity to the airfield, an extension of Runway 7L-25R could assist in balancing the airfield by being able to accommodate a greater number of operations without weight restrictions. The relocation of high-volume tenants, such as the flight schools, to the north side of the airfield could also assist in balancing the utilization of the runways.

3.3 Critical Aircraft

The FAA defines the critical aircraft for an airport as the aircraft representing the combination of the most demanding ARC with greater than 500 annual operations at the airport. DVT's existing critical aircraft is the Challenger 604 (C-II). The Forecast estimates that the future critical aircraft will be the Gulfstream IV (D-II) by approximately 2028. **Figure 3-1** below depicts a summary of DVT's forecast jet fleet mix by ARC. Chapter 1, Inventory of Existing Conditions, introduced the components of the RDC: ADG, AAC and approach visibility minimum as well as the TDG. An RDC and TDG are designated for each runway on an airfield. The existing north runway's (Runway 7L-25R) RDC and TDG are B/I/VIS and 1A, respectively. The forecast RDC and TDG for the north runway are B/II/VIS and 1B, respectively. With the long-planned relocation of Taxiway B, Runway 7L-25R will meet B/II/VIS design standards. As such, it is also prudent to plan taxiways and their corresponding fillets to meet TDG 1B standards. Representative aircraft fitting into B-II include Beech King Air, Cessna Citation V, and Falcon 20. The existing south runway's (Runway 7R-25L) RDC and TDG are C/II/5000 and 1B, respectively. The forecast RDC and TDG for the south runway are D/II/5000 and 2, respectively. The change from C/II/5000 to D/II/5000 has minimal facility impacts but indicates an increase in medium sized business jets in the Forecast. **Table 3-4** summarizes DVT's existing and forecast RDCs and TDGs. The approach visibility minimum component is analyzed in Section 3.4.5 and in Chapter 5, Airport Alternatives, to assess whether lower approach visibility minimums is a viable improvement at DVT.

Figure 3-1: Jet Fleet Mix Forecast by ARC



Source: HNTB Analysis

Table 3-4: Runway and Taxiway Design

Runway	Existing RDC	Forecast RDC	Existing TDG	Forecast TDG
Runway 7R-25L	C/II/5000	D/II/5000	1B	2
Runway 7L-25R	B/I/VIS	B/II/VIS	1A	1B

Source: HNTB Analysis

3.4 Airfield Requirements

The airfield requirements presented in this section are a composite of quantitative requirements, many of which are discussed in AC 150/5300-13A, and qualitative requirements that will help the airfield further improve safety and operational efficiency.

3.4.1 Runway Geometry

The Forecast estimates that DVT's Runway 7R-25L will have an RDC D/II/5000 by the end of the planning horizon. **Table 3-5** presents and compares the existing Runway 7R-25L geometry with the requirements for runway design criteria for D/II/5000 and D/II/2400. An analysis for D/II/2400 has been included in addition to D/II/5000 in order to assess the impacts of lowering the approach visibility minimums from the existing 1.25 miles to a Category I Instrument Landing System (ILS) precision approach with 0.5 mile approach visibility.

Among the Runway 7R-25L geometry elements that do not meet current FAA design standards for RDC D/II/5000 are the blast pad width, which is deficient by 20 feet; the runway centerline to holdbar separation between Runway 7R-25L and Taxiway C, which is deficient by 100 feet; and runway shoulders, which are not present. To meet RDC D/II/2400 design standards, in addition to the geometry elements, Runway 7R-25L's centerline separation to Taxiway C's centerline would need to increase from 300 feet to 400 feet, the separation from the closest aircraft parking area to Runway 7R-25L's centerline would have to increase from 400 feet to 500 feet, and the arrival RPZ size would increase which potentially requires additional land acquisition/easement control.

Table 3-5: Runway 7R-25L Facility Requirements

Geometry Element RDC	Existing C/II/5000	Geometry Requirements D/II/5000	 D/II/2400	
Approach Visibility Minimum	1.25 mile	1.25 mile	0.5 mile	*
Runway Width	100'	100'	100'	
Runway Shoulder Width	0'	10'	10'	
Runway Blast Pad Width	100'	120'	120'	
Runway Blast Pad Length	152'	150'	150'	
Maximum Crosswind Component	16 knots	16 knots	16 knots	
RSA Width[1]	500'	500'	500'	
RSA Length Beyond Stop End	1,000'	1,000'	1,000'	
RSA Length Prior to Landing Threshold	600'	600'	600'	
ROFA Width	800'	800'	800'	
ROFA Length Beyond Stop End	1,000'	1,000'	1,000'	
ROFA Length Prior to Landing Threshold	600'	600'	600'	
ROFZ Width	400'	400'	400'	
ROFZ Length Beyond Stop End	200'	200'	200'	
Arrival RPZ Length	1,700'	1,700'	2,500'	*
Arrival RPZ Inner Width	500'	500'	1,000'	*
Arrival RPZ Outer Width	1,010'	1,010'	1,750'	*
Departure RPZ Length	1,700'	1,700'	1,700'	
Departure RPZ Inner Width	500'	500'	500'	
Runway Centerline to:				
Holdline	150'	250'	250'	
Parallel Taxiway/Taxilane Centerline	300'[2]	300'	400'	*
Aircraft Parking Area	400'	400'	500'	*

Source: FAA AC 150/5300-13A, Change 1 and HNTB analysis

*: Indicates a difference in requirements between D/II/5000 and D/II/2400.

Note 1: For Airport Reference Code C-I, C-II, and D-II a RSA Width of 400' is Permissible (AC 150/5300-13A, Table 3-5).

Note 2: The existing runway centerline to taxiway centerline separation from Taxiways C and B are 300' and 500', respectively.

Similar to Runway 7R-25L, Runway 7L-25R's existing airfield geometry is compared with the airfield design for RDCs B/I/VIS and B/II/VIS in **Table 3-6**. The runway currently does not fully comply with RDC B/I/VIS standards as it does not have a runway blast pad and Taxiway B does not meet separation standards as it is only 200 feet from Runway 7L-25R's centerline and is required to be a minimum of 225 feet.

Compared to RDC B/II/VIS, Runway 7L-25R is further deficient in blast pad width and length. In addition, separation distance between Runway 7L-25R and Taxiway B would need to increase to a minimum of 240 feet. The runway's RSA, OFA, and OFZ are already graded to support B/II/VIS standards; however, they are currently only identified to meet B/I/VIS.

Table 3-6: Runway 7L-25R Facility Requirements

Geometry Element RDC	Existing B/I/VIS	Geometry Requirements B/I/VIS	 B/II/VIS	
Approach Visibility Minimum	1.25 mile	1.25 mile	1.25 mile	
Runway Width	75'	60'	75'	*
Runway Shoulder Width	10'	10'	10'	
Runway Blast Pad Width	0'	80'	95'	*
Runway Blast Pad Length	0'	100'	150'	*
Maximum Crosswind Component	10.5 knots	10.5 knots	13 knots	*
RSA Width	120'	120'	150'	*
RSA Length Beyond Stop End	240'	240'	300'	*
RSA Length Prior to Landing Threshold	240'	240'	300'	*
ROFA Width	400'	400'	500'	*
ROFA Length Beyond Stop End	240'	240'	300'	*
ROFA Length Prior to Landing Threshold	240'	240'	300'	*
ROFZ Width	250'	250'	400'	*
ROFZ Length Beyond Stop End	200'	200'	200'	
Arrival RPZ Length	1,000'	1,000'	1,000'	
Arrival RPZ Inner Width	500'	500'	500'	
Arrival RPZ Outer Width	700'	700'	700'	
Departure RPZ Length	1,000'	1,000'	1,000'	
Departure RPZ Inner Width	500'	500'	500'	
Runway Centerline to:				
Holdline	200'	200'	200'	
Parallel Taxiway/Taxilane Centerline	300'[1]	225'	240'	*
Aircraft Parking Area	365'	200'	250'	*

Source: FAA AC 150/5300-13A, Change 1 and HNTB analysis

*: Indicates a difference in requirements between B/I/VIS and B/II/VIS.

Note 1: The existing runway centerline to taxiway centerline separation from Taxiways A and B are 300' and 200', respectively.

3.4.2 Additional Runway Requirements

3.4.2.1 Runway Length

Runway length requirements are dependent upon aircraft type and maximum takeoff weight (e.g. aircraft, passengers, baggage, cargo, fuel), runway elevation, runway grade, conditions and obstructions, air temperature, and wind.

The runway takeoff length requirements in this analysis were reviewed based on weather conditions associated with a warm, summer day ("hot day"), which result in longer runway takeoff length requirements than on a typical day. **Figure 3-2** presents the takeoff length requirements at 105° F (an average day in July) for a variety of aircraft in DVT's current and future fleet mix as well as a sampling of other aircraft that DVT could expect on an infrequent basis (Boeing 737 [Boeing Business Jet], Gulfstream V, etc). The graphic illustrates the runway takeoff length requirement for the fleet at various percentages of maximum takeoff weight (80%, 90%, and 100%). The percentages of maximum takeoff weight are shown to demonstrate at what percentage of maximum payload a given aircraft can operate at DVT. The runway takeoff length requirement at maximum takeoff weight for a Gulfstream IV, DVT's future critical aircraft, is 8,153 feet. The Gulfstream IV is able to depart with 100% payload from DVT's Runway 7R-25L, which is currently 8,196 feet long.

The current and forecast fleet can operate at DVT largely without weight penalties even during the warmest months (June through September). It is important to note that even during the warmest months 100% of the small propeller-driven fleet is able to takeoff from Runway 7L-25R, which is currently 4,500 feet long. However, due its comparative length, pilots are not always willing to accept assignment on Runway 7L-25R. The ability to accommodate the departure length for the entire propeller-driven fleet, which encompasses the vast majority of the operations at DVT, will be important as this Master Plan strives to balance the distribution of activity between the two runways. Aircraft landings require less runway length. Generally, corporate jet insurance companies recommend that there is a minimum of 5,000 feet available for jet aircraft arrivals. Propeller-driven aircraft generally need less than 4,000 feet for arrivals.

The existing runway lengths are sufficient to accommodate the projected aircraft fleet mix's departure and arrival length requirements through the planning horizon, however, to better balance the airfield, an extension of the north runway would allow enhanced flexibility for ATC to utilize the runways and allow some jet departures and arrivals on the north runway should there be peak periods of very high traffic volume, or should there be an incident that temporarily closes Runway 7R-25L. This would provide increased operational efficiency on the airfield and an increase in overall airfield capacity as there could be less runway crossings as aircraft could utilize the runway closest to their parking area.

3.4.2.2 Pavement Strength

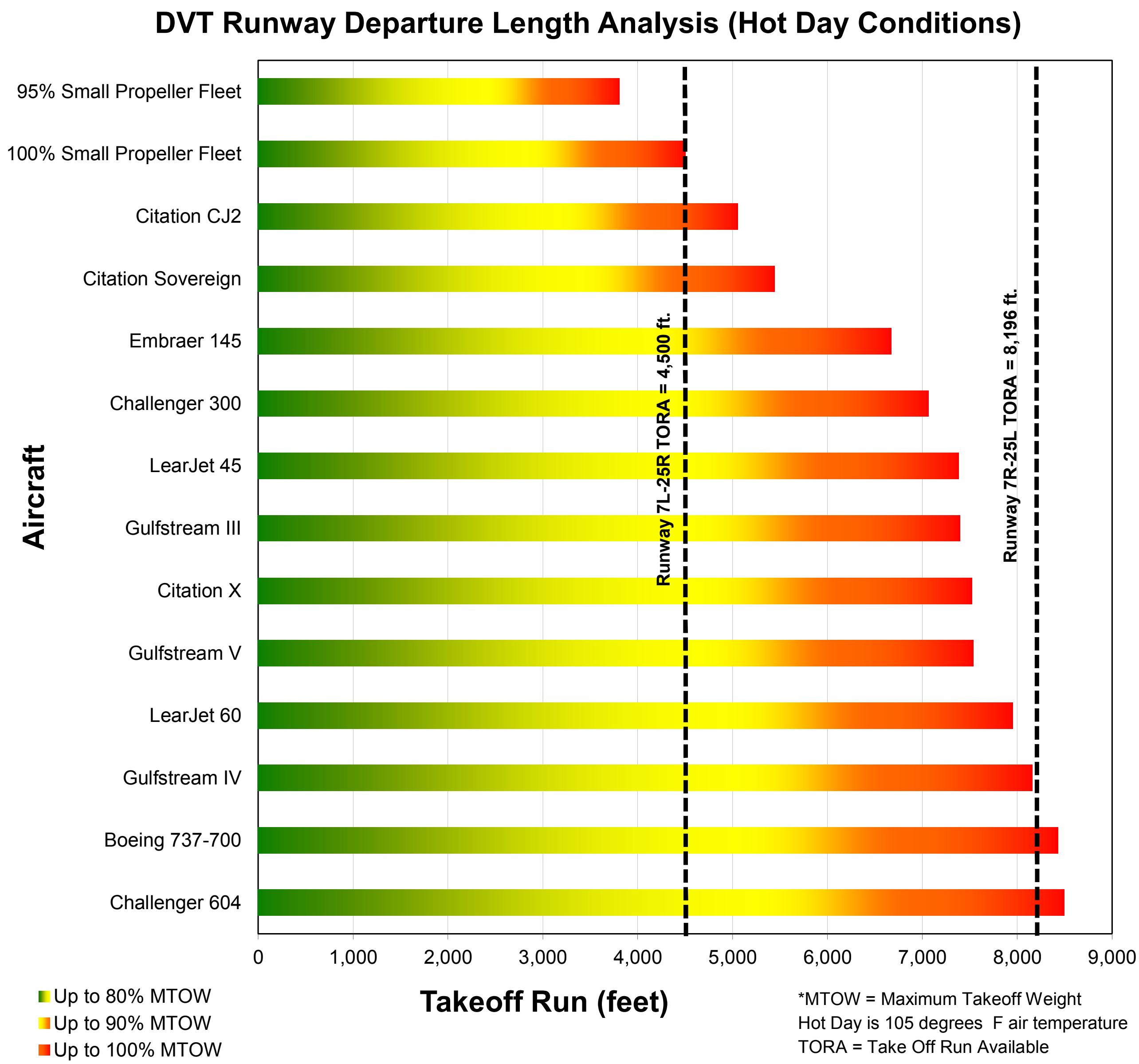
Chapter 1, Inventory of Existing Conditions, summarized the runway pavement bearing strengths for each runway (see **Table 1-7**). **Table 3-7** provides the maximum takeoff weight and landing gear configuration of a sampling of DVT's current and projected fleet mix.

Table 3-7: Select Aircraft Pavement Bearing Strength Requirements

Aircraft	Maximum Takeoff Weight	Landing Gear Configuration
Beech King Air C90	10,100 Lbs.	Single Wheel
Citation X	36,100 Lbs.	Double Wheel
Challenger 604	48,200 Lbs.	Double Wheel
Gulfstream IV	74,600 Lbs.	Double Wheel
Gulfstream V	90,500 Lbs.	Double Wheel
Boeing Business Jet I	171,000 Lbs.	Double Wheel

Source: Various aircraft manufacturer's design manuals and Applied Pavement Technology, DVT Final Report, 2014

Note: Runway 7R-25L Single Wheel bearing strength: 65,000 Lbs., Double Wheel bearing strength: 93,000 Lbs.; Runway 7L-25R Single Wheel bearing strength: 119,000 Lbs., Double Wheel bearing strength: 186,000 Lbs.



Percentage of Forecast Operations by Aircraft Type (2033)

Aircraft Type	%	Aircraft Type	%
95% Small Propeller Fleet	83.77	Gulfstream III	< 0.01
100% Small Propeller Fleet	88.18	Citation X	0.01
Citation CJ2	0.03	Gulfstream V	0.01
Citation Sovereign	0.01	LearJet 60	< 0.01
Embraer 145	0.01	Gulfstream IV	0.12
Challenger 300	0.26	Boeing 737-700	< 0.01
LearJet 45	0.03	Challenger 604	0.21

Percentage of forecast operations is derived from the Aviation Activity Forecast. The percentages are based on a total of 590,239 operations forecast for 2033.

Source: HNTB Analysis

Runway Takeoff Length Requirements

Figure 3-2

DVT

HNTB

The aircraft that are forecast to regularly operate at DVT all fall within the runway pavement bearing strengths of the airfield. The Boeing Business Jet I (737-700) exceeds the runway pavement double wheel bearing strength of 93,000 Lbs. for Runway 7R-25L, the runway that it would likely depart on due to the length and width of the runway; however, only 11 operations were recorded for that aircraft type in 2013. When a runway pavement bearing strength is exceeded by an aircraft's weight, it does not imply that the aircraft cannot use that runway or that the aircraft using that runway will cause immediate distress to the runway. Occasional usage by aircraft should not significantly impact the lifespan of runway pavement; however, regular operations of overweight aircraft will increase the rate at which a runway would need rehabilitation.

3.4.3 Runway Safety Action Plan

FAA's design advisory circular, AC 150/5300-13A, consolidates a variety of recent research findings related to airfield safety. Previously airfield safety enhancement bulletins had been published in FAA orders and engineering briefs. The research correlates existing design geometries with incursion history as well as the future potential for an incursion to take place. The FAA found that there are specific trends in airfield geometry that can result in incursions and have broadly identified them as:

- Complex runway intersections – Pilots can get confused on the airfield if there are too many decision points
- Runways beginning near the intersection of a crossing runway – Pilots could mistakenly takeoff or land on the wrong runway
- "High energy intersections" – Aircraft should not have runway crossing points in the middle 1/3 of the runway to provide enhanced pilot situational awareness
- Misaligned runway arrival thresholds – Pilots may misidentify a runway as a taxiway or vise-versa
- Complex taxiway intersections with greater than 2 intersecting paths – Pilots could mistakenly traverse the wrong taxiway
- Extra-wide taxiway pavements – Signage potentially could be too far out of view for pilots
- Runway crossings that lead directly into a ramp – Pilots could mistakenly cross a runway without being cleared
- Direct runway crossings from an adjacent runway – After landing pilots could mistakenly continue their taxi path in front of an aircraft landing or departing an adjacent runway
- Entrance taxiways to runways– Pilots approaching a runway sometimes mistakenly line up for approach on the parallel taxiway. Rounding out the entrance taxiway to a runway visually enhances both the taxiway and runway
- Runway/taxiway and taxiway/taxiway intersections – Right angles provide the best visibility left and right for a pilot at an intersection

3.4.3.1 Hot Spots

The FAA identifies Hot Spots at every airport. The FAA defines a hot spot as a location on an airport movement area with a history of potential risk of collision or runway incursion, and where heightened attention by pilots and drivers is necessary. There are two official Hot Spots at DVT.

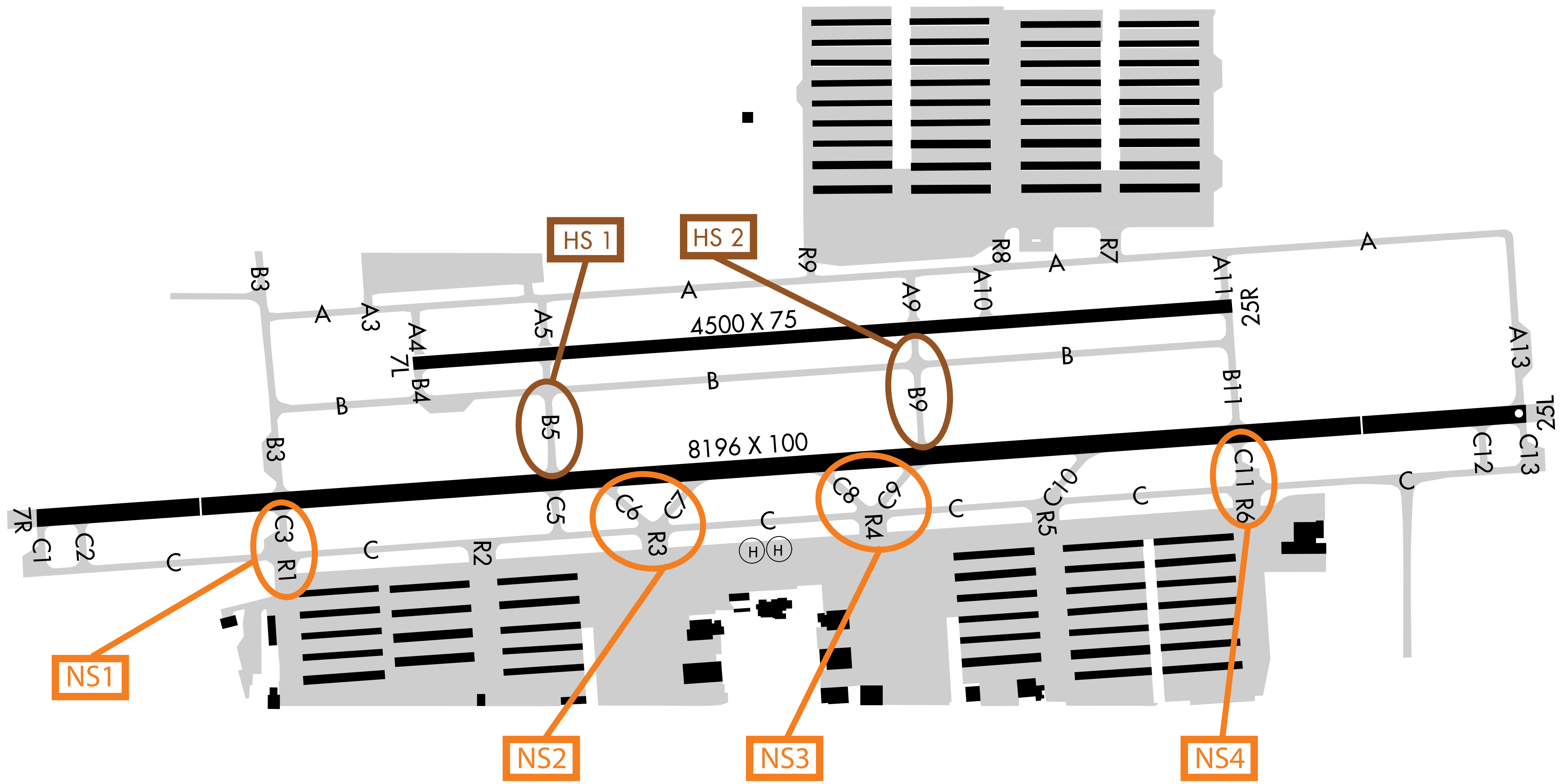
- **Hot Spot 1** is located along Taxiway B5 between Taxiway B and Runway 7R-25L. Historically, some pilots have crossed Runway 7R-25L at Taxiway B5 without ATC clearance. This is an example of a straight through runway crossing without an impediment.
- **Hot Spot 2** is located along Taxiway B9 between Runways 7L-25R and Runway 7R-25L. Historically, some pilots have crossed Runway 7R-25L at Taxiway B9 without ATC clearance.

The Hot Spots are depicted in **Figure 3-3** along with the nonstandard geometry intersections described below.

3.4.3.2 Nonstandard Geometry

In addition to the FAA Hot Spots, there are additional taxiway intersections that do not meet current FAA AC 150/5300-13A guidelines and have the potential for incursions. The nonstandard geometry locations are described in the bullets below. Proposed updates to the airfield geometry to address these intersections are discussed in Chapter 5, Airport Alternatives. These intersections are also depicted in **Figure 3-3**.

- **Nonstandard Geometry 1** is located along Taxiway C3 between Runway 7R-25L and the non-movement area. Aircraft leaving the non-movement area can taxi directly beyond Taxiway C and onto Runway 7R-25L without an impediment. This intersection is critical because it is a primary access point to the north runway. The pavement width also exceeds recommended FAA guidelines.
- **Nonstandard Geometry 2** is located at the intersection of Taxiways C6, C7, C, and the non-movement area. This five-node intersection point exceeds the FAA's recommendation for a maximum of four taxiway nodes. The pavement width exceeds recommended FAA guidelines.
- **Nonstandard Geometry 3** is located at the intersection of Taxiways C8, C9, C, and the non-movement area. This five-node intersection point exceeds the FAA's recommendation for a maximum of four taxiway nodes. The pavement width exceeds recommended FAA guidelines.
- **Nonstandard Geometry 4** is located along Taxiway C11 between Runway 7R-25L and the non-movement area. Aircraft leaving the non-movement area can taxi directly beyond Taxiway C and onto Runway 7R-25L without an impediment. This intersection is critical because it is a primary access point to the departure end of the north runway. The pavement width exceeds recommended FAA guidelines



- Hot Spot 1 is located along Taxiway B5 between Taxiway B and Runway 7R-25L. Historically, some pilots have crossed Runway 7R-25L at B5 without ATC clearance.
- Hot Spot 2 is located along Taxiway B9 between Runways 7L-25R and Runway 7R-25L. Historically, some pilots have crossed Runway 7R-25L at B9 without ATC clearance.
- Non-standard Geometry 1 is located along Taxiway C3 between Runway 7R-25L and the non-movement area. Aircraft leaving the non-movement area can taxi directly beyond Taxiway C and onto Runway 7R-25L without an impediment. This intersection is critical because it is a primary access point to the north runway. The pavement width exceeds recommended FAA guidelines.
- Non-standard Geometry 2 is located at the intersection of Taxiways C6, C7, C, and the non-movement area. This five-node intersection point exceeds the FAA's recommendation for a maximum of four taxiway nodes. The pavement width exceeds recommended FAA guidelines.
- Non-standard Geometry 3 is located at the intersection of Taxiways C8, C9, C, and the non-movement area. This five-node intersection point exceeds the FAA's recommendation for a maximum of four taxiway nodes. The pavement width exceeds recommended FAA guidelines.
- Non-standard Geometry 4 is located along Taxiway C11 between Runway 7R-25L and the non-movement area. Aircraft leaving the non-movement area can taxi directly beyond Taxiway C and onto Runway 7R-25L without an impediment. This intersection is critical because it is a primary access point to the departure end of the north runway. The pavement width exceeds recommended FAA guidelines.

DVT Hot Spots and Non-standard geometry

Figure 3-3

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NOT TO SCALE

3.4.4 Taxiway Requirements

Taxiway requirements are largely based on the TDG criteria presented in AC 150/5300-13A, Change 1 as well as qualitative operational observations of the taxiways. Similar to the runway geometry analysis, a taxiway geometry analysis comparison was prepared for the taxiways supporting Runway 7R-25L (**Table 3-8**) and Runway 7L-25R (**Table 3-9**).

Table 3-8: Runway 7R-25L TDG Requirements

Geometry Element	Existing	Required
TDG	1B	2
Taxiway Width	35’-40’	35'
Taxiway Shoulder Width	0'	15'
Taxiway Edge Safety Margin	7.5'	7.5'
Taxiway Centerline to:		
Parallel Taxiway/Taxilane Centerline	157'	105'
Fixed or Moveable Object	65.5'	65.5'
Taxiway Safety Area Width	79'	79'
Taxiway Object Free Area Width	131'	131'
Taxiway Wingtip Clearance	26'	26'
Taxilane Centerline to:		
Parallel Taxilane Centerline	116'	97'
Fixed or Moveable Object	50'	57.5'
Taxilane Object Free Area Width	115'	115'
Taxilane Wingtip Clearance	18'	18'

Source: FAA AC 150/5300-13A, Change 1 and HNTB analysis

Table 3-9: Runway 7L-25R TDG Requirements

Geometry Element	Existing	Required
TDG	1A	1B
Taxiway Width	35'	25'
Taxiway Shoulder Width	10'	10'
Taxiway Edge Safety Margin	5'	5'
Taxiway Centerline to:		
Parallel Taxiway/Taxilane Centerline	85'	105'
Fixed or Moveable Object	65.5'	65.5'
Taxiway Safety Area Width	49'	79'
Taxiway Object Free Area Width	89'	131'
Taxiway Wingtip Clearance	20'	26'
Taxilane Centerline to:		
Parallel Taxilane Centerline	114'	97'
Fixed or Moveable Object	39.5'	57.5'
Taxilane Object Free Area Width	79'	115'
Taxilane Wingtip Clearance	15'	18'

Source: FAA AC 150/5300-13A, Change 1 and HNTB analysis

The majority of DVT's taxiways meet FAA design standards for separations and widths. The main deficiency is the lack of taxiway shoulders on Taxiway C and the Runway 7R-25L entrance/exit taxiways. Rather than asphalt paved shoulders, Taxiway A has 10 foot milled shoulders on each side. Having milled shoulders as opposed to asphalt paved shoulders is a considerable cost saving measure.

In addition to the requirements identified in AC 150/5300-13A, there are a number of qualitative improvements that are recommended for the taxiway system. These include the following:

In order to meet a minimum RDC of B/II/VIS, it is recommended that Taxiway B be relocated from 200 feet from Runway 7L-25R centerline to 300 feet from Runway 7L-25R centerline. The relocation of the Taxiway B would provide the same runway to taxiway separation (300 feet) that Taxiway A was recently constructed to meet. If Taxiway B is relocated, there is an opportunity to further improve the taxiway geometry between the two runways by reconfiguring runway crossing points so they do not align with entrances to aircraft parking aprons and runway crossings are eliminated from the middle third of the runway.

The addition of a second parallel taxiway on the south side of the airfield would help accommodate the heavy traffic flow of inbound and outbound aircraft currently mixing on Taxiway C. The current location of the runway holdbars south of Runway 7R-25L does not meet standards. If the holdbars were relocated from their existing location of 150 feet south of Runway 7R-25L to the FAA-standard location of 250 feet, it would require arriving aircraft to immediately exit the runway onto Taxiway C as there would be insufficient length for aircraft to hold between the Runway 7R-25L RSA and the Taxiway C OFA. A second parallel taxiway would enable departures and arrivals to be segregated on two taxiways which would allow arriving aircraft to immediately exit the runway without having additional congestion from departing aircraft traversing Taxiway C. A second parallel taxiway would also allow enhanced sequencing of aircraft as there would be a bypass route for aircraft to taxi around other aircraft holding on the taxiway. Near the departure ends of the runway, this also allows jet and small general aviation departure traffic to be segregated which could help reduce potential jet blast impacts.

The FAA hot spots and other nonstandard geometry require mitigation to further improve safety and to minimize the potential risk for incursions. The latest edition of AC 150/5300-13A incorporates many recommendations from the FAA's research on reducing airfield incursions. Major recommendations include minimizing runway crossings, providing impediments prior to crossing multiple runways, arrival threshold alignment among parallel runways, enhancing visual cues, consistent marking and signage, and reducing complex taxiway and runway intersections.

With both flight schools located on the south side of the airfield, there are several peaks throughout the day where greater than 6 aircraft taxi out of the ramp and head to the departure end of the south runway at the same time. The existing run-up aprons at C1, C3, C11, and C13 are large enough to hold approximately two small general aviation aircraft at each location; however, all of the existing run-up aprons are contained within the RSA. Once the runway holdbars south of Runway 7R-25L are relocated to their required distance, these run-up aprons will not be able to be used. Furthermore, they are currently undersized and do not meet dimensional requirements outlined by the FAA. Larger run-up areas adjacent to each runway end that are outside of the RSA and below any approach and departure surfaces would better serve the operation. Given the frequency and demand for a run-up position from small general aviation aircraft, there should be a minimum of six positions at each end of the runway. A new, larger run-up apron designed to FAA standards would not only improve the congestion at each end of the runway, but would also improve ATC's ability to sequence aircraft.

3.4.5 NAVAIDs

The existing NAVAIDs at DVT support non-precision instrument arrivals. The previous Master Plan reviewed the ability for DVT to upgrade its approach to a precision instrument runway using a Category I ILS approach complete with a glideslope, localizer, and medium intensity approach lighting system with runway alignment indicator lights (MALSR). The NAVAID improvements recommended in the previous Master Plan would bring the approach visibility minimums for Runway 25L down to 0.5 mile (currently 1.25 miles). The meteorological conditions at DVT do not justify the installation of an ILS alone as the frequency of IFR conditions is less than 2% of the year. The intended purpose of an ILS at an airport with substantial flight training activity like DVT would be to provide instruction and recurrent training for pilots. The implementation of an ILS has physical airfield impacts as well as collateral impacts. Amongst DVT's users and tenants, there is a perceived lack of available ILS training sites within the Greater Phoenix Metropolitan area. The lack of available training sites would likely induce additional demand for aircraft from across the Phoenix area to practice approaches at DVT. The additional traffic could further congest the airspace at and between training sites.

As discussed in the runway geometry section, an ILS with 0.5 mile visibility would increase the required runway to taxiway separation from 300 feet to 400 feet. This would require the relocation and reconstruction of Taxiway C and would preclude the ability to construct a parallel taxiway within airport property. The off-airport RPZ impacts would also result in additional mitigation. The RPZ associated with a precision instrument approach is significantly longer and wider than the existing RPZ. The resultant RPZ would require off-airport property acquisition to maintain control of the property contained within the RPZ. Further analysis would also be required to verify that any approach would be clear of controlling obstacles. While still impactful, it is possible to have an ILS approach without a MALSR, which would translate to an approach with visibility minimums as low as 0.75 mile. At 0.75 mile approach visibility minimum, the runway to taxiway separation requirements are only 300 feet and the RPZ size is not as large as the lower visibility RPZ. Even with a 0.75 mile visibility approach minimum, the induced demand for shooting practice approaches would result in adverse delay impacts to DVT and would likely reduce overall capacity of the airfield because aircraft flying an ILS approach have greater final approach separations. Tenant and user reaction to the implementation of an

ILS has been mixed, however, the majority of tenants and users prefer that the ILS be located at an airport with less activity.

As the Next Generation (NEXTGEN) Air Transportation System continues to progress and technology continues to improve, GPS approaches will have approach visibility minimums comparable with existing ILS approaches. Many of these GPS approaches, such as LPV approaches and other Required Navigation Performance (RNP) procedures, can provide similar training opportunities for general aviation aircraft and adequate stabilized approach requirements for many corporate aircraft.

With regard to visual NAVAIDs, each of DVT's four existing PAPI visual slope indicators are two light systems. Two light systems indicate whether a pilot is above or below the runway's glide path angle. A four light system conveys to pilots additional relative information about the glide path including whether the pilot is marginally above/below the glide path angle or substantially above/below the glide path angle. Four-light PAPIs enhance pilot situational awareness on an approach and increase overall safety. It is recommended that DVT's two light PAPIs be replaced with four light PAPIs.

Tenant and user surveys have overwhelmingly recommended the reestablishment of a compass calibration pad at DVT. The former compass calibration pad was demolished as the northwest apron was reconstructed and reconfigured. A compass calibration pad allows pilots to calibrate their magnetic compass using surveyed magnetic headings painted on the ground. The siting criteria for a compass calibration pad are described in Appendix 6 of AC 150/5300-13A, Change 1. Chapter 5, Airport Alternatives, further explores the viability of siting a compass calibration pad at DVT.

3.4.6 Airfield Lighting, Marking and Signage

The existing airfield lighting (runway lighting, taxiway lighting, runway end identifier lights) meets the future needs of DVT provided an ILS approach is not implemented. Should an ILS approach be implemented, the runway and taxiway edge lighting would be required to be upgraded to high-intensity runway and taxiway edge lighting. Many airports are also now upgrading existing runway and taxiway lighting to light emitting diode (LED) lighting which has a superior service life over existing systems. LED lighting also uses less power than other contemporary lighting systems.

DVT's two runways will soon need to be re-designated to 8L-26R and 8R-26L due to magnetic declination. Magnetic declination is the angle between magnetic north and true north. Earth's magnetic north is constantly moving, and as a result, the magnetic headings of the runways are changing as well. By early 2016, DVT's runways designators will be eligible to be changed to 8-26s. The eligibility to change to 8-26 does not mean there is an immediate requirement to re-designate the runways. As there are a lot of impacts to re-designating the runways, including changing all publications, amending flight procedures, and modifying signage and marking on the ground, the re-designation should be implemented at a time when other significant construction projects are planned. An ILS would require the runway markings to be upgraded to precision markings and there could potentially be some ILS hold areas that would need to be marked to protect aircraft and vehicles from interfering with the ILS signals.

3.5 General Aviation Facilities

General aviation facility requirements include shade hangars, t-hangars, box hangars, apron tie-downs, and terminal services.

3.5.1 Hangars

There are three primary types of hangars at DVT: shade hangars, t-hangars and box hangars. Shade hangars are the most cost-effective of the three options. DVT has 12 shade hangar buildings accommodating 240 aircraft parking positions. Shade hangars have a fairly high vacancy rate compared to the other hangar options. DVT offers two sizes of t-hangars (large and small). Both sizes of t-hangars currently have a wait list for availability with large t-hangars in greater demand. DVT has a total of 58 t-hangar buildings accommodating 768 aircraft parking positions. Box hangars typically house larger aircraft and corporate/business aircraft. DVT has 11 on-airport box hangar buildings. Box hangar development is largely driven by increases in corporate / business jet traffic. Facility requirements have been prepared for each of the three types of hangars. The requirements take into account the role that each hangar type will play in the future. The analysis assumes that t-hangars will continue to be the most in-demand hangar type at DVT with shade hangar demand growing at a significantly slower pace. T-hangar and shade hangar demand are both correlated to the number of based aircraft. Box hangars have a stronger correlation to the volume of transient aircraft, especially jet aircraft. The facility requirements for shade hangars, t-hangars, and box hangars are presented in **Tables 3-10**, **3-11**, and **3-12**, respectively.

By the end of the planning horizon, there is a combined hangar building area deficiency of nearly 1,000,000 square feet, with nearly two-thirds being t-hangar building area. The demand for general aviation t-hangars will continue to grow. Modest growth in shade hangars is also expected near the end of the planning horizon as there are currently significant vacancies at the various shade hangars. The corporate jet community will continue to grow at DVT, and as a result, box hangar requirements are expected to grow substantially.

Table 3-10: Shade Hangar Requirements

Shade Hangars	2013	2018	2023	2028	2033
Shade Hangar Building Area Required (ft^2)	154,988	172,507	194,918	223,800	256,787
Existing Shade Hangar Building Area (ft^2)	221,411	221,411	221,411	221,411	221,411
Surplus / Deficiency (ft^2)	66,423	48,904	26,493	(2,389)	(35,376)

Source: HNTB Analysis

Table 3-11: T-Hangar Requirements

T-Hangars	2013	2018	2023	2028	2033
T-Hangar Building Area Required (ft^2)	964,500	1,073,522	1,212,991	1,392,724	1,598,006
Existing T-Hangar Building Area (ft^2)	952,952	952,952	952,952	952,952	952,952
Surplus / Deficiency (ft^2)	(11,548)	(120,570)	(260,039)	(439,772)	(645,054)

Source: HNTB Analysis

Table 3-12: Box Hangar Requirements

Box Hangars	2013	2018	2023	2028	2033
Box Hangar Building Area Required (ft^2)	113,579	208,726	267,257	350,258	459,062
Existing Box Hangar Building Area (ft^2)	161,317	161,317	161,317	161,317	161,317
Surplus / Deficiency (ft^2)	47,738	(47,409)	(105,940)	(188,941)	(297,745)

Source: HNTB Analysis

3.5.2 Aircraft Parking Apron

Aircraft parking apron requirements are based on a combination of factors, including projected volume of flight training, transient operations, and based operations. The facility requirements for aircraft parking aprons are presented in **Tables 3-13**. By the end of the planning period, there is a projected deficiency of approximately 667,000 square feet of aircraft parking apron.

Table 3-13: Aircraft Parking Apron Requirements

Parking Apron	2013	2018	2023	2028	2033
Aircraft Parking Apron Area Required (ft^2)	1,167,366	1,265,065	1,424,021	1,643,461	1,896,209
Existing Aircraft Parking Apron Area (ft^2)	1,228,806	1,228,806	1,228,806	1,228,806	1,228,806
Surplus / Deficiency (ft^2)	61,440	(36,259)	(195,215)	(414,655)	(667,403)

Source: HNTB Analysis

3.5.3 Helicopter Operations

DVT's local helicopter operations are currently handled by the FBOs and the Police Air Support Unit from their ramps. No additional dedicated helicopter landing areas or helipads exist on airport property. The majority of DVT's helicopter activity is from itinerant training operations from other regional airports. DVT could benefit from a dedicated helicopter training area located clear of the runways and main taxiways to reduce congestion and delay impacts to fixed-wing aircraft on approach/departure.

3.5.4 General Aviation Terminal Services

The Terminal is located on the south side of DVT and provides a range of services and amenities to pilots, tenants, and the community. To accommodate the vast number of tenants on the north side of the airfield, tenants and users have recommended the development of a small-scale terminal complete with a pilot lounge and restrooms. A north side terminal with those amenities could be accommodated in a relatively small building. It is recommended that the alternatives consider a suitable area for the implementation of a north side terminal or pilot's lounge.

3.6 Vehicle Access and Parking

3.6.1 Airport Access

As discussed in the inventory, DVT has two primary vehicular access points: a south entrance at Deer Valley Road and 7th Avenue and a north entrance at Airport Boulevard accessed from 7th Street. Currently no direct access is available from Pinnacle Peak Road to the FAA ATCT and north t-hangar facility. All vehicles arriving from the east or west must use Pinnacle Peak or Deer Valley roads to access 7th street which intersects Airport Boulevard providing local access to these north parcels.

Since the completion of the section of Pinnacle Peak Road between 19th Avenue and 7th Street north of DVT, the City has considered options to add a new north access point. With development of property on the north side of the airfield, access from the north will become increasingly critical. The two primary options consist of alignments along 7th Avenue and 3rd Avenue. An 850 foot long, 23 foot wide segment of 7th Avenue was recently constructed to connect Pinnacle Peak Road with the FedEx Ground Facility. This alignment could be widened by 17 feet (providing a minimum street width of 40 feet) and extended 450 feet to connect directly with the north-south alignment of Airport Boulevard providing access directly into the ATCT. The 3rd Avenue alignment right-of-way is owned by the City and if developed would connect to the mid-point of the north t-hangar development.

In 1985, the City purchased approximately 177 acres of property from the State of Arizona on the north side of the airfield and the existing north t-hangar development was subsequently constructed. As part of the deed transfer a 150-foot wide easement was stipulated to protect for taxiway access to the property bounded by the north airport property line and Pinnacle Peak Road allowing for future through-the-fence access to DVT. However, more recent FAA guidelines discourage through-the-fence agreements. Since 1985, additional land has been acquired on the north side of the airfield which could potentially be used for aviation business with a need for airfield access. The need and specific location for this easement, current FAA guidelines concerning through-the-fence operations, and the easement's influence of north side vehicle access options from Pinnacle Peak Road is considered in the alternatives development.

As more facilities are developed on the north, access from Pinnacle Peak Road will become increasingly critical. Options for this access point along with the taxiway easement will be reviewed as part of the alternatives development. The south airport access point sufficiently accommodates uses on the south but potential improvements associated with the location of proposed facilities will be reviewed as part of the alternatives development.

3.6.2 General Aviation Automobile Parking

Automobile parking requirements for DVTs general aviation facilities were calculated. The AZSAS set facility objectives for airports in Arizona. The objective for DVT as a reliever airport is to provide parking spaces for the equivalent of 75% of the based aircraft fleet. Although this is a high percentage compared to industry standards it accounts for parking at the terminal building for employees and visitors along with spaces for flight school students who do not utilize the shuttle service.

Currently DVT has 361 parking spaces adjacent to the terminal, FBOs and flight schools. Another 757 spaces are located at the t-hangar facilities for a total of 1,118 parking spaces, not including parking areas adjacent to individual facilities such as the ATCT, Police Air Support Unit facility or other individual buildings located throughout DVT. The overall number of general aviation parking spaces required at DVT per the AZSAS methodology is shown in **Table 3-14**. The requirement calculation shows a deficiency of parking spaces by 2028 and currently the terminal area has periods where there is a shortage of parking spaces. The future location of parking spaces will be addressed with the recommended plan as the relocation of some facilities on the south side of the airfield will also result in a redistribution of parking demand.

Table 3-14: DVT General Aviation Automobile Parking Summary (spaces)

Automobile Parking	2013	2018	2023	2028	2033
Based Aircraft	1,033	1,167	1,329	1,538	1,780
Parking Spaces Required	775	875	997	1,154	1,335
Existing Parking Spaces	1,118	1,118	1,118	1,118	1,118
Surplus / Deficiency	343	243	121	(36)	(217)

Source: HNTB Analysis

3.7 Support Facilities

3.7.1 Police Air Support Unit

The existing City of Phoenix Police Air Support Unit building and associated aircraft/helicopter apron is in poor condition. The building has surpassed its anticipated lifespan and requires frequent maintenance. Chapter 5, Airport Alternatives, will review locations to accommodate a reconstructed / relocated Police Air Support Unit. Police response times require their facility to be located on the south side of the airfield so that helicopters will not have to cross over the flight paths of arriving and departing aircraft.

3.7.2 Aircraft Rescue and Firefighting

DVT does not currently have any on-airport ARFF services. Nearby City of Phoenix Fire Station 36 provides fire and rescue support services during incidents. Should the Police Air Support Unit be relocated, it is recommended that Fire Station 36 be relocated and combined with the Air Support Unit in a consolidated Public Safety Building. A consolidated Public Safety Building could provide airside and landside fire response as well as Police Air Support Unit services in a single building. Police and Fire staff have stated that it would be advantageous to their operations to collocate in a single building. At Part 139 certificated airports, the capability of ARFF services is classified by the ARFF index. The ARFF index is determined based on the wingspan of the critical aircraft operating more than 5 daily departures at an airport. Since DVT is not a Part 139 certificated airport, it is not required to comply with ARFF index criteria. It is expected that if a landside fire station is located on airport property, traditional landside firefighting equipment will be sufficient to respond to any airside emergency.

3.7.3 Fuel Storage

Current fueling operations are described in Chapter 1, Inventory of Existing Conditions. Fuel storage requirements are determined for the month with the greatest fuel demand, April. Historical breakdowns between Jet-A and AVGAS were not available, and as a result, the total storage requirements for both fuels are combined in **Table 3-15**. It is typically recommended that an airport have sufficient storage capacity to hold up to a 7-day demand of fuel. DVT has sufficient fuel storage capacity through the planning horizon. The FAA is testing unleaded fuel options although approval and widespread use of an alternate fuel is not expected for another 10 years. Consideration should be given to additional storage that may be required in the future while unleaded AVGAS is phased into regular use among operators. During this time storage may be required for both leaded and unleaded fuel.

Table 3-15: Fuel Storage Requirements

Fuel Storage	2013	2018	2023	2028	2033
Fuel Utilization (gallons per ADPM departure)	12	12	12	12	12
Forecast ADPM Departures	621	642	727	856	1,008
Daily Fuel Demand (gallons)	7,452	7,704	8,724	10,272	12,096
Fuel 7-Day Storage Requirement (gallons)	52,164	53,928	61,068	71,904	84,672
Existing Storage Capacity (gallons)	117,000	117,000	117,000	117,000	117,000
Fuel Storage Surplus / Deficiency (gallons)	64,836	63,072	55,932	45,096	32,328

Source: HNTB Analysis

3.7.4 Utilities

The existing utilities serving DVT's existing facilities were deemed adequate through the planning horizon. The area south of the airfield is built out with existing utilities aside from the area reserved for corporate aviation on the southeast quadrant which has utility stub outs. The undeveloped parcels on the north will require additional utility placements for any proposed development. Water pressure considerations are discussed in Section 7.2.3.10 Water Quality.

4.0 Off-Airport Land Use and Zoning

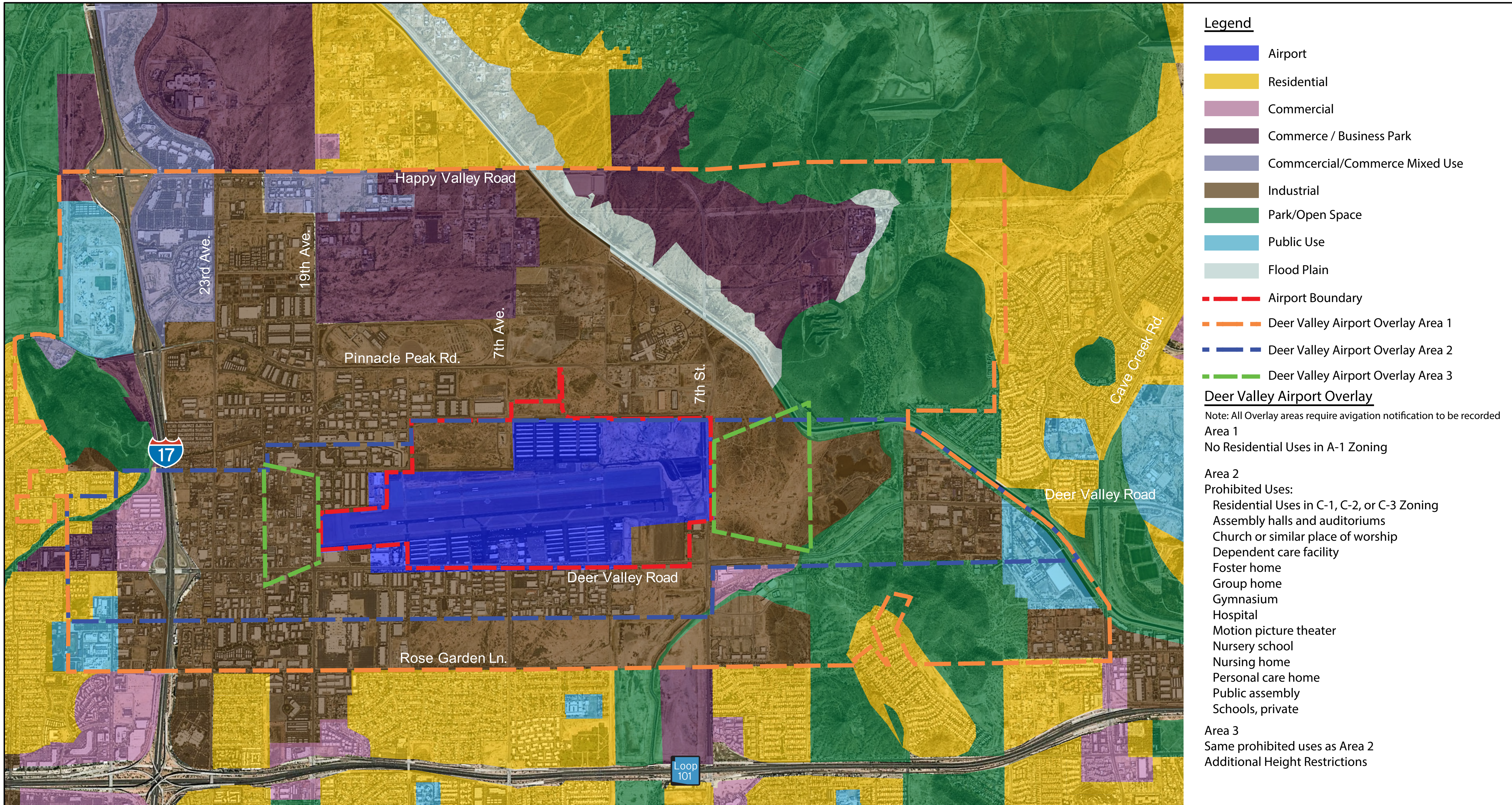
The City of Phoenix General Plan is a long-term comprehensive guide for physical development within the City of Phoenix and serves as the vision for future development. The General Plan Land Use Map indicates the intended predominate future function, density and characteristic use of land for the different parts of the City. The purpose of the Land Use Map is to depict generalized desired future land use and not the intended zoning of individual parcels; however, zoning granted after the adoption of the General Plan or subsequent amendments will be in conformity with the land use category depicted in the General Plan Land Use Map.
The City is currently updating the General Plan which was last completed in 2002. While the Arizona Revised Statutes requires cities to update their plans every 10 years a five-year extension was incorporated into the law to allow incorporation of 2010 census data. The update to the General Plan will be completed in 2015.

The City is divided into 15 Urban Villages and each village has a Village Planning Committee that is appointed by the City Council. The Village Planning Committees assist the City of Phoenix Planning Commission in the performance of its responsibilities including: identifying areas or provisions of the General Plan text that need refinement and updating; identifying problems and needs related to implementation of the General Plan; defining in greater detail the intended future function, density and character of subareas of the village; and commenting on proposals for new zoning districts or land use districts. Each village participates in the development of the General Plan. DVT is located in the Deer Valley Village which is comprised of industrial zoned land along with residential and park/open space such as the Adobe Recreation Area. Land uses surrounding DVT along with specific zoning ordinances applicable to DVT and the surrounding areas are described in this chapter.

4.1 General Plan Land Use

Land uses surrounding DVT as identified in the 2002 City of Phoenix General Plan Land Use Map, which was revised in June 2014, for the Deer Valley Village are depicted on **Figure 4-1**. Single and multi-family residential uses of all densities are shown as residential. A breakdown of residential densities can be found on the Deer Valley Village Land Use Map which is located on the Deer Valley Village Committee website[6]. Land immediately surrounding DVT is designated as industrial. To the south, land use is primarily comprised of residential with some limited commercial and open space. To the west of Interstate-17, there is a mixture of commercial, industrial, public, and park/open space land uses along Interstate-17 with residential and park/open space land uses further west. To the north, land use closest to DVT is designated as industrial, commercial, and commerce. North of Happy Valley Road areas are designated as residential and park/open space. To the east, areas are designated primarily as industrial and open space with residential land use along Cave Creek Road.

[6] https://www.phoenix.gov/pdd/pz/deer-valley-village-planning-committee



Source: Based on City of Phoenix Deer Valley Village General Plan Land Use Map

Deer Valley Village General Plan Land Use

Figure 4-1

Airport property is designated as public/aviation use with parcels in the northwest and southeast portions of airport property identified as industrial. These parcels were purchased in 2000, and their land use designations have not been changed from their previous designation within the General Plan.

4.2 Proposed Land Use

As part of the City's update of the General Plan, it is recommended that the land use identified for the parcels within DVT's property boundary be reclassified as public/airport. In addition, the areas outside the airport property line on the west side of DVT, which are currently identified as public/airport, be reclassified as industrial. The proposed future land use changes are depicted in **Figure 4-2**.

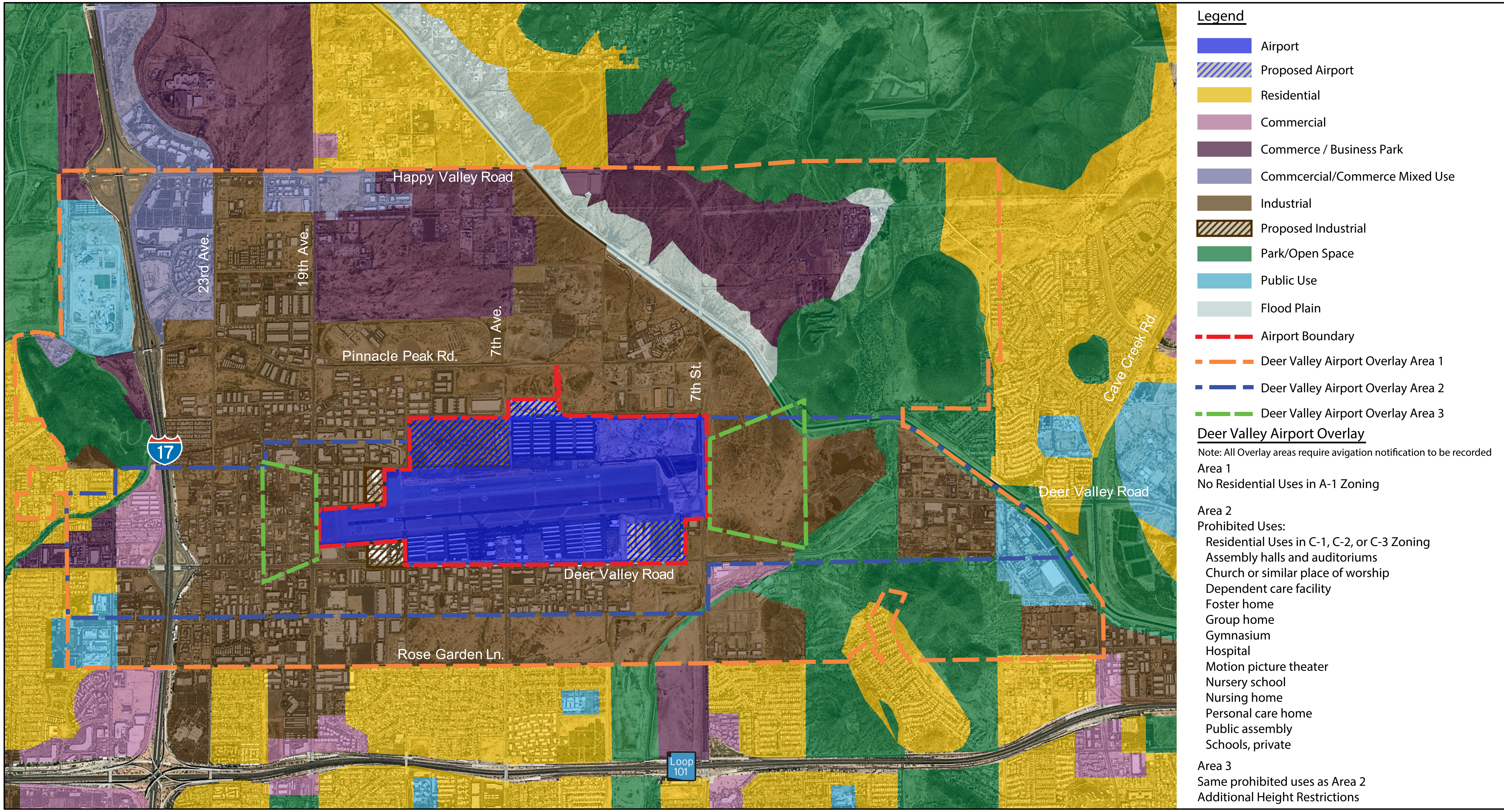
4.3 Airport Overlay District

The purpose of the Zoning Ordinance G-5929 of the City of Phoenix (Phoenix Zoning Ordinance) is to establish standards and regulations to govern the use of land and structures in the City and to provide a process for review and approval of all proposed development of property in the City consistent with the implementation of the General Plan and other adopted goals, policies and standards of the City. The Phoenix Zoning Ordinance divides City property into use districts which specify allowable uses such as single and multi-family residential, commercial office, industrial, parking, high-rise, conservation, historic preservation, etc. Overlays are used to further regulate the use of specific areas due to special circumstances where additional land use or height restrictions are required for reasons such as compatibility or safety, such as surrounding an airport.

In November 2006 after the completion of the Deer Valley Airport Area Study, the City Council approved an amendment to the Phoenix Zoning Ordinance to create the Deer Valley Airport Overlay (DVAO) District. The DVAO District boundaries and regulations are delineated on the City's Official Supplementary Zoning Map No. 1116 and in Section 658 of the City of Phoenix Code. The DVAO District was developed to assist the City planning process by providing reasonable zoning objectives for the community. The goal is to prevent incompatible land uses with regard to airport noise, public safety, and airspace protection as required by the FAA to promote the long term viability of DVT, by:

- Ensuring land use compatibility with airport operations
- Protecting navigable airspace from physical encroachment
- Requiring permanent notice of flight operations to property owners

The DVAO District is divided into three separate regulation areas shown on **Figure 4-1**, and is generally bound by Happy Valley Road on the north, 29th and 31st Avenues on the west, Rose Garden Lane and its general alignment on the south and Cave Creek Road, the Central Arizona Project Canal, and the alignment of 16th and 20th Streets on the east. All areas are required to record with the Maricopa County Recorder's Office that a parcel resides within the overlay area. When a parcel falls partially into one or more of the regulated areas, the most restrictive regulation area shall apply for the entire parcel.



Source: Based on City of Phoenix Deer Valley Village General Plan Land Use Map with proposed future land uses.

Proposed General Plan Land Use

Figure 4-2

N

NOT TO SCALE

Area 1 seeks to encourage industrial and commercial uses while prohibiting residential uses in A-1 Zoning except as used for a caretaker on industrial or agricultural parcels.

Areas 2 and 3 have the same restrictions as Area 1 and also prohibit any uses, such as places of assembly, which would be adversely impacted by aircraft noise, such as:

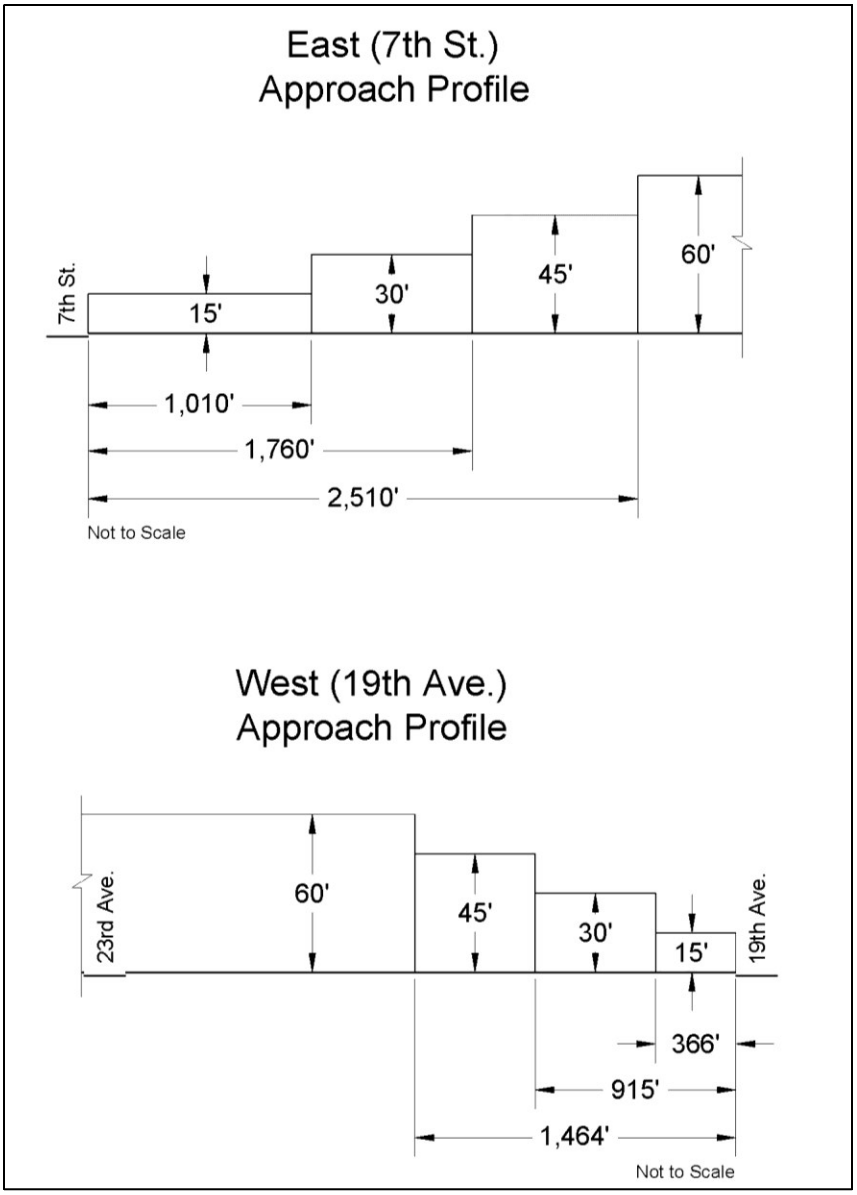
- Residential uses in C-1, C-2, or C-3 Zoning
- Assembly halls and auditoriums
- Churches or similar place of worship
- Dependent care facilities
- Foster homes or group foster care facilities
- Group homes for the handicapped
- Gymnasiums
- Hospitals
- Motion picture theaters
- Nursery schools
- Nursing homes
- Personal care homes
- Public assembly uses limited to active recreational and spectator only
- Schools, private

The underlying zoning for the use district establishes the allowable height for development within Areas 1 and 2. Area 3 incorporates additional height restrictions on structures as shown in **Figure 4-3**. Distances are measured horizontally from the existing natural grade of the site along the centerlines of 19th Avenue and 7th Street, respectively.

The Phoenix Building Construction Code also specifies that no building permit will be issued for a project in the City that may affect navigable airspace until a Notice of Proposed Construction or Alteration (FAA Form 7460-1) is filed with the FAA and a "No Hazard Determination" is received. A Form 7460-1 is required for:

- Any construction or alteration exceeding 200 feet above ground level
- Any construction or alteration:
    - Within 20,000 feet of a public use or military airport which exceeds a 100:1 surface from any point on the runway of each airport with its longest runway more than 3,200 feet
    - Within 10,000 feet of a public use or military airport which exceeds a 50:1 surface from any point on the runway of each airport with its longest runway no more than 3,200 feet
    - Within 5,000 feet of a public use heliport which exceeds a 25:1 surface
- Any highway, railroad or other traverse way where the prescribed adjusted height would exceed the above noted standards. Under FAR Part 77, roadway elevations are adjusted 15 feet above roadway level, interstate highway elevations are adjusted 17 feet above highway level, and railroad elevations are adjusted 23 feet above railway track level.
- Any construction or alteration located on a public use airport or heliport regardless of height or location
- When requested by the FAA

Figure 4-3: Deer Valley Airport Overlay Area 3 Height Restrictions



Source: Zoning Ordinances of the City of Phoenix, Section 658 Deer Valley Airport Overlay District Figure 1.

4.4 Off-Airport Terrain

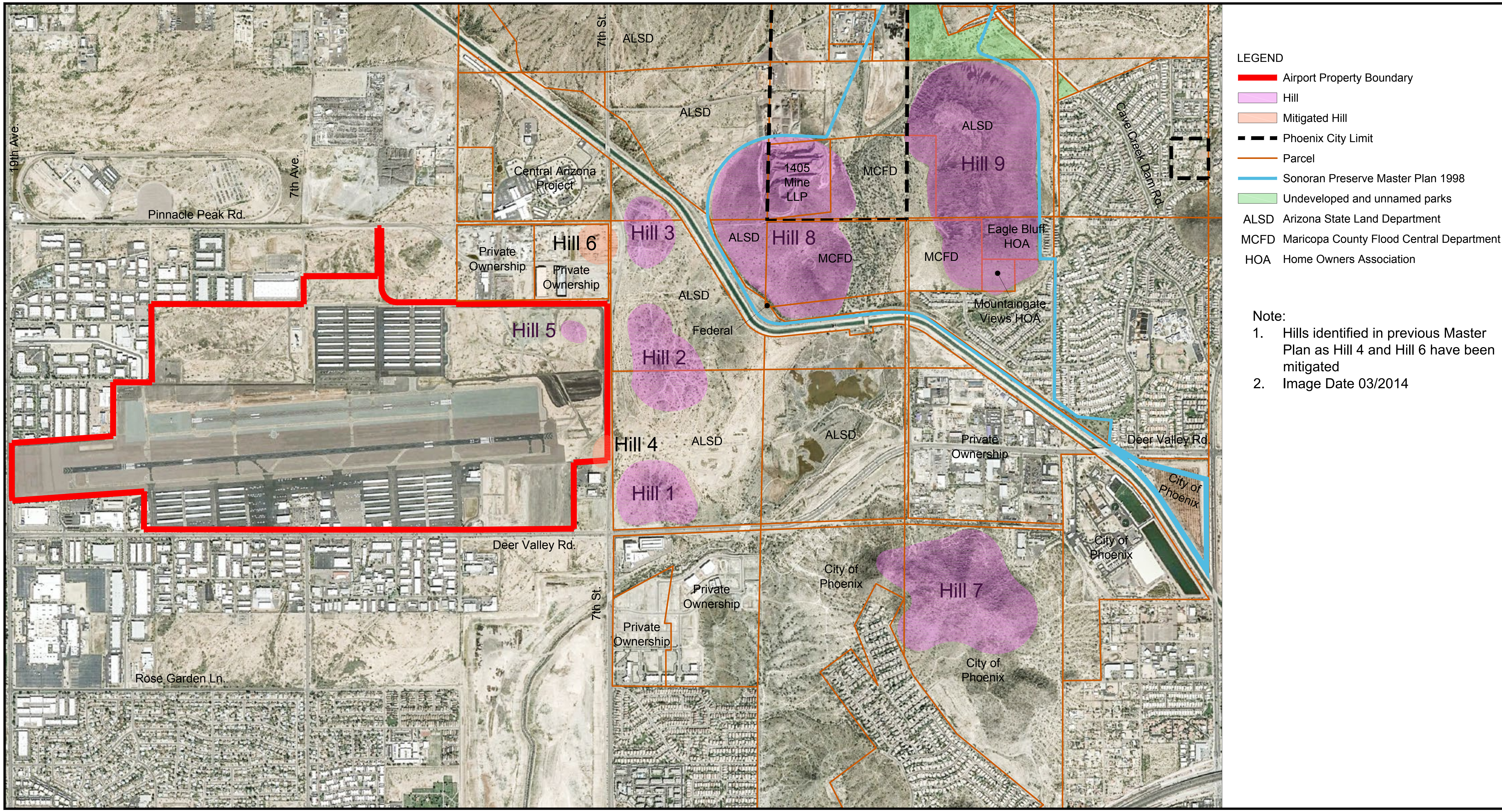
The terrain surrounding DVT must be considered prior to selecting airport development alternatives. There are several hills located just to the east of DVT which may serve as constraints for the development of higher-precision approach procedures and changes to runway departure and arrival threshold locations. The hills are existing penetrations of the Runway 25L Part 77 Approach Surface and the Runway 7R and 7L Terminal Instrument Procedures (TERPS) Departure Surfaces. While it is not explicitly required to keep these surfaces clear of obstacle penetrations, they impact DVT's procedures, especially the departure procedure, Deer Valley One (Obstacle), which includes a sharp left turn after departure to allow aircraft to climb while maintaining lateral clearance from the hills. Some of the hills to the northeast of DVT are actively being mined which will reduce their elevation over time. A 2006 inventory of the adjacent hills is included below and locations are depicted in **Figure 4-4**. The inventory identifies the ownership, height, obstruction light status, whether it is within the Sonoran Preserve, its current status, and the existing impacts to air navigation. In the years since the inventory was conducted, Hills 4 and 6 have been mitigated and are no longer issues for airport development. It is recommended that coordination with the Arizona State Land Department is continued to identify opportunities for reducing the elevation of the hills below the encroached airspace surfaces.

Hill 1
Ownership: Arizona State Land Department (ASLD)
Height: 1,560 feet MSL
Obstruction Light: Yes, on leased parcel
Sonoran Preserve: Outside of Sonoran Preserve boundary
Current Status: ASLD has issued permit to F & F Construction to use the hill for borrow for Deer Valley Road extension
Master Plan Impact:

- Penetrates the Runway 7R Departure Surface by 50 feet

Hill 2
Ownership: ASLD
Height: 1,636 feet MSL
Obstruction Light: Yes, on leased parcel
Sonoran Preserve: Outside of Sonoran Preserve boundary
Current Status: ASLD has issued permit to F & F Construction to use the hill for borrow for Deer Valley Road extension
Master Plan Impact:

- Contributes to current Runway 25L threshold displacement
- Penetrates the Runway 25L Part 77 approach surface by 16 feet
- Penetrates the Runway 7L Departure Surface by 48 feet



Hills Inventory

Figure 4-4

HNTB

Hill 3
Ownership: ASLD
Height: 1,600 feet MSL
Obstruction Light: No
Sonoran Preserve: Outside of Sonoran Preserve boundary
Current Status: ASLD has issued permit to F & F Construction to use the hill for borrow for Deer Valley Road extension
Master Plan Impact: No Impacts

Hill 4 (MITIGATED)
Ownership: City of Phoenix (Phoenix Deer Valley Airport)
Height: Ground Level
Obstruction Light: Not applicable
Sonoran Preserve: Outside of Sonoran Preserve boundary
Current Status: Hill has been mitigated (removed) and is no longer a constraint
Master Plan Impact: No impacts

Hill 5
Ownership: City of Phoenix (Phoenix Deer Valley Airport)
Height: 1,513 feet MSL
Obstruction Light: No
Sonoran Preserve: Outside of Sonoran Preserve boundary
Current Status: None
Master Plan Impact:

- Potential impacts to future on-airport development. Hill will require evaluation and potential removal prior to development

Hill 6 (MITIGATED)
Ownership: Airpark 30, LLC
Height: 1,510 feet MSL
Obstruction Light: Not applicable
Sonoran Preserve: Outside of Sonoran Preserve boundary
Current Status: Recently mined for materials
Master Plan Impact: No impacts

Hill 7
Ownership: City of Phoenix
Height: 2,075 feet MSL
Obstruction Light: Yes, on City-owned property
Sonoran Preserve: Outside of Sonoran Preserve boundary
Current Status: No current plans
Master Plan Impact:

- Penetrates the Runway 7R Departure Surface by 4 feet

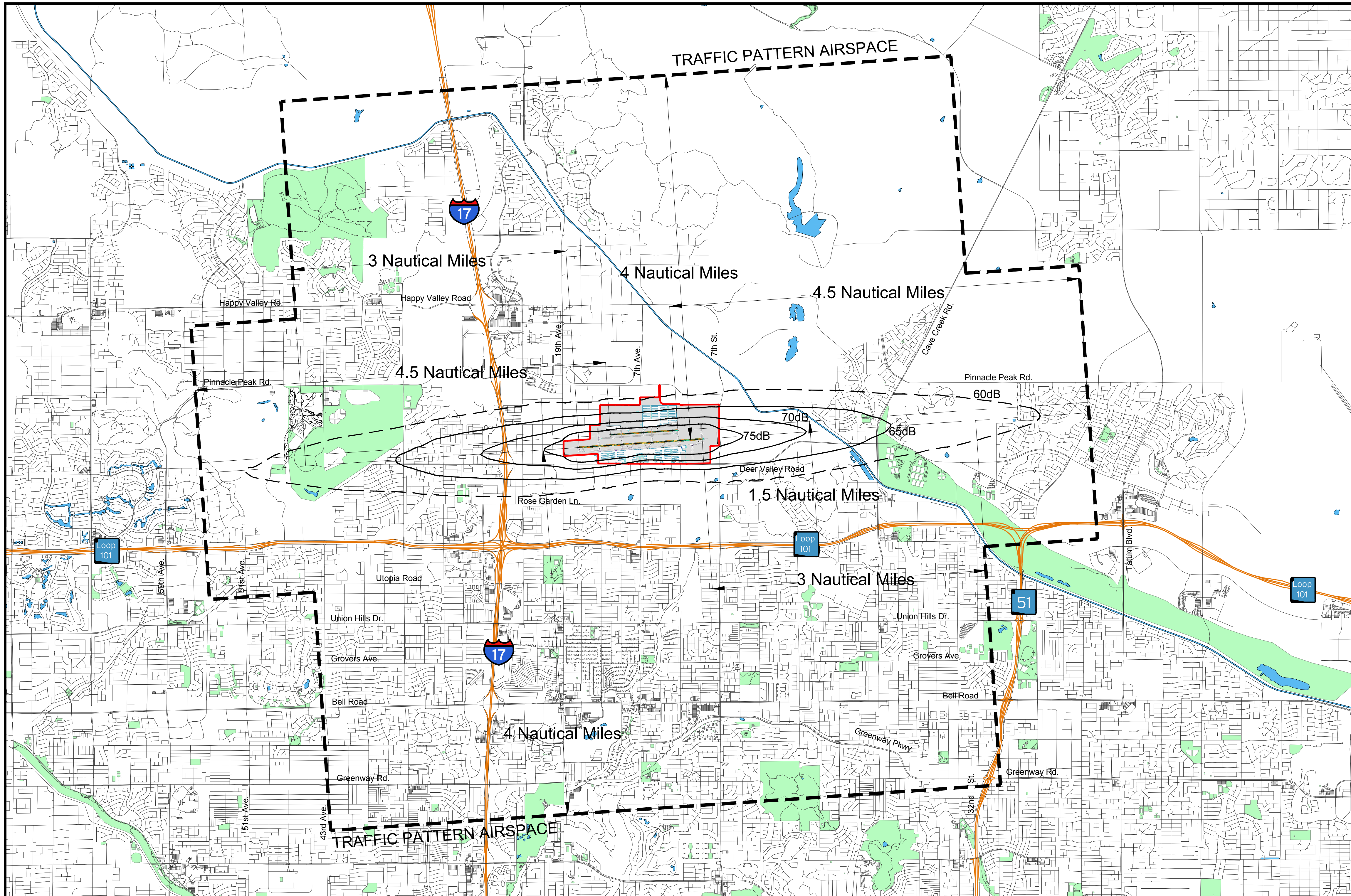
Hill 8
Ownership: 1405 Mine, LLP; Maricopa County Flood Control District
Height: North Peak - 1,840 feet MSL; South Peak – 1,700 feet MSL
Obstruction Light: Yes (north peak), on small parcel owned by the City of Phoenix
Sonoran Preserve: Within Sonoran Preserve boundary
Current Status: 1405 Mine, LLP is presently mining its property on the north side of the hill. This portion is outside of City limits and mining permits were approved by Maricopa County.
Master Plan Impact:
South Peak penetrates the Runway 7L Departure Surface by 45 feet

Hill 9
Ownership: ASLD; Maricopa County Flood Control District; Eagle Bluff Homeowners
Association; Mountain Gate Views, LLC
Height: North Peak - 1,943 feet MSL; South Peak – 1,938 feet MSL
Obstruction Light: Yes, but no known parcel lease or ownership
Sonoran Preserve: Within Sonoran Preserve boundary
Current Status: City of Phoenix has made application to ASLD to acquire the property as part of a voter-approved Sonoran Preserve initiative; however, there is no available funding to acquire the property. The City has interest in preservation of parcels under other ownership.
Master Plan Impact:

- South Peak penetrates Runway 7R Departure Surface by 217 feet

4.5 Public Airport Disclosure Map

Arizona Revised Statute (ARS) 28-8486, Public Airport Disclosure, requires that public airport owners publish a map depicting the boundary of the "territory in the vicinity of the public airport". The territory is defined as property that is within the traffic pattern airspace defined by the FAA which includes property that experiences a Day-Night Average Sound level (DNL) of 60 decibels or higher in counties with more than 500,000 residents (in counties with 500,000 thousand residents or less the threshold is 65 decibels). The DNL is calculated for a 20-year forecast condition and the current noise contours were developed in 2007. ARS 28-8486 requires the State Real Estate Office prepare a disclosure map in conjunction with the airport owner that is recorded with the county and available to the public. The map must be sufficient to notify owners and potential purchasers of property that the property is located in or outside of a territory in the vicinity of a public airport. The Deer Valley public airport disclosure boundary and noise contours are depicted on **Figure 4-5**. The published Public Airport Disclosure Map is provided in **Appendix D**.



LEGEND
- Airport Property Boundary
- Traffic Pattern Airspace
- Noise Contour Line
- 60 dB Noise Contour Line
- Extended Runway Centerline
- Park / Public Open Space
- Body of Water

Notes:
1. Traffic Pattern Airspace Noise contours depicted based on the published Deer Valley Public Airport Disclosure map which was prepared in accordance with Arizona Revised Statute 28-8486.
2. Traffic Pattern Airspace Boundaries as depicted in the Airport Public Disclosure Map have been established in accordance with the guidelines provided in FAA Order 7400.2K.
3. 1 nautical mile = 6,080 feet or 1,1516 statute miles.
4. Base map derived from electronic Open Street Map based on USGS mapping and the Association of Governments (MAG) street map.

DVT Public Airport Disclosure Boundary

Figure 4-5

N

0' 7,500'

1" = 7,500'

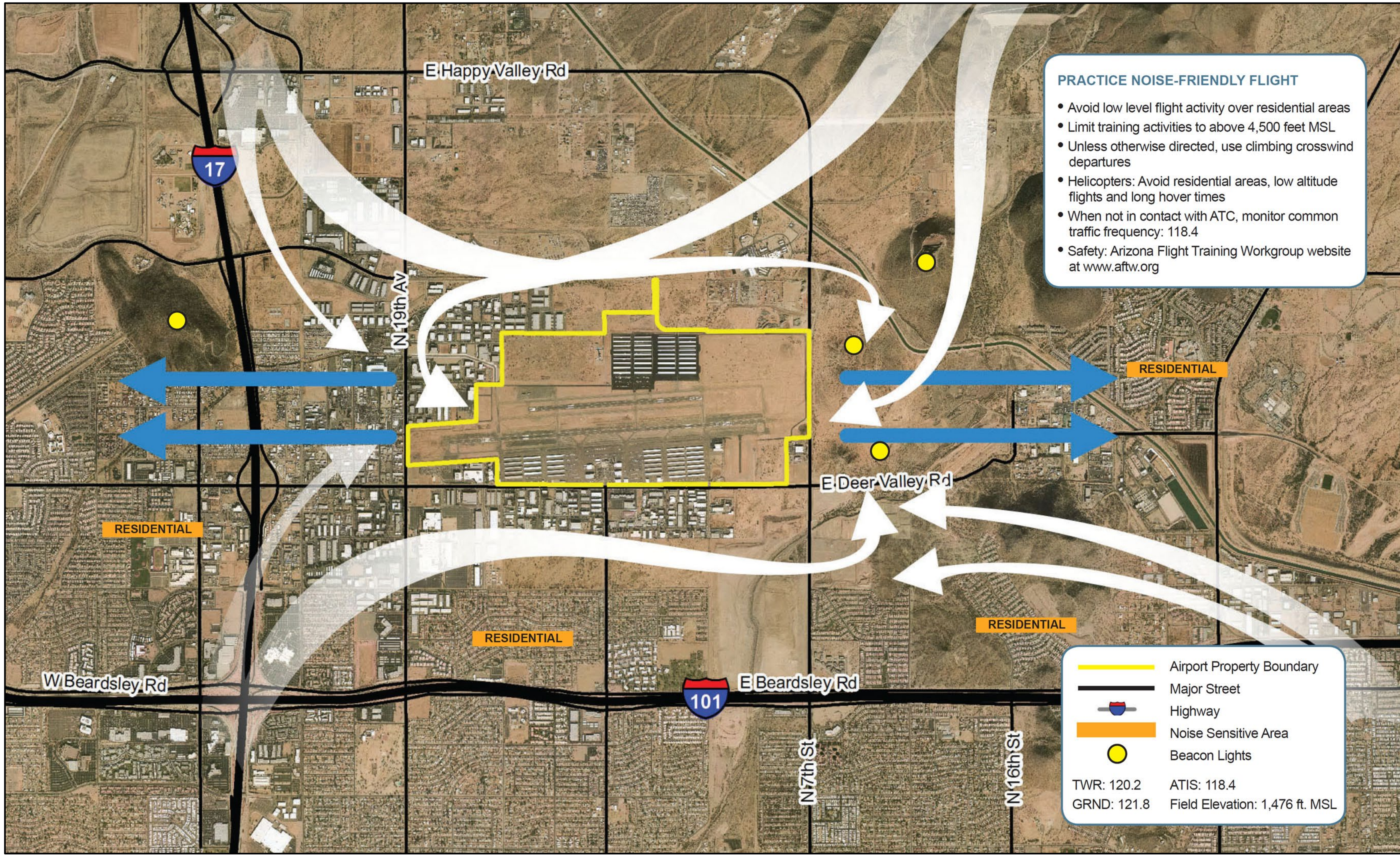
DVT

HNTB

4.6 Voluntary Noise Abatement Procedures

Pilots at DVT are encouraged to practice noise awareness and use noise friendly procedures. The Deer Valley Airport Pilot Guide outlines the Airport Owners and Pilots Association noise awareness guidelines as follows, and as depicted in **Figure 4-6**. These are voluntary guidelines that pilots are requested to adhere to them when safe to do so.

1. If practical, avoid noise-sensitive areas. Make every effort to fly at or above 3,500 feet MSL over such areas when overflight can 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 aircraft noise substantially.
3. Perform stalls, spins and other practice maneuvers over uninhabited terrain.
4. Familiarize yourself and comply with airport noise abatement procedures.
5. On takeoff, gain altitude as quickly as possible without compromising safety. Begin takeoffs at the start of a runway, not an intersection.
6. Use PAPI. This will indicate a safe glide-path and allow a smooth, quiet descent to the runway.
7. 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.
8. 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.
9. 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.
10. Avoid low-level, high-power approaches, which not only create high noise impacts, but also limit options in the event of engine failure.
11. Flying between 11 pm and 7 am should be avoided whenever possible.
12. 700 feet of separation between runways.
13. Simultaneous departures and arrivals on runways.



1. If practical, avoid noise-sensitive areas. Make every effort to fly at or above 3,500 feet MSL over such areas when overflight can 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 aircraft noise substantially.
3. Perform stalls, spins and other practice maneuvers over inhabited terrain.
4. Familiarize yourself and comply with airport noise abatement procedures.
5. On takeoff, gain altitude as quickly as possible without compromising safety. Begin takeoffs at the start of a runway, not an intersection.
6. Use PAPI. This will indicate a safe glide-path and allow a smooth, quiet descent to the runway.
7. 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.
8. 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.
9. 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.
10. Avoid low-level, high-power approaches, which not only create high noise impacts, but also limit options in the event of engine failure.
11. Flying between 11 p.m. and 7 a.m. should be avoided whenever possible.
12. 700 feet of separation between runways.
13. Simultaneous departures and arrivals on runways.

Note: Note: These are general recommendations; some may not be advisable for every aircraft in every situation. No noise reduction procedure should be allowed to compromise flight safety.

Source: Deer Valley Airport Pilot Guide

DVT Voluntary Noise Reduction Procedures

Figure 4-6

N

NOT TO SCALE

DVT

5.0 Airport Alternatives

5.1 Alternatives Objectives

This Airport Alternatives Chapter describes potential improvements to DVT's airfield, landside, and support facilities to meet the forecast facility requirements presented in Chapter 3, Facility Requirements.

5.1.1 Identified Needs

Chapter 3, Facility Requirements identified the future infrastructure needed to accommodate forecast demand for those facilities. The condition of the existing airport infrastructure and its capability to accommodate this need is also taken into account. Based on the recommendations of the facility requirements and input from project stakeholders, the following improvements were studied within this Airport Alternatives Chapter:

<u>Airside Development Alternatives</u>

- Mitigation of FAA-recognized hot spots
- Mitigation of non-standard airfield geometry
- Extension of Runway 7L-25R
- Mitigation of Runway 7R-25L holdbars south of the runway
- Improvements to meet current FAA design standards for the future critical aircraft (Gulfstream IV)
- Improvements to the visual navigation aids for both runways

<u>Support Facility Alternatives</u>

- Compass calibration pad
- Options for an IFR hold bay
- Relocation options for the Police Air Support Unit
- U.S. Customs and Border Protection (CBP) Alternatives

<u>On-Airport Land Use Alternatives (includes general aviation and landside)</u>

- Expansion of general aviation hangar facilities
- North side terminal or pilot's lounge
- Helicopter training area
- Access improvements to the north side facilities
- New vehicle parking associated with new/relocated facilities

The development alternatives presented in this chapter are separated into the three families as indicated above. Each family of alternatives addresses its specific functional areas without consideration of other alternative families. In addition, the individual support facility alternatives each address a specific component without inclusion of the other components. The alternatives will be considered comprehensively in relation to each other during the evaluation and selection of the Recommended Alternative.

5.1.2 Alternatives Objectives

The following objectives were considered in order to guide the development of the various alternatives:

- **Meet the Forecast Facility Requirements:** The facility requirements qualitatively and quantitatively describe DVT's needs for the next 20 years based on the Forecast as well as tenant/user-specific requirements.
- **Right-size the Airport for Future Growth:** This Master Plan is not intended to overbuild facilities nor preclude the ability to further expand facilities in the future, but to provide a plan for future growth.
- **Meet Current FAA Design Standards:** A significant number of the airside facilities do not currently meet current FAA design standards and the Master Plan strives to bring them into compliance with current standards.
- **Balance the Utilization of the Airfield (North and South):** The existing utilization of the runways heavily favors the south runway, Runway 7R-25L, due to the proximity of DVT's most frequent users. The plan aims to better balance this demand between the north and south runways.
- **Improve the Safety and Operational Efficiency of the Airfield**: Continue to look for opportunities to reduce the risk of airfield incursions while maximizing the efficiency of DVT.
- **Continue to Serve the General Aviation Community:** DVT's role as a general aviation reliever airport will not change as part of this Master Plan
- **Provide a High Level of Service to Tenants and Users:** Ensure that planned infrastructure provides DVT's tenants and users with a high level of service and customer satisfaction.

5.1.3 System Considerations

There are several considerations specific to DVT factored into the development of the alternatives families. A principal physical consideration is DVT's existing property boundary. As discussed in the previous section, one of the main goals of this Master Plan is to right-size DVT, and as such, the vast amount of developable land that already exists on airport will be sufficient to meet DVT's needs for the next 20 years. Another consideration is the desire to minimize additional impacts to off-airport property either by physical development or by associated airspace surfaces (e.g. RPZs, RSAs, ROFAs, Part 77 surfaces, etc…). Based on this Master Plan's goal to continue serving the general aviation community, DVT will not serve commercial airline operations other than air taxi service or purposefully attract additional military traffic. Development opportunities will be sized to meet the needs of DVT's future critical aircraft – the Gulfstream IV.

5.2 Non-Development Alternatives

Non-development alternatives are used to compare and assess impacts of development alternatives. Three non-development alternatives were identified.

5.2.1 No Build Alternative

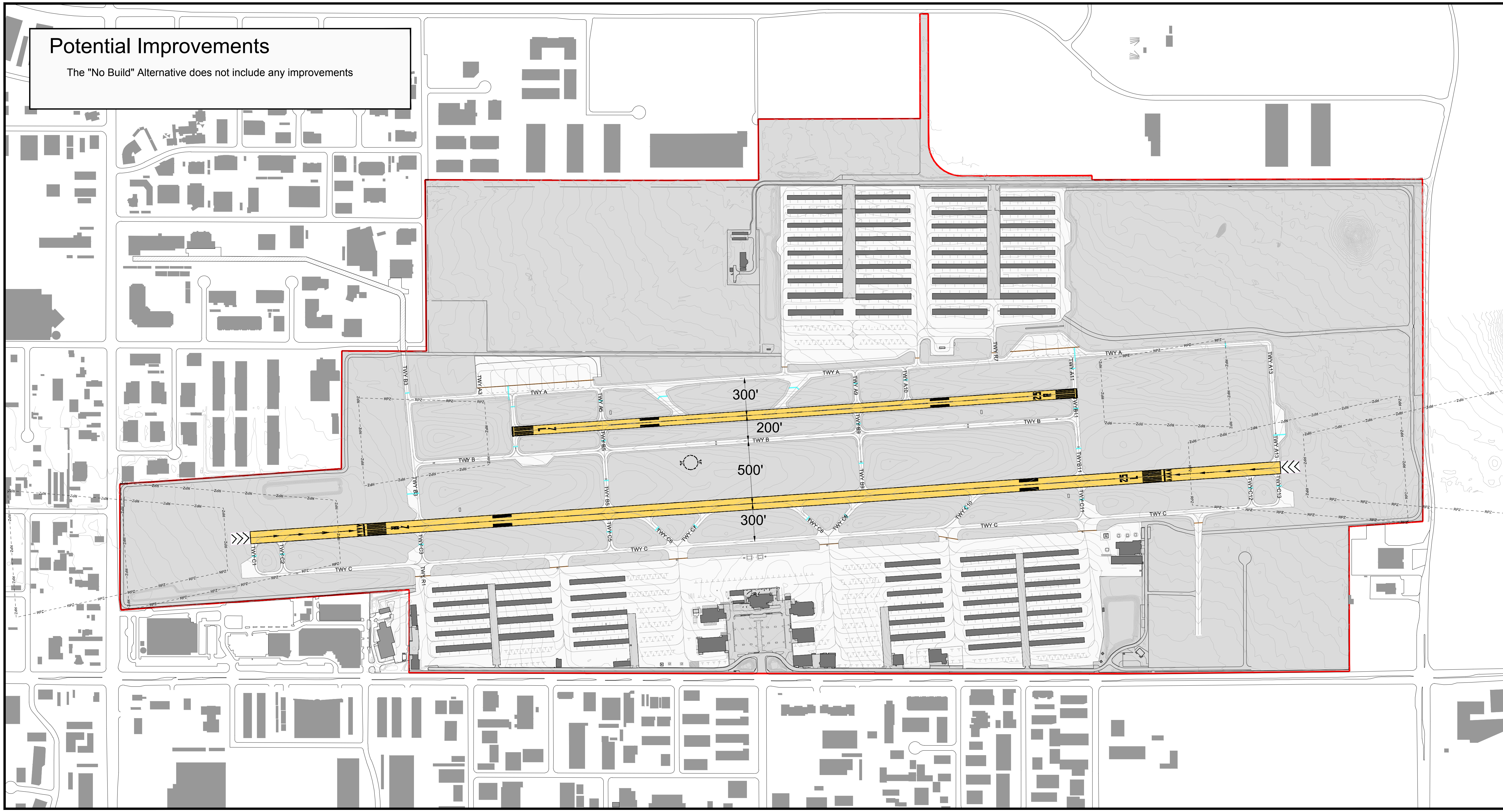
Under the No Build (or No Action) Alternative, no additional airside and landside facilities would be constructed. The No Build Alternative is included for comparison to Build Alternatives and will be carried through any subsequent environmental analysis. The No Build Alternative does not address existing or forecast airside, landside, or support facility deficiencies. Under this alternative, the existing facilities and infrastructure remain in place and no physical alterations would be made with the exception of necessary regular maintenance activities. It is expected that periodic runway and taxiway overlay projects will be needed to maintain airport operations. As demand continues to grow, DVT will not be able to accommodate much more activity in many of its facilities than it accommodates today and deficiencies projected in the Chapter 3, Facility Requirements, will be realized. The No-Action Alternative is presented in **Figure 5-1**.

5.2.2 Transfer Aviation Services

Another non-development alternative is the transfer of all or partial existing aviation services to another airport in the Phoenix Metropolitan Area. Transferring all aviation services and activities to another airport, which would result in the closure of DVT, is not a viable alternative as the City has identified DVT as its primary general aviation reliever airport for PHX. Transferring specific or partial aviation services to another airport would change the mission of DVT. In addition, DVT is an economic driver creating employment opportunities and supporting businesses in the area. It is not recommended to transfer any aviation services or activities to another airport.

5.2.3 Construction of a new Airport Site

In some exceptional situations, replacement airports are constructed when an existing airport cannot sufficiently be expanded or face significant external challenges due to the community, environment, or terrain. Constructing a new airport in today's environment can take more than a decade and cost billions of dollars. DVT's existing facilities and available developable parcels are sufficient to support projected aviation demand through the planning horizon and the surrounding industrial land use and DVAO District make DVT compatible with its surroundings. It is not recommended that the City explore the construction of a new airport site.



No Build Alternative

Figure 5-1

LEGEND

- Airport Property Boundary
- Airfield Ramp, Taxiway & shoulders
- Existing Runway Pavement
- Existing on-Airport Building
- Holding Position
- Runway Protection Zone

N

0' 800'

1" = 800'

HNTB

5.3 Airfield Development Alternatives

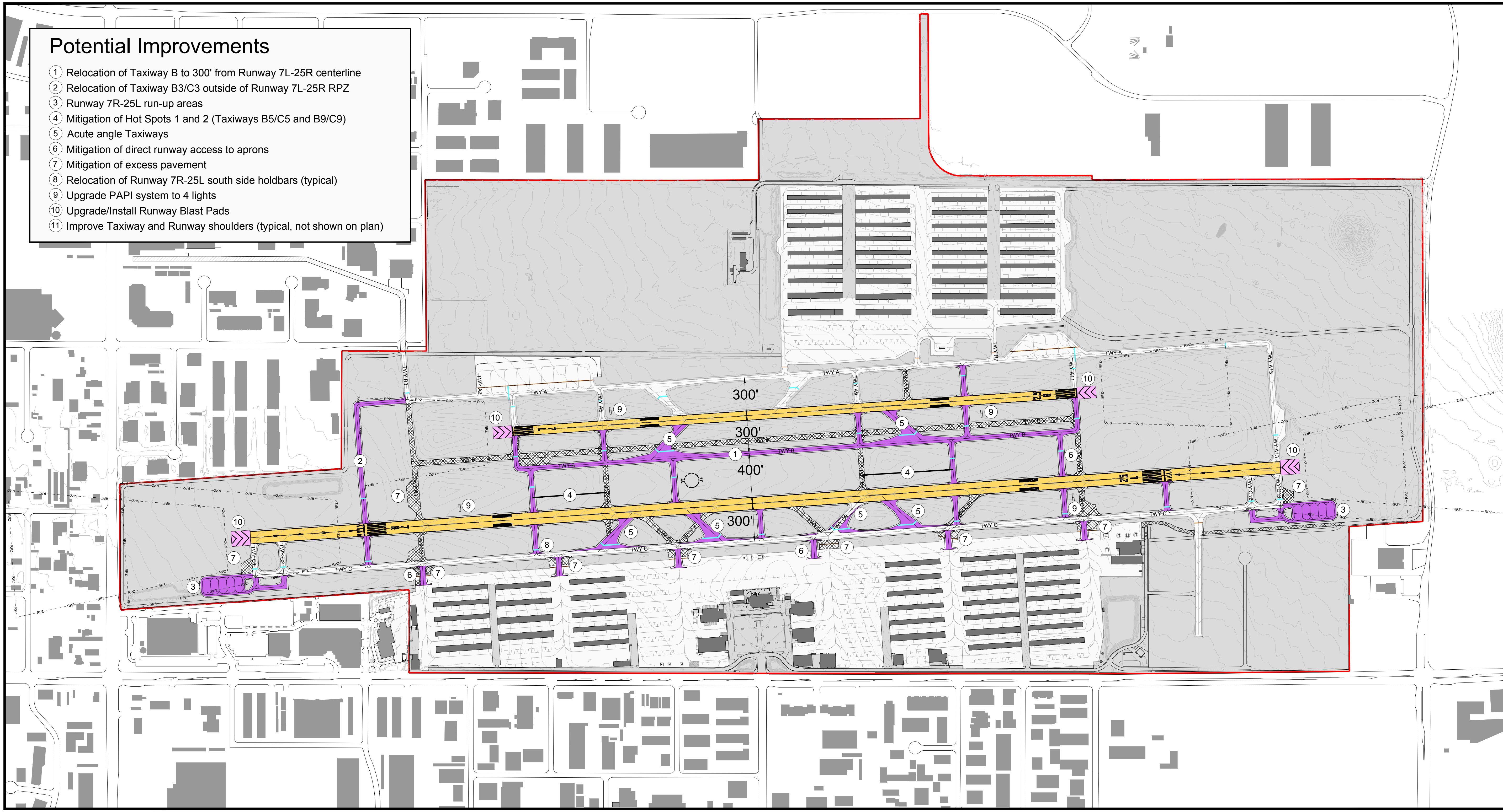
The airfield development build alternatives were created with the overall development goals presented in Section 5.1.2 in mind and specifically address the need to right-size DVT based on the Forecast, meet current FAA design standards, and further improve safety. Five build alternatives are presented accommodating a range of potential needs. The alternatives are intended to be interchangeable and all of the alternatives build off of each other.

5.3.1 Airfield Alternative 1 – Taxiway Geometry Enhancements

Airfield Alternative 1 – Taxiway Geometry Enhancements, presented in **Figure 5-2**, proposes the reconfiguration, realignment, and reconstruction of many of DVT's taxiways with the goal of meeting current FAA design standards and eliminating hot spots and non-standard geometry intersections. The most significant improvement included within this alternative is the relocation of parallel Taxiway B to increase its existing centerline to centerline separation with Runway 7L-25R from 200 feet to 300 feet. Similar to the Taxiway A reconstruction and relocation, which relocated Taxiway A from 200 feet to 300 feet north of Runway 7L-25R's centerline, the relocation and reconstruction of Taxiway B is needed for Runway 7L-25R to meet ARC B-II design standards. While the future RDC for Runway 7L-25R is B-II, and the required runway to taxiway design standard separation is a minimum of 240 feet, relocating Taxiway B to the RDC D-II standard of 300 feet from the runway centerline allows full redundancy in case of an incident on Runway 7R-25L. This would allow D-II aircraft to have functional use of the airfield during periods of Runway 7R-25L closure. The additional separation gained by the 100 foot relocation allows most of the small general aviation fleet to hold between the Runway 7L-25R holdbars and the Taxiway B OFA, reducing congestion on Taxiway B and enhancing the capacity of the taxiway system. The relocation of Taxiway B 100 feet south still maintains sufficient separation of 400 feet from Runway 7R-25L as well.

The relocation of Taxiway B also provides an opportunity to address the FAA hot spots and non-standard geometry intersections that were identified in Chapter 3, Facility Requirements. An important and successful method to improve airfield safety and reduce the occurrence of incursions is the enhancement of pilot situational awareness by eliminating runway crossings straight through to the ramp, maximizing 90 degree intersections to improve pilot visibility, as well as implementation of other visual cues.

To address the FAA-identified hot spots, this alternative proposes to eliminate the straight through taxi paths that currently exist on Taxiways B5 and B9 and require aircraft to make a turn onto Taxiway B in order to cross to the north or south. Requiring an aircraft to make a turn onto Taxiway B enhances pilot and controller situational awareness as it provides more visual cues for pilots to understand their location on the airfield. This reduces the risk of a pilot missing runway holdbars and causing an incursion in these two hot spot locations.



Airfield Alternative 1 - Taxiway Geometry Enhancements

Figure 5-2

LEGEND

- Airport Property Boundary
- Airfield Ramp, Taxiway & shoulders
- Existing Runway Pavement
- Existing on-Airport Building
- Holding Position
- Runway Protection Zone
- Proposed Removal
- Proposed Airfield Enhancement
- Proposed Runway Pavement

N

0' 800'

1" = 800'

Another improvement proposed within this alternative is the addition of two acute angle taxiway connectors connecting Runway 7L-25R with the relocated Taxiway B, one accommodating east flow, and the other accommodating west flow. The acute angle taxiway connector in the west flow direction aligns with acute angle taxiway connector A6. The east flow taxiway connector would not align with acute angle Taxiway A8 as a greater percentage of the fleet would be able to exit the runway further east. The eastbound acute angle taxiway connector would be located approximately 3,000 feet east of the Runway 7L threshold. At that distance, approximately 90% of the propellor-driven fleet would be able to slow down sufficiently to exit the runway.

Existing Taxiway B3 serves as a north-south taxi route connecting the Northwest Industrial Airpark with Runway 7R-25L. Taxiway B3, while not officially recognized as an FAA hot spot, has geomtery similar to Taxiways B5 and B9 such that aircraft have the potential to miss runway holdbars due to an extended straight through taxi route. Airfield Alternative 1 proposes to relocate Taxiway B3 to the west outside of the Runway 7L arrival RPZ. The relocation improves pilot situational awareness as aircraft originating from the Northwest Industrial Airpark would have to make a turn onto Taxiway A, prior to turning south on the relocated Taxiway B3.

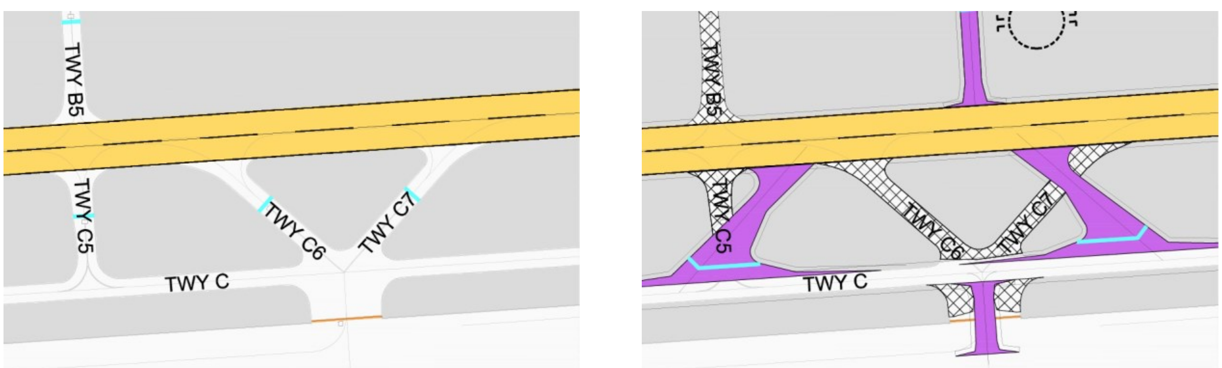
Existing Taxiway A10 is proposed to be relocated to the east and provide a complete north-south connection between Taxiway A and Taxiway B. This new set of connector taxiways also replaces Taxiway B9's crossing, which is currently located in the "high-energy" middle third of the runway.

This alternative also proposes several taxiway geomtery modifications south of Runway 7R-25L. This alternative carries forward the run-up areas that were studied and proposed in a separate DVT Airport Layout Plan update. Each run-up area accommodates six ADG-I aircraft positions allowing pilots to complete their pre-flight checklists and perform engine run-ups. The new run-up areas are needed because the existing run-up areas south of Runway 7R-25L are located within the RSA. The configuration of the run-up areas, as depicted, allow the enhanced sequencing of aircraft and remove the first-in, first-out restriction that currently exists. The high-volume of flight training aircraft residing on the south side of the airfield justifies the need for six positions on each end of the runway. Oftentimes, flight training aircraft will leave the ramp in groups of up to 10 aircraft. The proposed six positions better balances congestion on Taxiway C. A small portion of a taxiway parallel to Taxiway C would need to be constructed in order to provide a dedicated entrance into the run-up areas. The parallel taxiway would begin at Taxiway C2 on the west end and at Taxiway C12 on the east end. That entrance taxiway would be designed to meet ADG-II stadards for taxiway separation.

As described in Chapter 3, Facility Requirements, there are several taxiway intersections that were identified to have non-standard geometries. The six (6) taxiway entrances to/from the southside aprons all have taxiway widths that exceed FAA design standards and can cause signs to be located outside of a pilot's peripheral vision resulting in a loss of pilot situational awareness. Instead of demolishing the extra pavement width and its associated fillets, the extra pavement could be painted to identify it as shoulder pavement.

The intersection of Taxiways C6, C7, C, and R3 was also identified as a non-standard geometry intersection. This five spoke decision point can cause the loss of pilot and controller situational awareness. A 90 degree four spoke intersection, also known as a "t" intersection provides more clarity to pilots and controllers. Acute angle taxiway connectors C6 and C7 also both directly feed into the ramp entrance. In order to remedy this non-standard geometry, Airfield Alternative 1 proposes to relocate both acute angle taxiway connectors to the east and west. Acute angle taxiways are needed in order to minimize runway occupancy time so that minimum in-trail arrival separations can be maintained which optimizes the capacity of the airfield. **Figure 5-3** provides a larger scale view of this existing five node intersection and the potential geometry improvements to meet current design standards. The relocation of Taxiway B5 provides the opportunity to locate a replacement westbound acute angle Taxiway C7 connector in its former location. The location further west accommodates a greater percentage of the jet fleet, approximately 75%. The eastbound acute angle Taxiway C6 would be relocated approximately 500 feet to the east and would also capture a greater percentage of the fleet, both jet and propeller-driven aircraft. The relocation of both acute angle taxiways resolves the complex, non-standard geometry of that intersection and better locates the acute angle taxiways to serve a larger percentage of the expected fleet.

Figure 5-3: Taxiway Geometry Comparison



Source: HNTB

The intersection of Taxiways C8, C9, C, and R4 is another complex intersection with five spokes. Similar to the improvements described above for C6, C7, C, and R3, this alternative proposes to reconfigure the acute angle taxiway connectors C8 and C9 to better accommodate a larger share of the fleet mix. Westbound acute angle Taxiway C9 would remain in its current location, however, its fillet would be widened to meet current design standards. Taxiway C9 will continue to accommodate the majority of the propeller-driven fleet. The eastbound acute angle taxiway would be relocated approximately 800 feet east of its existing location. This new location will accommodate approximately 70% of the jet fleet. To eliminate the exit taxiway leading directly to a ramp, this alternative proposes to relocate the entrance to R4 to the west requiring aircraft turn onto Taxiway C prior to entering the ramp. This also prevents aircraft coming from the ramp errantly continuing onto the acute angle taxiway and entering Runway 7R-25L.

Existing acute angle Taxiway C10 would be reconfigured into a 90 degree taxiway connector. Taxiway C10 is currently located approximately 1,500 feet west of the Runway 25L arrival threshold. This location is too close to the arrival threshold to justify an acute angle taxiway connector. Furthermore, existing Taxiway C10 leads directly into the ramp. The proposed relocation of Taxiway C10 allows for a north-south crossing that replaces hot spot Taxiway B9 and is located within the first third of Runway 7R-25L.

Existing Taxiway B11 has similar geometry to the existing hot spots, Taxiways B5 and B9. In order to enhance situational awareness and reduce the potential risk of incursion, Alternative 1 proposes to relocate Taxiway B11 to the west to prohibit aircraft from crossing two runways without a turning movement. Further to the east, a new taxiway connector would connect Taxiway C with the arrival threshold of Runway 25L. This taxiway is needed to reduce the runway occupancy time for aircraft that roll long and have no exit between Taxiways C11 and C12. It is also useful as another intersection departure location for smaller aircraft.

There are several other improvements included within Alternative 1 unrelated to taxiway geometry. As identified in Chapter 3, Facility Requirements, many of the taxiways on the south side of the airfield lack taxiway shoulders. Additionally, Runway 7R-25L does not have paved runway shoulders. This alternative proposes to add those missing shoulders. The facility requirements identified that the existing runway blast pads for Runway 7R-25L do not meet existing design standards. This alternative proposes to widen the blast pad to meet standards and add blast pads to Runway 7L-25R, which currently does not have them. Airfield Alternative 1 also proposes the upgrade of all existing 2-light PAPIs to 4-light PAPIs as recommended in the facility requirements.

The final feature of this alternative is the relocation of the runway holdbars south of Runway 7R-25L to their standard location 250 feet from runway centerline. Many of the problems caused by moving these holdbars, as discussed in Chapter 3, Facility Requirements, are not mitigated by this alternative. Aircraft arriving on Runway 7R-25L would no longer have the room to hold between the Runway 7R-25L holdbars and the Taxiway C OFA and will immediately have to taxi directly onto Taxiway C.

The following is a summary of the advantages of this alternative:

- Meets current FAA design standards
- Mitigates the FAA-identified hot spots
- Mitigates the non-standard geometry south of Runway 7R-25L
- Minimizes the risk of runway incursions
- Eliminates runway crossings in the “high energy” middle third of each runway
- Re-uses existing airfield pavement to the extent possible
- Improves operational efficiency and reduces runway occupancy times by relocating acute angle taxiway connectors on both runways

- Adds needed run-up positions outside of the RSA
- Provides a slight increase in capacity by reducing the runway occupancy time of landing aircraft

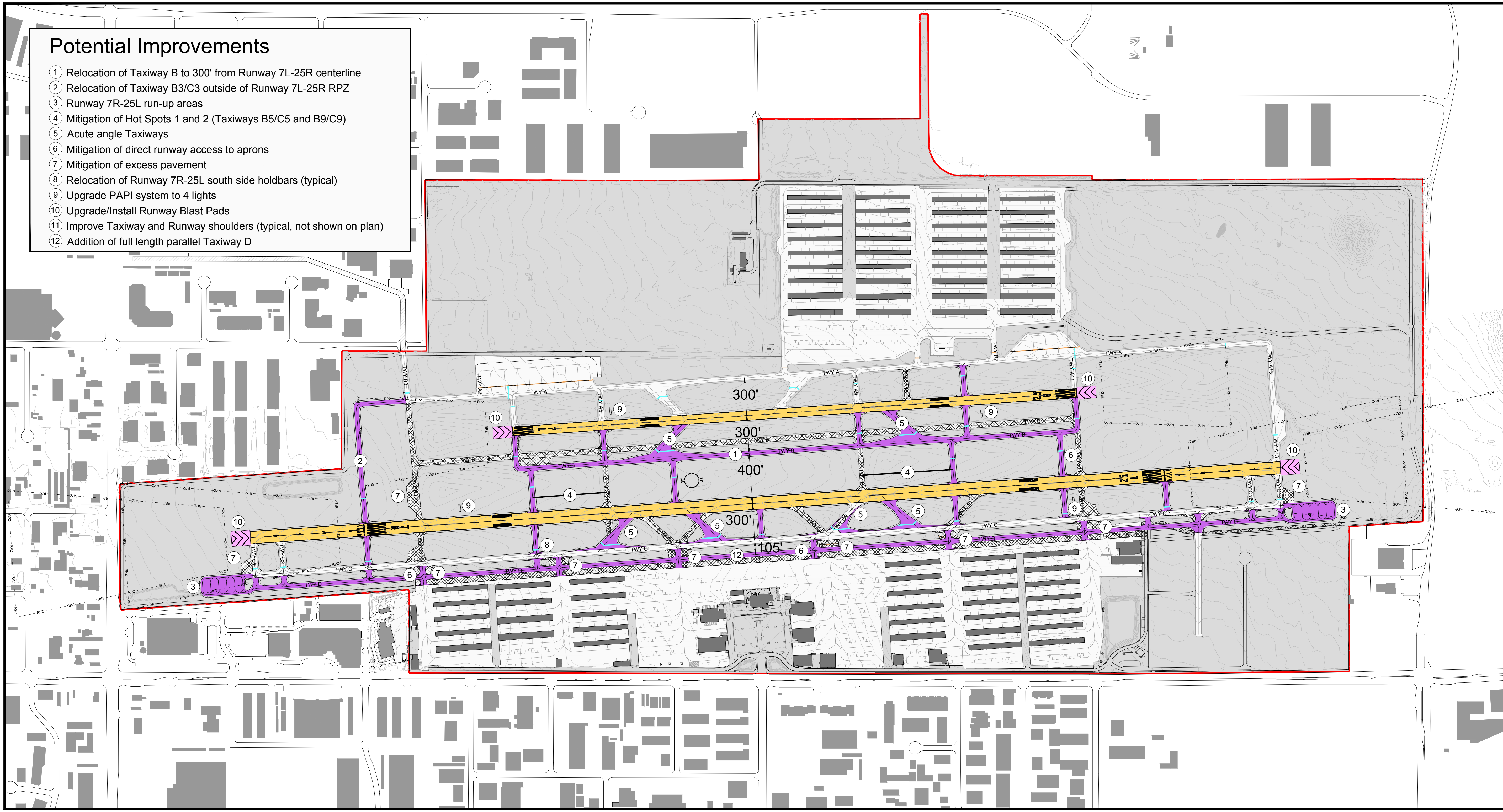
The following is a summary of the disadvantages of this alternative:
- Solution for runway holdbars south of Runway 7R-25L does not address Safety Risk Management concerns
- Requires an expansive reconstruction of the airfield

5.3.2 Airfield Alternative 2 – Full Length Parallel Taxiway D

Airfield Alternative 2 – Full Length Parallel Taxiway D, presented in **Figure 5-4**, incorporates all of the improvements described in Alternative 1 and supplements them with a new full length parallel taxiway, denoted as Taxiway D, south of existing Taxiway C. Taxiway D's centerline would be located 105 feet south of Taxiway C's centerline and meet the ADG-II design standards. Taxiway D provides a comprehensive solution for relocating the holdbars south of Runway 7R-25L to their standard location because a second parallel taxiway enables the segregation of modes allowing departing and arriving aircraft to operate on separate taxiways. Arriving aircraft could taxi directly onto Taxiway C without risk of a head-to-head conflict with an aircraft taxiing to departure and aircraft would no longer need to hold short of Taxiway C upon arrival to avoid other taxiing aircraft. This will reduce ATC's workload and improve pilot and controller situational awareness.

The full length taxiway enables enhanced flexibility for the sequencing of aircraft, especially IFR aircraft that are assigned a specific departure time. It is not uncommon for IFR aircraft to be given a departure time 10 to 30 minutes after taxiing out from the ramp. Today these aircraft sometimes block Taxiway C when waiting for their call for release, but a new parallel taxiway would allow aircraft to bypass each other and meet the dynamic needs of ATC. A large portion of Taxiway D, between ramp entrances R1 and R6, are already paved, however, detailed pavement analyses are needed to determine whether or not that pavement could support the demands of a taxiway. The portions of Taxiway D west of R1 and east of R6 will require full-depth pavement sections.

The proposed alignment of Taxiway D causes a number of impacts to existing facilities. The first row of north facing t-hangar and shade hangar buildings west of the Terminal and south of Taxiway D would have to be operationally closed due to the impact from aircraft exiting the hangars encroaching Taxiway D's OFA. The three t-hangar buildings could be repurposed to serve alternative uses. The north facing hangars could be used for airport related storage and maintenance or the north and south sides of the buildings could be converted to larger hangars that only open to the south. Further to the east, Taxiway D impacts the Police Air Support Unit leasehold. The extents of Taxiway D's OFA requires the extensive reconfigurations the Police Air Support Unit's apron and hangars, as their hangars open to the north. The combined operational restrictions and existing poor condition of the building provide the opportunity to relocate this facility to a more advantageous location. Potential relocation concepts are presented in Section 5.4.



Airfield Alternative 2 - Full Length Parallel Taxiway D

Figure 5-4

LEGEND
- Airport Property Boundary
- Airfield Ramp, Taxiway & shoulders
- Existing Runway Pavement
- Existing on-Airport Building
- Holding Position
- Runway Protection Zone
- Proposed Removal
- Proposed Airfield Enhancement
- Proposed Runway Pavement

N

0' 800'

1" = 800'

DVT

HNTB

The following is a summary of the advantages of this alternative:

- Meets current FAA design standards
- Mitigates the FAA-identified hot spots
- Mitigates the non-standard geometry south of Runway 7R-25L
- Minimizes the risk of runway incursions
- Eliminates runway crossings in the "high energy" middle third of each runway
- Re-uses existing airfield pavement to the extent possible
- Improves operational efficiency and reduces runway occupancy times by relocating acute angle taxiway connectors on both runways
- Adds needed run-up positions outside of the RSA
- Minimizes runway occupancy time by providing a dedicated arrival taxiway
- Reduces the risk of head-to-head taxi conflicts
- Enables the relocation of the Runway 7R-25L holdbars to their standard location while minimizing impacts to airfield operations
- Improves ATC flexibility for sequencing departures, especially for IFR aircraft

The following is a summary of the disadvantages of this alternative:

- Requires an expansive reconstruction of the airfield
- Requires the costly construction of a full length taxiway
- Requires the relocation of some hangars and leaseholds, including the Police Air Support Unit, as a result of the taxiway development

5.3.3 Airfield Alternative 3 – Partial Length Parallel Taxiway D

Airfield Alternative 3 – Partial Length Parallel Taxiway D, presented in **Figure 5-5**, incorporates all of the improvements described in Alternative 1 and supplements them with a new partial length parallel taxiway, denoted as Taxiway D, south of existing Taxiway C. Alternative 3 is similar in design to Alternative 2; however, Taxiway D is limited to a span between existing Taxiways C3 and C11. Partial length parallel Taxiway D still meets ADG-II design standards and provides many of the same benefits that the full length alternative does. The partial length taxiway allows for the segregation of arriving and departing aircraft in the central portion of the airfield, where nearly 100% of the fleet are expected to land and exit the runway. This allows the Runway 7R-25L holdbars to be relocated to their standard location without a significant impact on operations.

Taxiway D still impacts the first row of the north facing t-hangar and shade hangar buildings west of the Terminal and south of Taxiway D. The existing tenants would need to be relocated to another hangar. The partial length Taxiway D terminates at ramp entrance R6 on the east end, and therefore, the Police Air Support Unit leasehold would not be impacted. The construction of a partial length taxiway does not preclude the ability to expand to a full length taxiway in the future and is a reasonable first phase of development if funds are not initially available to construct the full length taxiway and a replacement Police Air Support Unit facility.

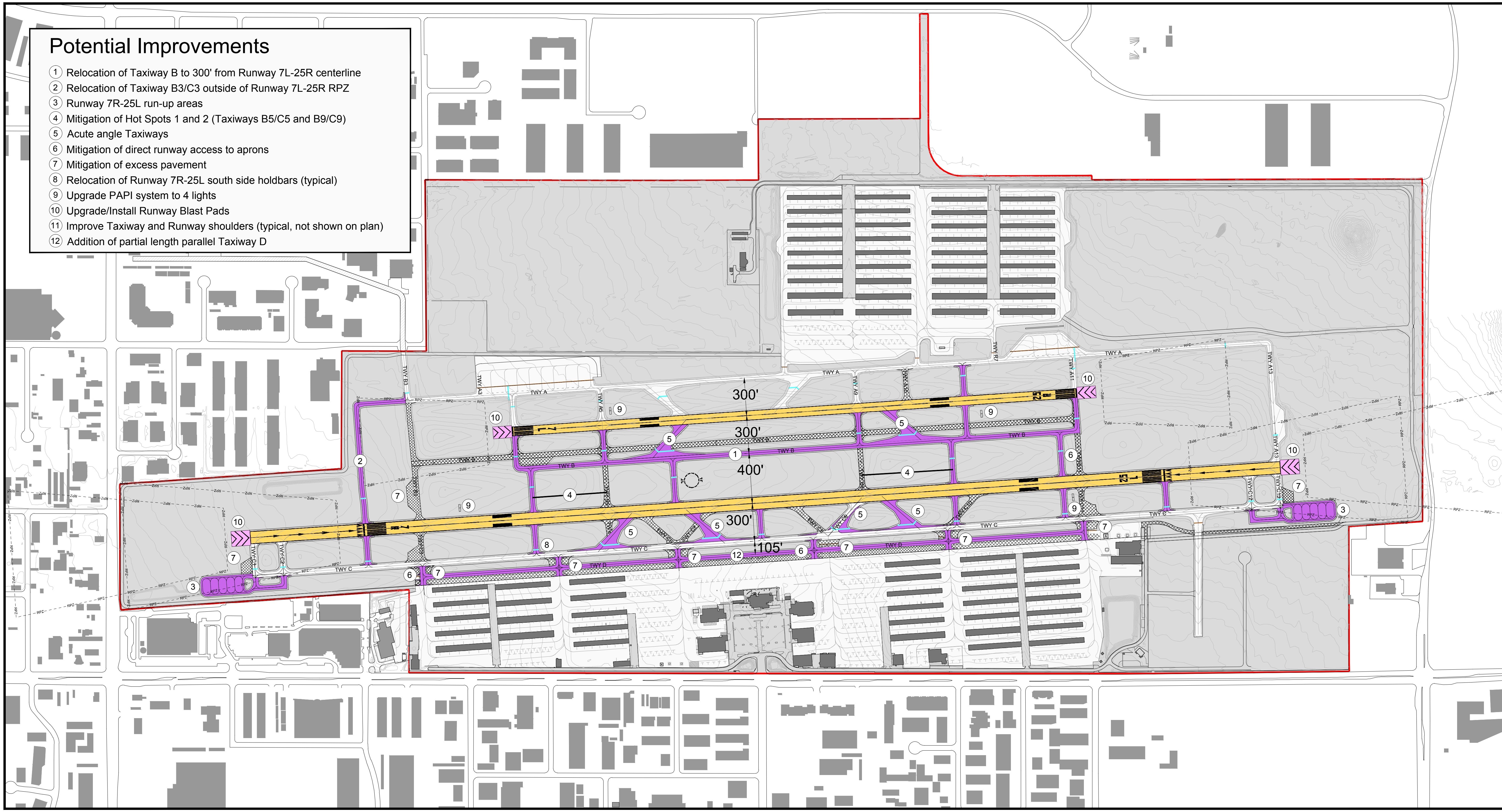
The following is a summary of the advantages of this alternative:

- Meets current FAA design standards
- Mitigates the FAA-identified hot spots
- Mitigates the non-standard geometry south of Runway 7R-25L
- Minimizes the risk of runway incursions
- Eliminates runway crossings in the "high energy" middle third of each runway
- Re-uses existing airfield pavement to the extent possible
- Improves operational efficiency and reduces runway occupancy times by relocating acute angle taxiway connectors on both runways
- Adds needed run-up positions outside of the RSA
- Minimizes runway occupancy time by providing a dedicated arrival taxiway
- Reduces the risk of head-to-head taxi conflicts
- Enables the relocation of the Runway 7R-25L holdbars to their standard location
- Does not require relocation of the Police Air Support Unit

The following is a summary of the disadvantages of this alternative:

- Requires an expansive reconstruction of the airfield
- Requires the costly construction of a partial length taxiway
- Requires the relocation of some hangars and leaseholds as a result of the taxiway development
- Does not provide enhanced flexibility for ATC sequencing of aircraft

PHOENIX DEER VALLEY AIRPORT MASTER PLAN UPDATE



Airfield Alternative 3 - Partial Length Parallel Taxiway D

Figure 5-5

LEGEND

- Airport Property Boundary
- Airfield Ramp, Taxiway & shoulders
- Existing Runway Pavement
- Existing on-Airport Building
- Holding Position
- Runway Protection Zone
- Proposed Removal
- Proposed Airfield Enhancement
- Proposed Runway Pavement

N

0' 800'

1" = 800'

DVT

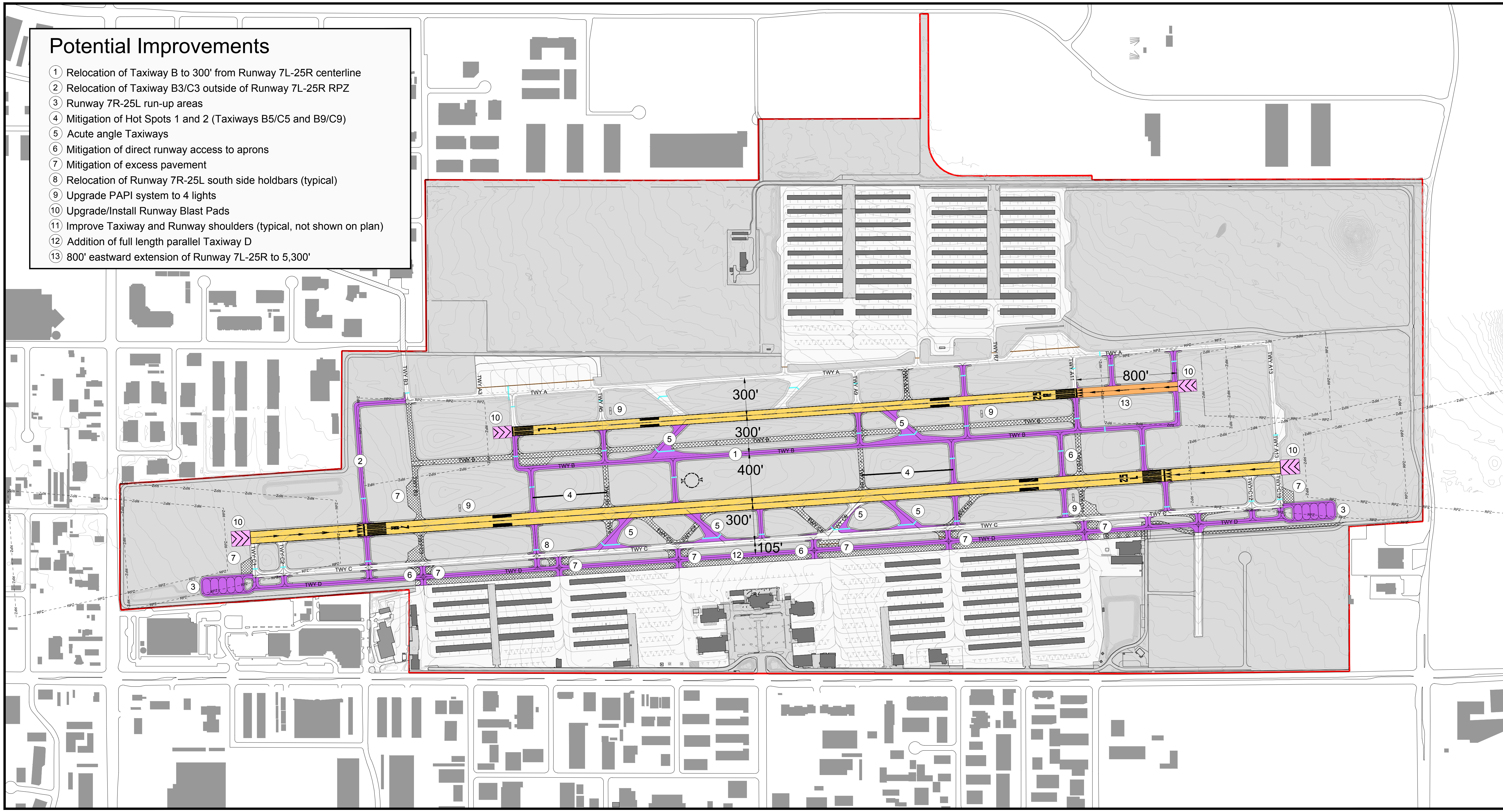
HNTB

5.3.4 Airfield Alternative 4 – 800 Foot Extension of Runway 7L-25R

Airfield Alternative 4 – 800 Foot Extension of Runway 7L-25R, presented in **Figure 5-6**, incorporates all of the improvements presented in Alternative 2, Full Length Parallel Taxiway D, and supplements it with an extension of Runway 7L-25R 800 feet to the east for a total length of 5,300 feet. Chapter 3, Facility Requirements, reviewed DVT's runway length requirements for the next 20 years based on the projected fleet mix and concluded that Runway 7L-25R could benefit from additional runway length to bring the total length over 5,000 feet. Exceeding 5,000 feet of runway length will allow corporate aircraft to use the runway and could better balance the utilization of the two runways.

During development of this alternative, it was concluded that the only feasible direction that Runway 7L-25R could be extended is to the east due to off-airport property impacts associated with the RPZ on the west. Several iterations of a modest runway length increase were studied and presented to the Technical and Public Advisory Committees, ranging from 500 feet to 1,000 feet. New obstruction data prepared for an FAA AC 150/5300-18B aeronautical survey provided detailed information about the objects and terrain east of DVT. One of the primary goals with the runway extension is to provide runway pavement that is usable in both east and west flow. In discussions with DVT's tenants and users it was stated that the users prefer not to move the Runway 25R arrival threshold closer to the Runway 25L arrival threshold because of the high number of student pilots making converging approaches. By not aligning the arrival thresholds, aircraft entering the pattern for Runway 25R will be at a higher altitude than the aircraft entering the Runway 25L pattern, reducing the risk of inflight incident should one or both aircraft overshoot their final approach course.

Of the various runway extension opportunities, an 800 foot extension of Runway 7L-25R maximizes the ability to use the additional runway length bi-directionally. Due to tenant and user's request to maintain the existing arrival threshold as a safety measure, Alternative 4 proposes that the runway extension is added with a displaced arrivals threshold on the 25R end. The additional runway length would be used for departures and arrivals in east flow and departures in west flow. Arrivals in west flow would not benefit from the added runway length because of the displaced threshold. For departures to the east, the 800 foot extension is the maximum distance that does not cause the departure climb to exceed a 500 foot per nautical mile climb gradient over obstacles to the east of the runway. A summary of the available runway lengths is included in **Table 5-1**. Anything greater than a 500 foot per nautical mile climb gradient must be approved by FAA's Flight Standards Division.



Airfield Alternative 4 - 800' Extension of Runway 7L-25R

Figure 5-6

LEGEND

- Airport Property Boundary
- Airfield Ramp, Taxiway & shoulders
- Existing Runway Pavement
- Existing on-Airport Building
- Holding Position
- Runway Protection Zone
- Proposed Removal
- Proposed Airfield Enhancement
- Proposed Runway Pavement

N

0' 800'

1" = 800'

DVT

HNTB

Table 5-1: Airfield Alternative 4 Runway Lengths

Operation	Available Length
Westbound Departures	5,300’
Westbound Arrivals	4,500’
Eastbound Departures	5,300’
Eastbound Arrivals	5,300’

Source: HNTB Analysis

To adequately serve the 800 foot runway extension, Taxiway B is extended east to align with the physical end of Runway 7L-25R. An additional taxiway connector leading to the runway from Taxiway A is included approximately 500 feet down the runway for intersection departures or to allow aircraft that abort a departure to exit the runway quickly. The new departure RPZ is contained within airport property and there are no other impacts to airport safety surfaces.

The following is a summary of the advantages of this alternative:

- Meets current FAA design standards
- Mitigates the FAA-identified hot spots
- Mitigates the non-standard geometry south of Runway 7R-25L
- Minimizes the risk of runway incursions
- Eliminates runway crossings in the “high energy” middle third of each runway
- Re-uses existing airfield pavement to the extent possible
- Improves operational efficiency and reduces runway occupancy times by relocating acute angle taxiway connectors on both runways
- Adds needed run-up positions outside of the RSA
- Minimizes runway occupancy time by providing a dedicated arrival taxiway
- Reduces the risk of head-to-head taxi conflicts
- Enables the relocation of the Runway 7R-25L holdbars to their standard location
- Improves ATC flexibility for sequencing departures, especially for IFR aircraft
- Provides redundancy of operations should Runway 7R-25L be temporarily closed
- Provides a more balanced utilization of the runways

The following is a summary of the disadvantages of this alternative:

- Requires an expansive reconstruction of the airfield
- Requires the costly construction of full length taxiway
- Requires the relocation of some hangars and leaseholds as a result of the taxiway development
- Requires the development of new airspace departure procedures
- May require the lighting/marking of new obstructions

5.3.5 Airfield Alternative 5 – 1,526 Foot Extension of Runway 7L-25R

Airfield Alternative 5 – 1,526 Foot Extension of Runway 7L-25R, presented in **Figure 5-7**, incorporates all of the improvements presented in Alternative 2, Full Length Parallel Taxiway D, and supplements it with an extension of Runway 7L-25R 1,526 feet to the east for a total length of 6,026 feet. This runway extension maximizes the distance the runway can be extended while still maintaining associated safety areas on airport which avoids the need for property acquisition and easements. The proposed runway length accommodates a significant portion of the jet fleet at a high payload percentage.

The full runway length would be available for westbound departures and eastbound arrivals only. As in Alternative 4, Runway 25R would have a displaced arrivals threshold and westbound arrivals would be limited to the existing runway length. Eastbound departures would be limited to 5,300 feet until critical obstructions limiting climb gradients above 500 feet per nautical mile are mitigated. A summary of the available runway lengths is included in **Table 5-2** below.

Table 5-2: Airfield Alternative 5 Runway Lengths

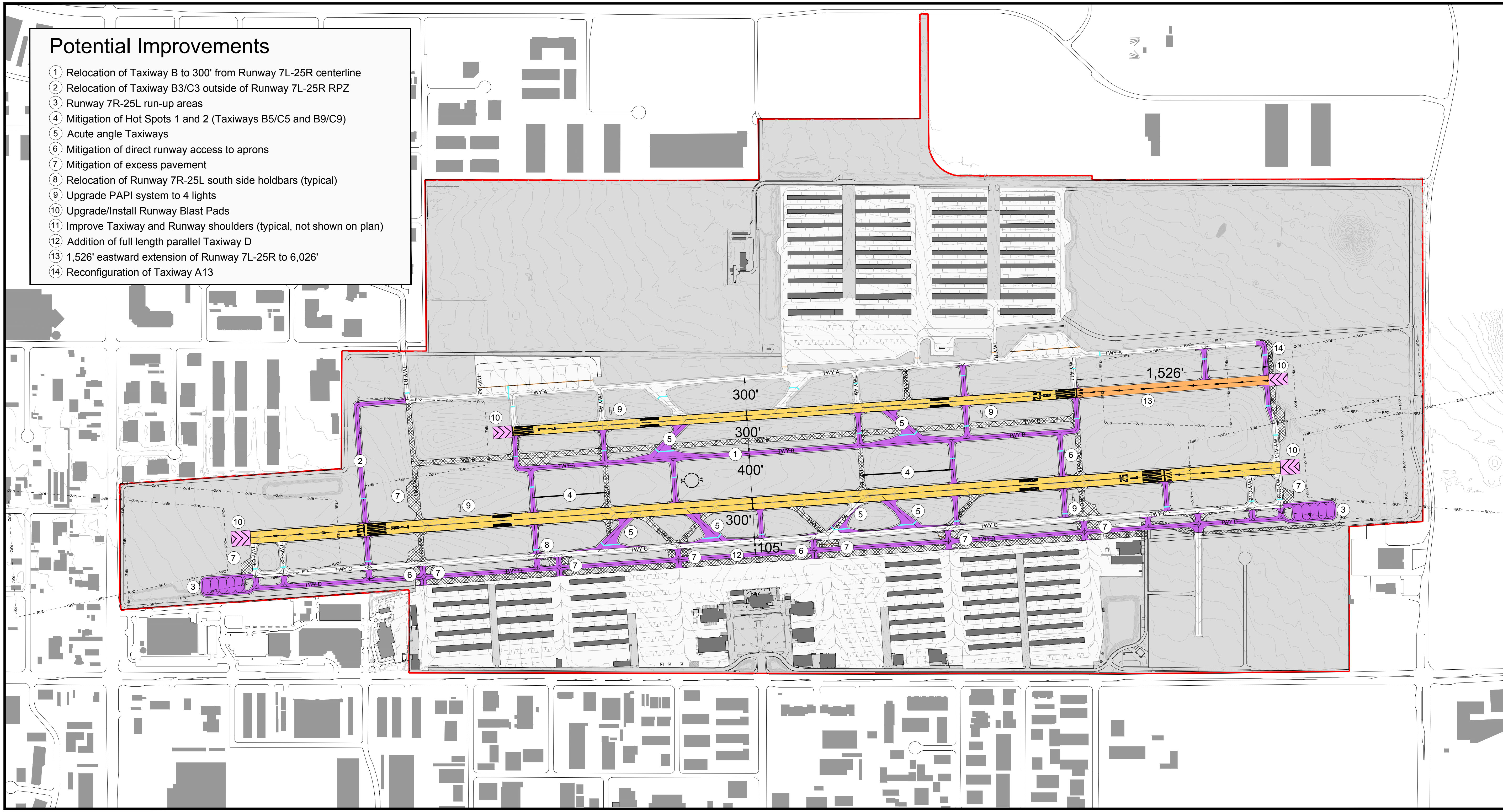
Operation	Available Length
Westbound Departures	6,026’
Westbound Arrivals	4,500’
Eastbound Departures	5,300’
Eastbound Arrivals	6,026’

Source: HNTB Analysis

The physical end of Runway 7L-25R does not align with Runway 7R-25L to minimize off-airport RPZ impacts. The alignment of Taxiway A13 requires a jog and partial reconstruction to serve the extended runway threshold because the FAA no longer allows aligned taxiways to serve runways. An additional taxiway connector leading to the runway from Taxiway A is included approximately 500 feet down the runway for intersection departures or to allow aircraft that abort a departure a way to exit the runway quickly. In this alternative, Taxiway B is not extended further to the east in order to prevent the potential misidentification of the taxiway as a runway.

The following is a summary of the advantages of this alternative:

- Meets current FAA design standards
- Mitigates the FAA-identified hot spots
- Mitigates the non-standard geometry south of Runway 7R-25L
- Minimizes the risk of runway incursions
- Eliminates runway crossings in the “high energy” middle third of each runway
- Re-uses existing airfield pavement to the extent possible
- Improves operational efficiency and reduces runway occupancy times by relocating acute angle taxiway connectors on both runways
- Adds needed run-up positions outside of the RSA



Airfield Alternative 5 - 1,526' Extension of Runway 7L-25R

Figure 5-7

LEGEND

- Airport Property Boundary
- Airfield Ramp, Taxiway & shoulders
- Existing Runway Pavement
- Existing on-Airport Building
- Holding Position
- Runway Protection Zone
- Proposed Removal
- Proposed Airfield Enhancement
- Proposed Runway Pavement

N

0' 800'

1" = 800'

DVT

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- Minimizes runway occupancy time by providing a dedicated arrival taxiway
- Reduces the risk of head-to-head taxi conflicts
- Enables the relocation of the Runway 7R-25L holdbars to their standard location
- Improves ATC flexibility for sequencing departures, especially for IFR aircraft
- Provides redundancy should Runway 7R-25L be temporarily closed
- Provides a more balanced utilization of the runways
- Enables a large percentage of the jet fleet to use Runway 7L-25R

The following is a summary of the disadvantages of this alternative:

- Requires an expansive reconstruction of the airfield
- Requires the costly construction of full length taxiway
- Requires the relocation of some hangars and leaseholds as a result of the taxiway development
- Requires the development of new airspace departure procedures
- May require the lighting/marking of new obstructions
- Additional runway length is not fully usable in both directions

5.3.6 Summary of Airfield Development Alternatives

Table 5-3 below summarizes the principal improvements associated with the alternatives described above.

Table 5-3: Airfield Alternatives Summary

Component	No Build	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Runway 7L-25R Length	4,500′	4,500′	4,500′	4,500′	5,300′	6,026′
Runway 7R-25L Length	8,196′	8,196′	8,196′	8,196′	8,196′	8,196′
Meets AC Design Standards	No	Yes	Yes	Yes	Yes	Yes
Addresses Runway 7R-25L Holdbar Location	Yes	Not Adequately	Yes	Yes	Yes	Yes
Improves Operational Efficiency	No	No	Yes	Yes	Yes	Yes
Mitigates Hot Spots	No	Yes	Yes	Yes	Yes	Yes
Mitigates Non-Standard Geometry	No	Yes	Yes	Yes	Yes	Yes
Impacts Existing Tenants/Leaseholds	No	No	Yes	Yes	Yes	Yes
Balances the Airfield	No	No	No	No	Yes	Yes
Improves FAA Sequencing Flexibility	No	No	Yes	No	Yes	Yes

Source: HNTB Analysis

5.4 Support Facility Alternatives

5.4.1 Compass Calibration Pads

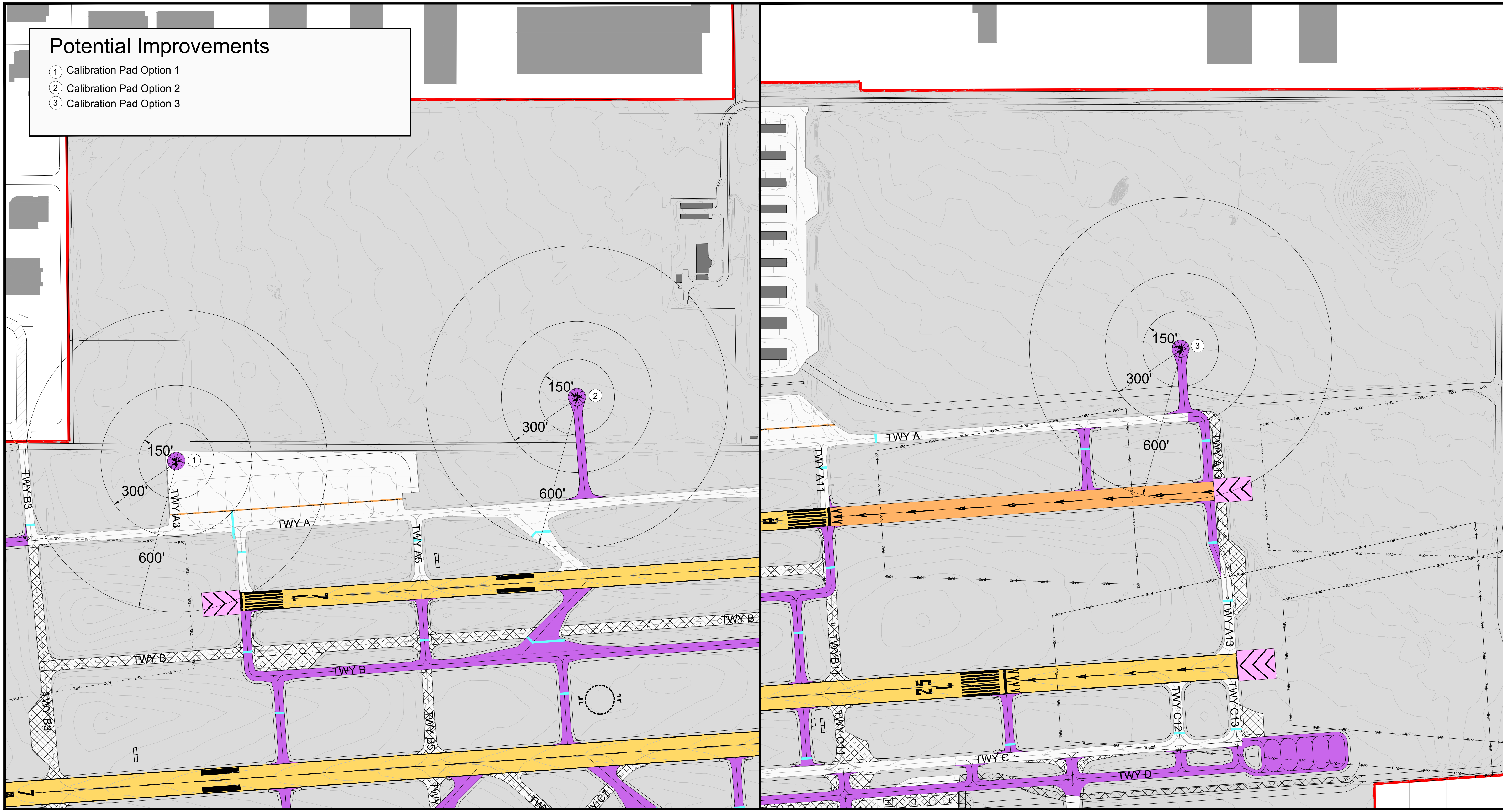
Prior to its reconstruction, DVT maintained a compass calibration pad located on the northwest run-up apron. A compass calibration pad enables pilots to calibrate their on-board magnetic compass by aligning their aircraft on known magnetic headings and making adjustments to the compass and/or placard markings to indicate the required corrections. Since the decommissioning of the former compass calibration pad, tenants and users have requested that this important air navigation function be restored at DVT and it was the most requested facility in the survey of DVT based pilots. FAA AC 150/5300-13A, Appendix 6, specifies detailed requirements for the siting of a compass calibration pad.

The FAA recommends the following design criteria when siting a compass calibration pad at an airport:

- Locate the center of the pad at least 600 feet (183 meters) from magnetic objects such as large parking lots, busy roads, railroad tracks, high voltage electrical transmission lines or cables carrying direct current (either above or below ground)
- Locate the center of the pad at least 300 feet (91 meters) from buildings, aircraft arresting gear, fuel lines, electrical or communication cable conduits when they contain magnetic (iron, steel, or ferrous) materials and from other aircraft
- Locate the center of the pad at least 150 feet (46 m) from runway and taxiway light bases, airfield signs, ducts, and grates for drainage that contain iron, steel, or ferrous materials
- Avoid NAVAID interference in accordance with other NAVAID siting criterion
- The compass calibration pad must be located outside airport design surfaces to satisfy the runway and taxiway clearances applicable to the airport on which it is located
- Conduct a comprehensive magnetic survey of the area to ensure compliance with magnetic interference requirements

The three alternatives for accommodating a compass calibration pad are presented in **Figure 5-8**. For the purposes of ensuring the maximum development of the airfield can be accommodated in the future, the compass calibration pad options are paired with Airfield Alternative 5. This is not intended to indicate a preference toward Airfield Alternative 5.

Compass Calibration Pad Alternative 1 is located within the northwest run-up apron, which is close to where it was previously located. This alternative, unlike the other two alternatives, does not propose a remote location for the compass calibration pad. It relies on existing pavement in an area of the run-up apron that does not accommodate frequent traffic. Alternative 1 may be inoperable during periods where the run-up area is occupied by aircraft due to magnetic interference.



Compass Calibration Pad Alternatives

Figure 5-8

LEGEND

- Airport Property Boundary
- Airfield Ramp, Taxiway & shoulders
- Existing Runway Pavement
- Existing on-Airport Building
- Holding Position
- Runway Protection Zone
- Proposed Removal
- Proposed Airfield Enhancement
- Proposed Runway Pavement

N

0' 400'

1" = 400'

DVT

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Compass Calibration Pad Alternative 2 sites the compass calibration pad in a more remote location served by a connector taxiway linking Taxiway A with the pad just to the east of the northwest run-up apron. This alternative requires an extensive amount of taxiway pavement to locate the pad at a distance that meets clearance requirements. The location also interferes with potential development options in the northwest portion of the airfield.

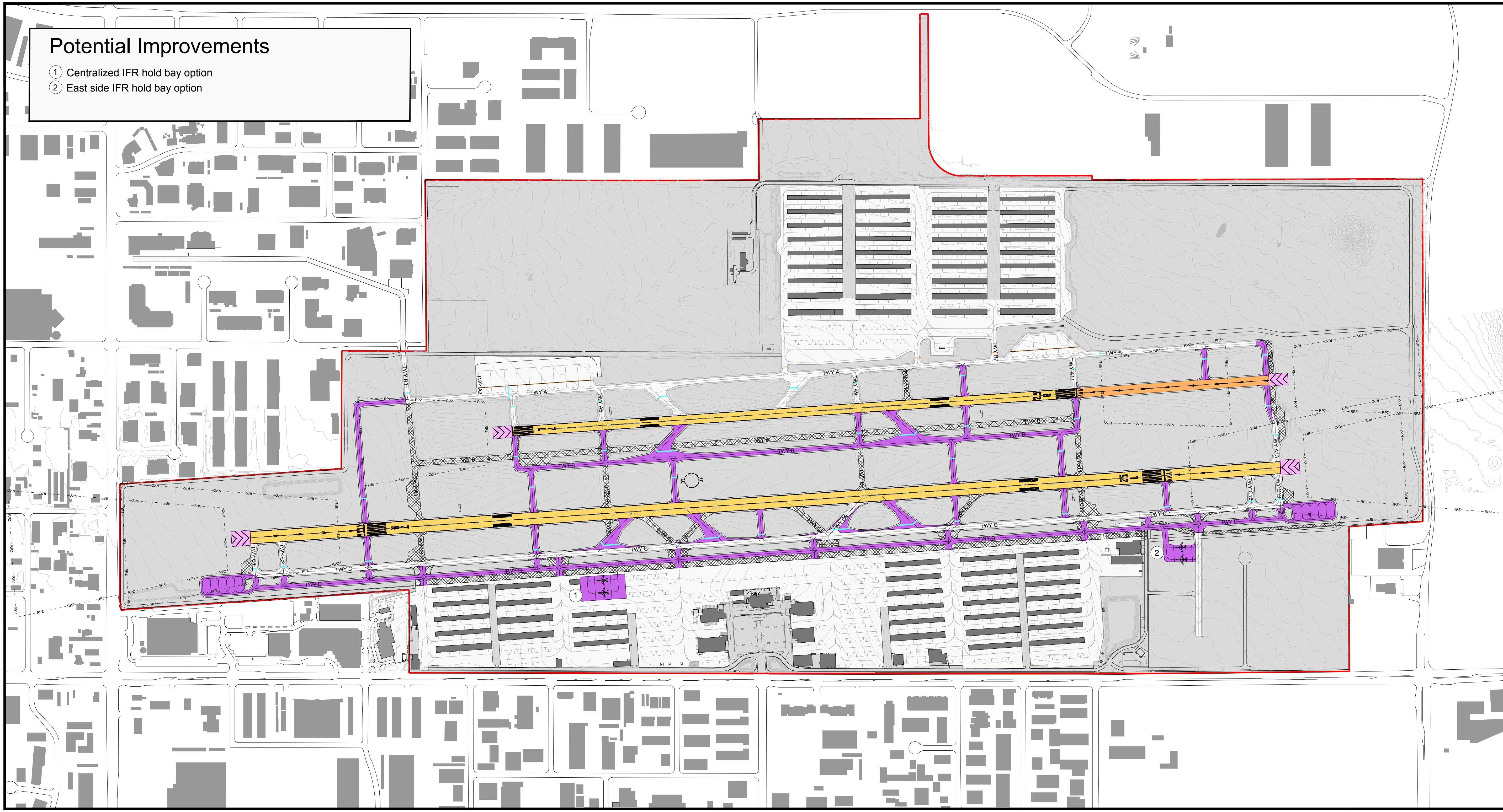
Compass Calibration Pad Alternative 3 sites the compass calibration pad in a remote location in the northeast corner of the airfield. The connector taxiway would be located near the intersection of Taxiways A and A13. Similar to Alternative 2, this alternative requires an extensive amount of taxiway pavement to locate the pad at a distance that meets clearance requirements. The location also interferes with potential development options in the northeast portion of the airfield.

5.4.2 IFR Hold Bays

As discussed in Airfield Alternative 2, aircraft departing under IFR are often given very narrow windows to depart by FAA ATC. Upon notification of a wheels-up time, aircraft are usually given less than five minutes to reach the end of the runway and depart. Given the larger share of small propeller-driven aircraft at DVT, it is clear why the proposed south run-up areas are planned for ADG-I aircraft. However, when IFR traffic taxi down to the end of the runways and await clearance, they often block other aircraft trying to taxi to the end of the runway since no bypass route is currently available. Construction of Taxiway D, as described in Airfield Alternative 2, would allow IFR aircraft to hold without blocking other aircraft, providing one potential solution. Another potential solution is the development of IFR hold bays that are specifically designed for corporate aircraft and located where they do not block other aircraft but when released they can access the departure end of the runway within their narrow departure window. Two potential IFR hold bay alternatives are presented in **Figure 5-9**.

IFR hold bay Alternative 1 sites a two position ADG-II capable hold bay west of the Atlantic Aviation FBO ramp where two shade hangars are currently located. The design would allow aircraft to power-in and power-out of their holding positions avoiding long tow times. This alternative is compatible with all of the potential airfield alternatives. The location of the hold bay would make it difficult for aircraft to access the end of Runway 25L within a timely manner and is preferable for aircraft departing from Runway 7R.

IFR hold bay Alternative 2 sites a two position ADG-II capable hold bay east of the Police Air Support Unit and connects to the existing southbound taxilane. The design of Alternative 2 would also allow aircraft to power-in and power-out of their holding positions. The location of the hold bay would make it even more difficult for aircraft to access the end Runway 7R within a timely manner and is preferable for aircraft departing from Runway 25L. Furthermore it is located in an area that has long been planned for corporate aviation development.



IFR Hold Bay Alternatives

Figure 5-9

LEGEND

- Airport Property Boundary
- Airfield Ramp, Taxiway & shoulders
- Existing Runway Pavement
- Existing on-Airport Building
- Holding Position
- Runway Protection Zone
- Proposed Removal
- Proposed Airfield Enhancement
- Proposed Runway Pavement

N

0' 800'

1" = 800'

HNTB

5.4.3 Public Safety Building

As discussed in Airfield Alternative 2 – Full Length Parallel Taxiway D, the existing City of Phoenix Police Air Support Unit has surpassed its service life and the building and adjoining apron is in poor condition. Additionally, several of the airfield alternatives recommend improvements that directly impact the ability of the Police Air Support Unit to operate from their existing facility. It is prudent to identify a potential replacement location for the facility that could meet other City needs as well including providing a replacement home for City of Phoenix Fire Station 36. Existing City Fire Station 36, which is located at the intersection of West Melinda Lane and North 9th Avenue, is the station assigned to respond to on-airport emergencies and is nearing the end of its expected service life. As strongly indicated in feedback from DVT's tenant and user surveys, it would be a major benefit to co-locate the fire department and Police Air Support Unit in a single joint-use Public Safety Building on DVT's property. An on property fire department could respond to aircraft emergencies much more quickly than their existing route allows.

Three alternatives, depicted in **Figure 5-10**, were developed to accommodate the consolidated Public Safety Building. The common criteria across all three options is that they are all located on the south side of DVT which is necessary to maintain Police Air Support Unit response times to Downtown Phoenix.

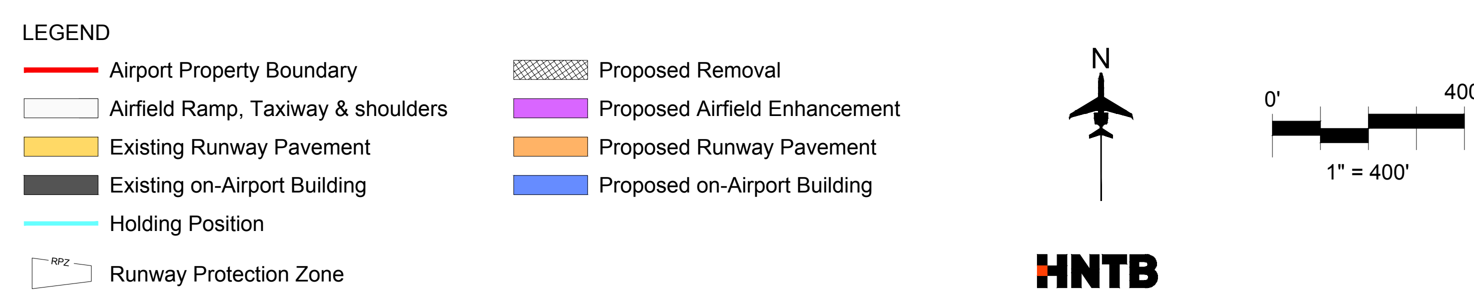
Public Safety Building Alternative 1 locates the Public Safety Building at the south terminus of the corporate aviation taxilane in the southeast corner of airport property. The Public Safety Building would include administrative offices, hangars, a fire station, apron, and landside parking. Being located close to the fence line facilitates ease of access for the fire station to respond to community and on-airport emergencies. The proposed location for Alternative 1 has long been reserved for corporate aviation development.

Public Safety Building Alternative 2 locates the Public Safety Building at the south end of Taxilane R6 just to the west of the Alternative 1 location. The Public Safety Building would include administrative offices, hangars, a fire station, apron, and landside parking. Being located close to the fence line facilitates ease of access for the fire station to respond to both community and on-airport emergencies. The proposed location for Alternative 2 impacts one existing shade hangar structure, one t-hangar building, and 18 aircraft tie-down parking positions.

Public Safety Building Alternative 3 reconstructs the Public Safety Building in its current location. The Public Safety Building would include administrative offices, hangars, a fire station, apron, and landside parking. Being located further away from the fence line increases fire department response times to the community as the fire department would have to traverse internal DVT roads in order to get outside of airport property. Additionally, the facility could not be easily phased if it is reconstructed on its current leasehold unlike the other two alternatives.

Public Safety Building Alternatives

Figure 5-10



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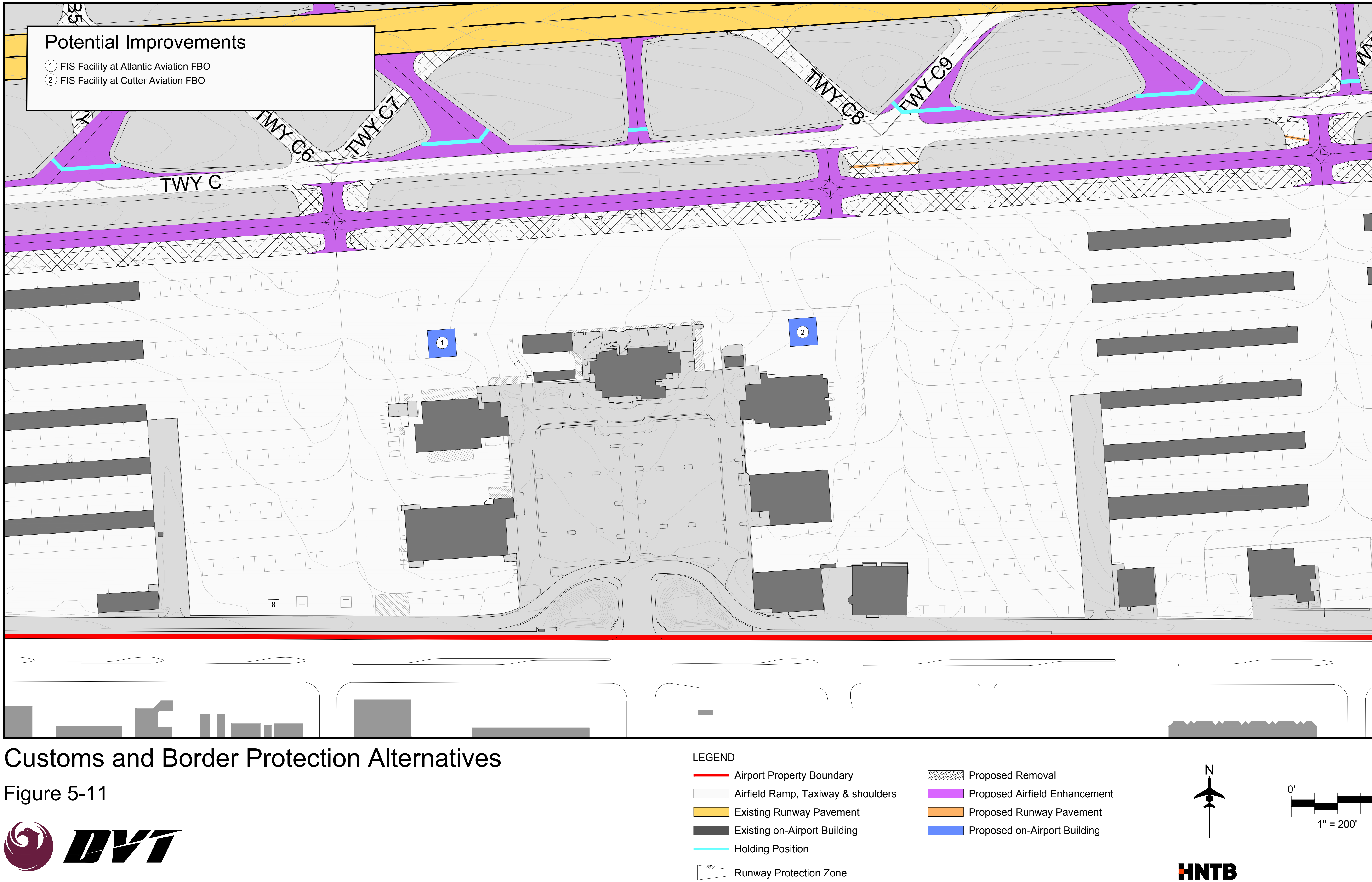
5.4.4 U.S. Customs and Border Protection Facility

A U.S. Customs and Border Protection international arrivals facility processes immigration and customs for international arriving passengers. A CBP facility at a general aviation airport is considered a premium amenity and can oftentimes attract additional high-end corporate aviation traffic. SDL and PHX currently have CBP services for general aviation international arrivals. DVT does not currently have a permanent CBP facility; however, CBP service can be made available with advanced notice. At most general aviation airports that have CBP service, FBOs burden the costs of capital construction of permanent processing facilities and the reimbursable CBP staffing costs. DVT's two FBOs have expressed interest in having CBP service at DVT to enhance their business offerings to the corporate aviation community.

CBP's Airport Technical Design Standards, published in June 2012, provides specific facility requirements and design guidelines for all CBP facilities. General aviation CBP facilities are able to process up to 20 passengers and associated baggage at one time. The typical dedicated area required for a CBP facility is approximately 5,000 square feet; however, that size is subject to change based on negotiations with the presiding local CBP Port Director. Two alternatives were developed to meet the CBP requirements, both of which are depicted in **Figure 5-11**. Alternative 1 locates the CBP facility on the Atlantic Aviation FBO leasehold. Alternative 2 locates the CBP facility on the Cutter Aviation leasehold. The locations depicted for the CBP facilities are intended to only represent that the cost of CBP services will be burdened by one of the two FBOs. The actual location of where the building would be constructed would likely be different than what is depicted in the two alternatives.



Customs and Border Protection Alternatives

Figure 5-11

5.5 On-Airport Land Use Development Alternatives

The On-Airport Land Use Development Alternatives present three opportunities for defining the future land use for vacant on-airport land. The alternatives identify potential locations for accommodating general aviation, corporate aviation, aviation support services, and aviation business park uses. A separate market study, the *DVT Real Estate Development Strategy*, was conducted in December 2012 to review opportunities to cultivate additional sources of revenue through the strategic development of DVT's vacant parcels. The purpose of the market study was to identify potential revenue streams from the vacant parcels, while the Master Plan's objective is to comprehensively review all of DVT's needs and protect space for development in appropriate areas. The market study was reviewed as part of this task and some of the recommendations were carried through the land use development alternatives. The market study identified solar farm development as a non-permanent use for the northeast parcel. This use was not carried through the Land Use Alternatives, because it was not determined to be a long-term strategy. A solar farm could be developed as an interim use but would require a detailed cost-benefit review to confirm the short-term financial benefits versus the cost of interim development. The potential glare impacts would also need to be assessed to confirm the location proposed in the market study would not impact the ATCT or pilots' view of the airfield.

The On-Airport Land Use Development Alternatives identify four major functional areas of development. The specific layouts of facilities, including supporting landside and airside access infrastructure (e.g. roads and taxiways), within the areas will be determined as facilities are designed and constructed. Proposed roadway access for sites on the north side of the airfield is described within each On-Airport Land Use Development Alternative. The four functional development areas identified are as follows:

General Aviation: General aviation uses include aircraft parking hangars and tie-down areas, flight schools, helicopter areas, and pilot services such as a terminal or pilot's lounge.

Corporate Aviation: Corporate aviation uses include FBO facilities and corporate box hangar development.

Aviation Support: Aviation support services include facilities that would support general aviation pilots at DVT such as propeller or paint shops and avionics repair. These are facilities which were frequently requested in the DVT pilot's user survey.

Aviation Business Park: Aviation business park uses include development of aviation related business facilities and business or industrial airpark. Facilities may include aircraft hangar and ramp space with direct taxiway access. Development be undertaken by a large single-purpose user or a third-party developer accommodating multiple smaller scale businesses.

All alternatives maintain the southeast parcel for future corporate aviation development and depict the maximum airfield development to preserve the space although no preferred airfield development option has been selected. The previous Master Plan also reserved a 150-foot wide easement to protect taxiway access to property north of the airport property line adjacent to Pinnacle Peak Road, allowing for future through-the-fence access to DVT. This easement was carried through the alternatives but the need for the easement is lessened by current FAA guidelines discouraging through-the-fence agreements and the excess vacant airport parcels located on the north side of the airfield that provide opportunities for businesses who desire to maintain aircraft and have access to the airfield.

The On-Airport Land Use Development Alternatives were created with the overall development objectives presented in Section 5.1.2 in mind and specifically address the desire to balance the utilization of the airfield. The land use plans do not indicate immediate development or relocation of facilities, but designate the areas where facilities would be developed as the need arises. The recommended Land Use Development Plan may include a hybrid of the alternatives described below.

5.5.1 Land Use Alternative 1

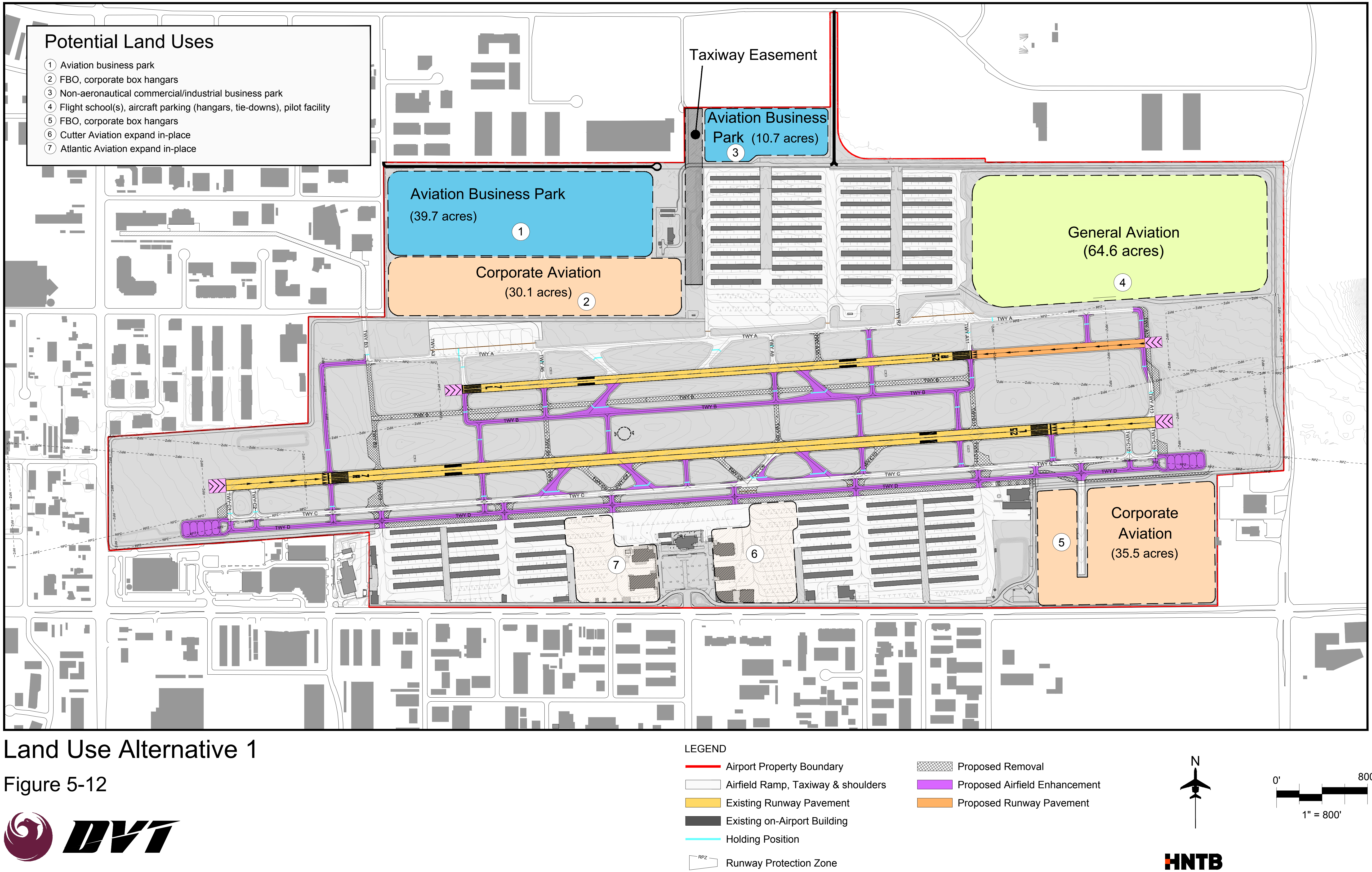
Land Use Alternative 1 (**Figure 5-12**) maintains approximately 40 acres of aviation commercial and industrial business park land uses in the northwest parcel along with the 10.7 acre area north of Airport Boulevard, as proposed in the DVT market study. The south 30 acre portion of the northwest parcel is reserved for corporate aviation uses. The northeast 64.6 acre parcel would be dedicated to general aviation development including aircraft hangar and tie-down parking expansion and a pilot's lounge. The flight schools would be relocated to the northeast general aviation site allowing the existing FBOs to expand in place. North side non-secure access would be provided to the aviation business park development from Pinnacle Peak Road and 15th Avenue. This new access roadway would end past the development parcel and would not connect to airside facilities. Additional north side roadway access to the ATCT and north hangars would be provided by developing 3rd Avenue from Pinnacle Peak Road. Airside gates would be maintained at the ATCT and north hangar entrances. This alternative does not specify a specific area for aviation support or helicopter training.

The following is a summary of the advantages of this alternative:

- Maintains aviation business park uses recommended in the DVT market study
- Moves flight schools to the north side of the airfield to better balance the use of the north and south runways
- Allows the existing FBOs to expand their facilities
- Provides a pilot's lounge on the north side of the airfield to serve pilots of aircraft housed in the north side facilities
- Provides north side roadway access from Pinnacle Peak Road

The following is a summary of the disadvantages of this alternative:

- Does not provide a designated space for aviation support uses
- Does not provide a designated space for helicopter training



Land Use Alternative 1

Figure 5-12

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5.5.2 Land Use Alternative 2

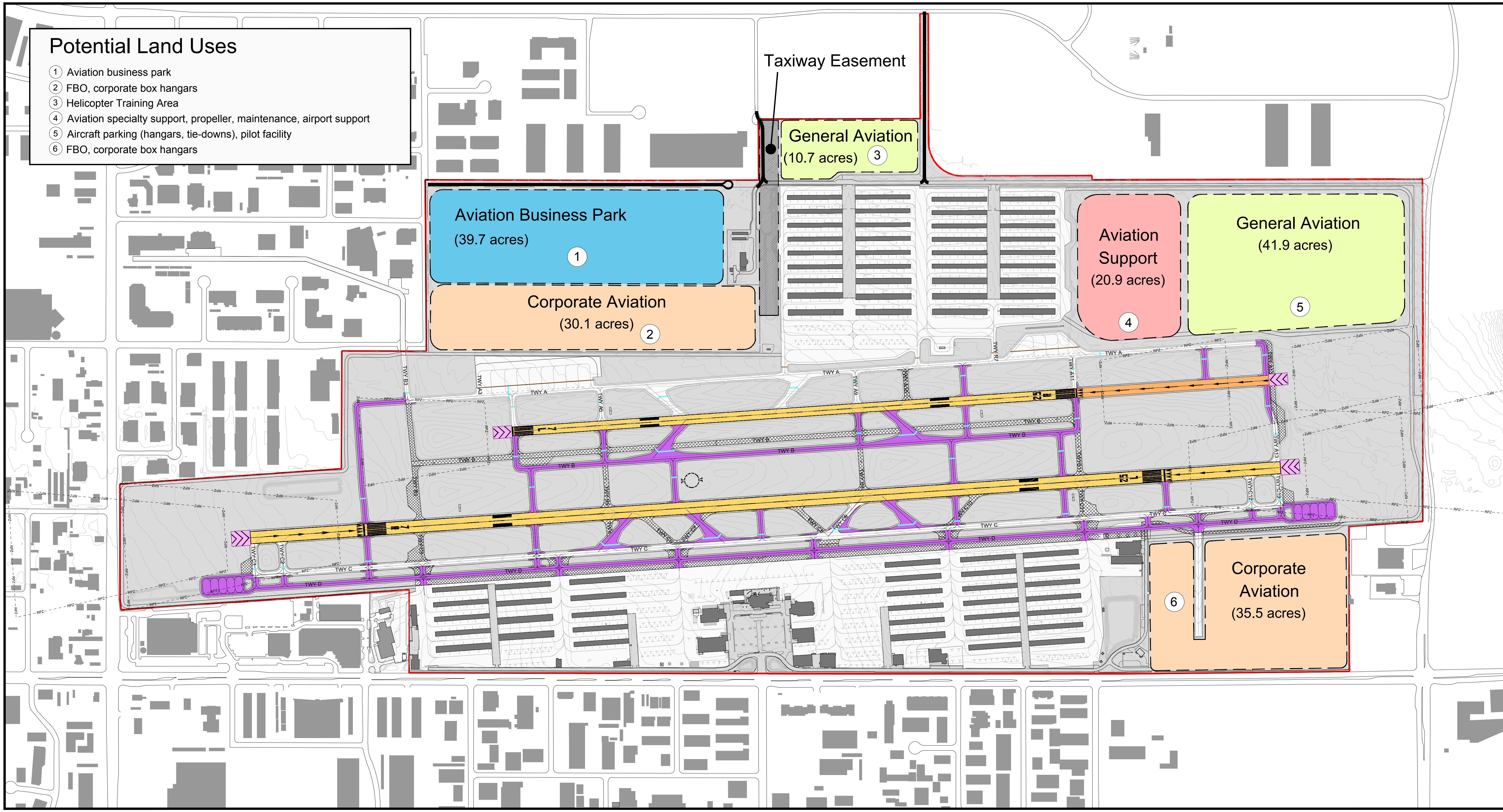
Land Use Alternative 2 (**Figure 5-13**) retains the aviation business park and corporate aviation uses on the northwest parcel as presented in Land Use Alternative 1, while designating approximately 21 acres of space for aviation support uses, such as a propeller or paint shop, and approximately 42 acres for future general aviation hangar and tie-down expansion on the northeast parcel. A pilot's lounge would also be located in this general aviation development. The 10.7 acre parcel north of Airport Boulevard is identified for general aviation uses and would be designated for helicopter pattern work allowing it to be separated from other airfield operations increasing the safety of the airfield. Under this alternative flight schools would remain on the south side of the airfield and the existing FBO's would maintain their current configurations. North side non-secure access would be provided to the aviation business park development from Pinnacle Peak Road and 15th Avenue. This new access roadway would end past the development parcel and would not connect to airside facilities. Additional north side roadway access to the north hangars would be provided by developing 3rd Avenue from Pinnacle Peak Road. In addition, 7th Avenue would be extended to Airport Boulevard providing access to the ATCT and north hangar facilities. Airside gates would be maintained at the ATCT and north hangar entrances.

The following is a summary of the advantages of this alternative:

- Maintains aviation business park uses recommended in the DVT market study
- Provides a pilot's lounge on the north side of the airfield to serve pilots of aircraft housed in the north side facilities
- Provides a designated space for aviation support uses
- Provides a designated space for helicopter training
- Provides north side roadway access from Pinnacle Peak Road

The following is a summary of the disadvantages of this alternative:

- Does not move flight schools to the north side of the airfield maintaining the current imbalance of operations on the south runway
- Does not provide additional space for the existing FBO's to expand in place



Land Use Alternative 2

Figure 5-13

LEGEND

- Airport Property Boundary
- Airfield Ramp, Taxiway & shoulders
- Existing Runway Pavement
- Existing on-Airport Building
- Holding Position
- Runway Protection Zone
- Proposed Removal
- Proposed Airfield Enhancement
- Proposed Runway Pavement

N

0' 800'

1" = 800'

DVT

HNTB

5.5.3 Land Use Alternative 3

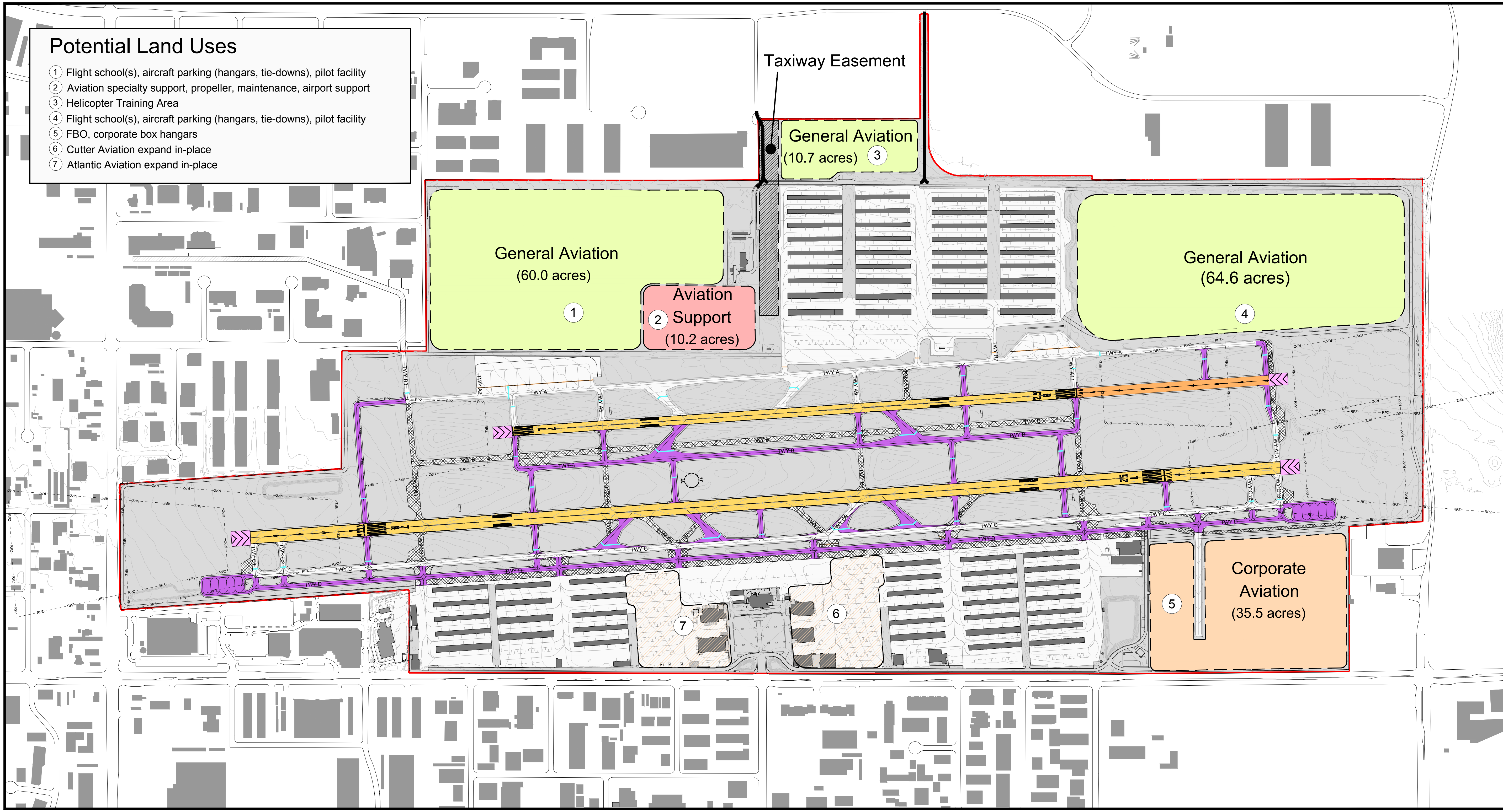
Land Use Alternative 3 (**Figure 5-14**) expands general aviation uses to all parcels on the north. A 60 acre northwest parcel and a 64.6 acre parcel on the northeast would provide space for future general aviation hangar and tie-down expansion. The flight schools would be relocated to the northeast and / or northwest general aviation sites allowing the existing FBOs to expand in place. A pilot's lounge would be located within one of these general aviation development parcels. The 10.7 acre parcel north of Airport Boulevard is identified for general aviation uses and would be designated for helicopter pattern work allowing it to be separated from other airfield operations increasing the safety of the airfield. A 10.2 acre space would be carved out of the northwest general aviation and designated for aviation support uses, such as a propeller or paint shop. North side roadway access to the expanded northeast hangars and flight schools would be provided by developing 3rd Avenue from Pinnacle Peak Road. In addition, 7th Avenue would be extended to Airport Boulevard providing access to the ATCT and northwest hangar and flight school facilities. Airside gates would be maintained at the ATCT and north hangar entrances.

The following is a summary of the advantages of this alternative:

- Moves flight schools to the north side of the airfield to better balance the use of the north and south runways
- Allows the existing FBOs to expand their facilities
- Provides a pilot's lounge on the north side of the airfield to serve pilots of aircraft housed in the north side facilities
- Provides a designated space for aviation support uses
- Provides a designated space for helicopter training
- Provides north side roadway access from Pinnacle Peak Road

The following is a summary of the disadvantages of this alternative:

- Does not maintain aviation business park uses recommended in the DVT market study



Land Use Alternative 3

Figure 5-14

DVT

HNTB

6.0 Recommended Master Plan Concept

6.1 Introduction

The evaluation and ranking of the various airport improvement alternatives is based on how well each alternative meets the specific criteria and project goals set by the TAC and PAC members and Aviation Department staff. The primary goals, as identified in this Master Plan, are to:

- Improve safety
- Enhance operational efficiency
- Right-size the development at DVT
- Meet current FAA airport design standards
- Accommodate forecast demand at a high level of service
- Balance the utilization of the airfield (north and south)
- Implement financially responsible development

6.2 Alternatives Evaluation

Each of the alternatives presented in Chapter 5, Airport Alternatives, were evaluated against the Master Plan goals presented in the previous section. This section summarizes the evaluation process for the airside improvements, support facilities, and on-airport land use. Proposed off-airport land use is discussed in Chapter 4, Off-Airport Land Use and Zoning. Each set of alternatives is compared to the overarching goals of the Master Plan. The evaluation also takes into account comments and feedback received from workshops with the TAC, PAC, general public, and Aviation Department staff.

6.2.1 Airside Alternatives

This section evaluates and ranks each of the airside alternatives depicted previously in Section 5.3. Each airfield alternative, with the exception of the No Build Alternative, builds upon Airfield Alternative 1, Taxiway Geometry Enhancements. The overall improvements in this alternative are needed to correct DVT's non-standard geometry and resolve the two Hot Spots discussed in Section 3.4.3.1. **Table 6-1** summarizes how each airfield alternative compares against the Master Plan Goals. If an alternative meets a goal, it is awarded "1", and if it does not meet a goal it is awarded "0". As shown in **Table 6-1** and further described below, Airfield Alternative 4 ranks highest among the airfield alternatives.

The base geometry improvements in Airfield Alternative 1 also improve airfield safety. The two existing Hot Spots are mitigated by the relocation of Taxiway B and the modified alignments of Taxiways B5/C5 and B9/C9. The non-standard geometry intersections are also improved as each alternative proposes to reduce the wide taxiway throats leading to/from the ramp and eliminate the complex intersections south of Runway 7R-25L.

Table 6-1: Airfield Alternatives Evaluation Matrix

Criteria	No Build	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Right-Sizes DVT	0	1	1	1	1	1
Meets Design Standards	0	1	1	1	1	1
Improves Safety	0	1	1	1	1	1
Enhances Operational Efficiency	0	0	1	1	1	1
Accommodates Forecast Demand	0	0	0	0	1	1
Balances the Airfield	0	0	0	0	1	1
Financially Responsible	1	1	1	1	1	0
Evaluation	**0**	**4**	**5**	**5**	**7**	**6**

Source: HNTB Analysis

Airfield Alternatives 2 through 5 further enhance safety at DVT by identifying a solution to relocating the runway holdbars south of Runway 7R-25L to their standard separation of 250 feet south of the runway's centerline. A full or partial-length Taxiway D, as proposed in Alternatives 2 and 3, respectively, and carried forward to Alternatives 4 and 5, provides a comprehensive solution for relocating the holdbars south of Runway 7R-25L to their standard location because a second parallel taxiway enables the segregation of aircraft allowing departing and arriving aircraft to operate on separate taxiways. Arriving aircraft could taxi directly onto Taxiway C without risk of a head-to-head conflict with an aircraft taxiing to departure and aircraft would no longer need to hold short of Taxiway C upon arrival to avoid other taxiing aircraft. This will reduce ATC's workload and improve pilot and controller situational awareness. Airfield Alternative 1 does not adequately address the impacts caused by the holdbar relocation, potentially causing a hazardous condition when they are relocated.

Airfield Alternatives 2 through 5 significantly enhance operational efficiency with the addition of Taxiway D. In addition to the safety benefits gained from enabling the relocation of holdbars as described above, dual parallel taxiways provide needed flexibility on the south side of the airfield where the majority of active tenants are located. Taxiways C and D can be operated to segregate arrivals and departures, or east and westbound traffic on different taxiways, which results in enhanced ATC management of the airfield. Each of the "build" airfield alternatives also propose to relocate the acute angle exit taxiways connecting Runway 7R-25L with Taxiway C to accommodate a larger percentage of the propeller-driven and jet fleet. The acute angle exit taxiways allow aircraft to exit the runway at a higher speed, which reduces runway occupancy time and ultimately increases airfield capacity. New acute angle exit taxiways connecting Runway 7L-25R with Taxiway B are also proposed in each of the "build" alternatives. These proposed acute angle taxiways are intended to accommodate approximately 100% of the propeller-driven fleet landing on the runway.

Airfield Alternatives 4 and 5 are the only alternatives that adequately accommodate forecast demand and balance the airfield by providing an extension of Runway 7L-25R. The extension of Runway 7L-25R to a length over 5,000 feet enables jet aircraft to use the north runway and provides an additional margin of safety allowing 100% of the propeller-driven fleet to use the runway. Providing the ability to accommodate all propeller and most jet aircraft on either runway will allow operations on the airfield to be better balanced. Currently, the majority of operations utilize the south runway for takeoffs and landings because of its length. As discussed in Chapter 5, Airport Alternatives, the extension proposed in Airfield Alternative 5 requires the mitigation of several hills east of DVT in order to use the full length of pavement for departures to the east. The longer extension proposed in Airfield Alternative 5 is not currently considered financially viable due to the potential cost of mitigation at this time. It is recommended, however, to mitigate the hills east of DVT as the opportunities arise in order to provide additional safety to air navigation. Once the hills and their associated obstructions are removed, the displaced thresholds for both runways can also be reevaluated.

Airfield Alternative 4 – 800 Foot Extension of Runway 7L-25R scores highest against the evaluation criteria amongst the airfield alternatives and due to the reasons cited above was the Recommended Airfield Alternative brought forward in the Recommended Alternative. The longer runway extension proposed in Airfield Alternative 5 is not precluded by the selected alternative and could be a longer-term (post 2033) recommendation brought forward in the next update of the Master Plan.

6.2.2 Compass Calibration Pad

From the goals presented in Section 6.1, only three: *Meets Design Standards, Accommodates Forecast Demand* and *Implements Financially Responsible Development*, are applicable for evaluating the proposed compass calibration pad alternative locations described in Section 5.4.1. **Table 6-2** summarizes how each compass calibration pad alternative compares against the Master Plan Goals.

Table 6-2: Compass Calibration Pad Evaluation Matrix

Criteria	No Build	Alt 1	Alt 2	Alt 3
Right-Sizes DVT			*Not applicable*	
Meets Design Standards	0	1*	1	1
Improves Safety			*Not applicable*	
Enhances Operational Efficiency			*Not applicable*	
Accommodates Forecast Demand	0	1	1	1
Balances the Airfield			*Not applicable*	
Financially Responsible	1	1	0	0
Evaluation	**1**	**3**	**2**	**2**

Source: HNTB Analysis

Note: *Meets general design standards but may not fully meet the magnetic interference requirements presented in AC 150/5300-13A and as a result may be inoperable during periods where the run-up area is occupied due to magnetic interference.

Compass Calibration Pad Alternative 1 proposed on the northwest run-up apron, best matches the evaluation criteria, meeting design standards for a compass calibration pad and utilizing existing pavement, which reduces the need for extensive pavement construction on the airfield. This makes Alternative 1 much more financially responsible. While all three options meet general design standards, it should be noted that Alternative 1 may not fully meet the magnetic interference requirements presented in AC 150/5300-13A and as a result may be inoperable during periods where the run-up area is occupied due to magnetic interference. It was determined that the cost considerations outweighed the potential short-term periods of inoperability and Compass Calibration Pad Alternative 1 was recommended to be brought forward in the Recommended Alternative.

6.2.3 IFR Hold Bays

With the selection of Airfield Alternative 4 as the recommended airfield development alternative, the need for separate IFR hold bays is eliminated because of the sequencing benefits provided by proposed full-length parallel Taxiway D. It is not uncommon for IFR aircraft to be given a departure time 10 to 30 minutes after taxiing out from the ramp and today these aircraft sometimes block Taxiway C when waiting for their call for release. Both IFR hold bay alternatives identified a location that requires extensive travel time to reach one or both ends of the runway, which can impact an IFR aircraft's slotted departure time. However, new parallel Taxiway D, as proposed in the recommended airfield alternative, will allow aircraft to bypass each other, meeting the dynamic needs of ATC and allowing these IFR aircraft to hold close to the end of the runway while waiting for ATC clearance. In addition, aircraft leaving the FBOs on the south side of the airfield generally hold on the FBO's ramp until called for IFR release. As a result no IFR hold bay was recommended to be carried forward in the Recommended Alternative.

6.2.4 Public Safety Building

The development of Taxiway D in the selected Airfield Alternative 4 – 800 Foot Extension of Runway 7L-25R impacts the existing Police Air Support Unit apron and hangars. The facility is also old and in disrepair. As a result when Taxiway D is constructed a relocation of the facility will be required. **Table 6-3** summarizes how each public safety building alternative (alternatives described in Section 5.4.3) compares against the Master Plan Goals.

Table 6-3: Public Safety Building Evaluation Matrix

Criteria	No Build	Alt 1	Alt 2	Alt 3
Right-Sizes DVT	*Not applicable*			
Meets Design Standards	0	1	1	1
Improves Safety	0	1	1	1
Enhances Operational Efficiency	0	1	1	1
Accommodates Forecast Demand	0	1	1	1
Balances the Airfield	*Not applicable*			
Financially Responsible	1	0	0	0
Evaluation	**1**	**4**	**4**	**4**

Source: HNTB Analysis

Each alternative was located on the south side of DVT to keep the existing helicopter response times to the Downtown Phoenix area and to avoid conflict with the airspace that would be caused by crossing the runways to respond to the south (the most common response direction) if the facility was located on the north. All alternatives scored the same against the Master Plan Goals, shown in **Table 6-3**, and were also evaluated to determine any impacts to the existing drainage retention basin or future revenue generating development and proximity to the fence line along Deer Valley Road which will facilitate faster landside fire and emergency response.

Public Safety Building Alternative 1 is located along the fence line on the south side of the airfield; however, its location interferes with the long planned corporate aviation development in the southeast corner of airport property which would impact revenue generating development. Public Safety Building Alternative 2 is also located along the fence line on the south side of the airfield and does not impact the future corporate aviation area. It does displace one existing shade hangar building, one t-hangar building, and 18 aircraft tie-down parking positions. Public Safety Building Alternative 3 is not located along the fence line, but is located on the south side of the airfield. Being located further away from the fence line provides the Police Air Support Unit with unimpeded access to the runways; however, it increases the response time for landside fire response. The combined facility would also have some impact to the future corporate aviation area which would impact revenue generating development. Based on the evaluation criteria and feedback from stakeholders, Public Safety Building Alternative 2 was selected as the preferred location and carried forward in the Recommended Alternative (shown on **Figure 6-2**).

6.3 On-Airport Land Use

Each of the three on-airport land use alternatives (described in Section 5.5) preserve the Corporate Aviation area in the southeast corner of airport property but vary in the location of general aviation facilities and the location and accommodation of flight schools, aviation support uses and aviation business park areas. The overall evaluation of the three on-airport land use plans is provided in the matrix on **Table 6-4**. The biggest differentiators in the evaluation was the limited ability of Alternative 2 to balance the airfield as flight schools remained on the south side and the limited revenue potential gained from Alternative 3 which did not maintain the DVT 2012 Market Study recommendation for an aviation business park. In addition, Alternative 1 did not provide dedicated space for the aviation support facilities (e.g. paint shop, avionics) that users have requested.

Table 6-4: On-Airport Land Use Evaluation Matrix

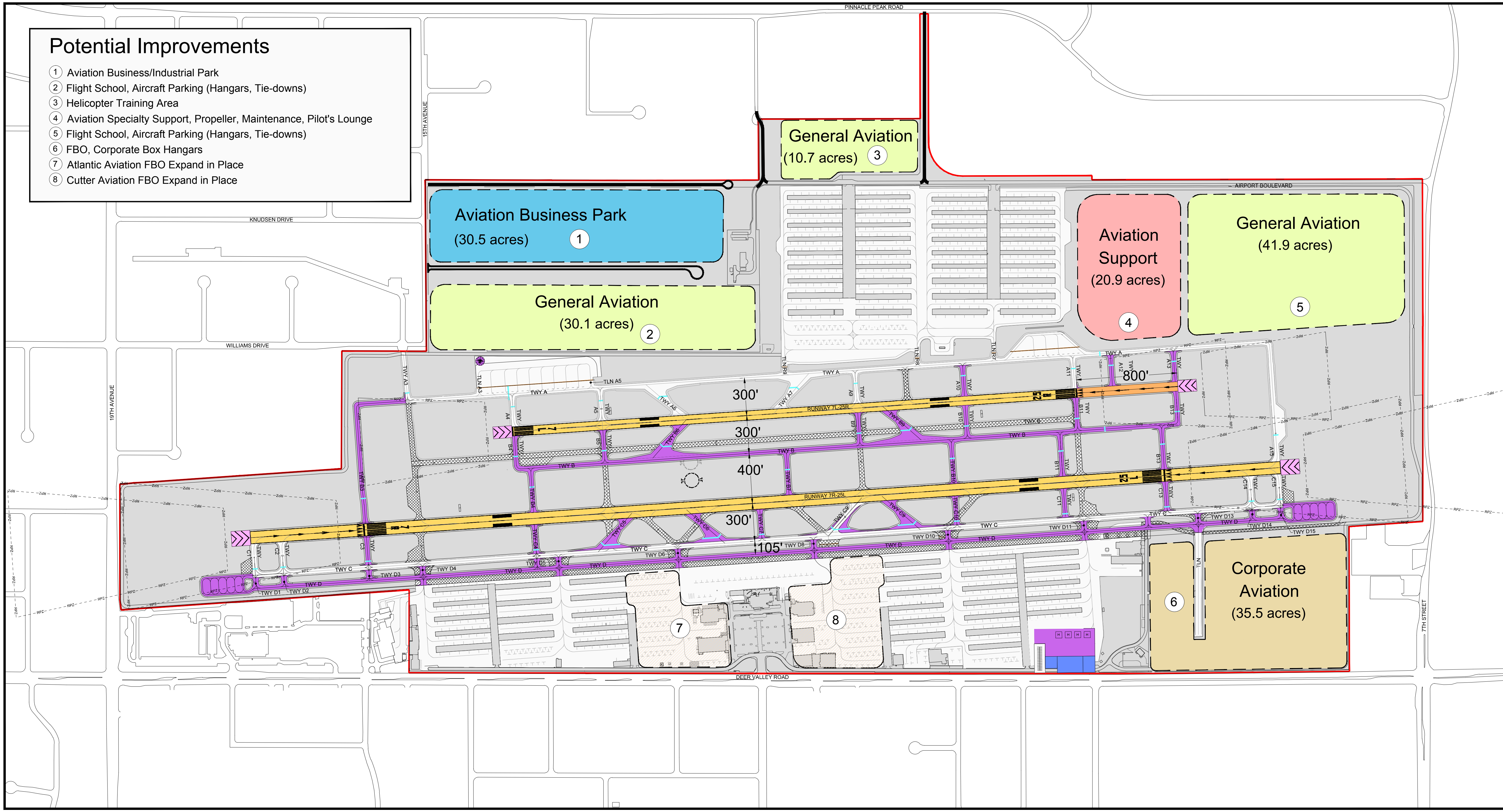
Criteria	Alt 1	Alt 2	Alt 3
Right-Sizes DVT	1	1	1
Meets Design Standards	1	1	1
Improves Safety	1	1	1
Enhances Operational Efficiency	1	1	1
Accommodates Forecast Demand	1	1	1
Balances the Airfield	1	0	1
Financially Responsible	1	1	0
Evaluation	**7**	**6**	**6**

Source: HNTB Analysis

As the alternatives were presented to Aviation Department Staff and the TAC and PAC members, many of the stakeholders recommended a refined land use alternative, combining elements from each of the three land use alternatives. There was a desire to maintain an area for multiple- or single-use revenue generating development, designated as the aviation business park, for a third-party developer that might have synergies with the north air park. It was also recommended that a helicopter training area be provided in the parcel north of the north t-hangars and that an area for aviation support and the eventual relocation of the flight schools also be provided. The refined land use alternative was unanimously selected as the recommended on-airport land use plan presented in **Figure 6-1**. The recommended on-airport land use plan does not indicate immediate development or relocation of facilities but designates the areas where facilities would be developed as the need arises.

The plan recommends maintaining the 35.5 acre corporate aviation area in the southeastern quadrant of DVT. This site has been graded and some infrastructure has already been constructed, including a taxilane, roadway, and some utility tie-ins. The recommended on-airport land use plan splits general aviation development and aviation support facilities on the northeast corner of the airfield. The aviation support areas (20.9 acres) would provide space for development of aviation specialty support businesses, propeller shop, maintenance hangar, paint shop, and a small pilot's lounge. The east general aviation area (41.9 acres) includes areas for flight schools (new or relocated from the south side), t-hangars, and aircraft tie-down parking positions.

Another general aviation area (10.7 acres) is preserved north of the north side t-hangars. On an interim basis this this area is intended to serve as a training area for locally-based and transient helicopters to perform touch and go operations. The area has a clear line of sight to the ATCT, is within the normal fixed wing traffic pattern, and is unlikely to have adverse noise impacts. The northwest corner is split between general aviation uses on the south portion directly adjacent to the airfield and aviation business park uses on the north portion. The general aviation area (30.1 acres) would reserve space for a flight school (new or relocated from the south side), t-hangars, and aircraft tie-down parking positions.



Recommended On-Airport Land Use Plan

Figure 6-1

LEGEND

- Airport Property Boundary
- Airfield Ramp, Taxiway & shoulders
- Existing Runway Pavement
- Existing on-Airport Building
- Holding Position
- Runway Protection Zone
- Proposed Removal
- Proposed Airfield Enhancement
- Proposed Runway Pavement

N

0' 800'

1" = 800'

DVT

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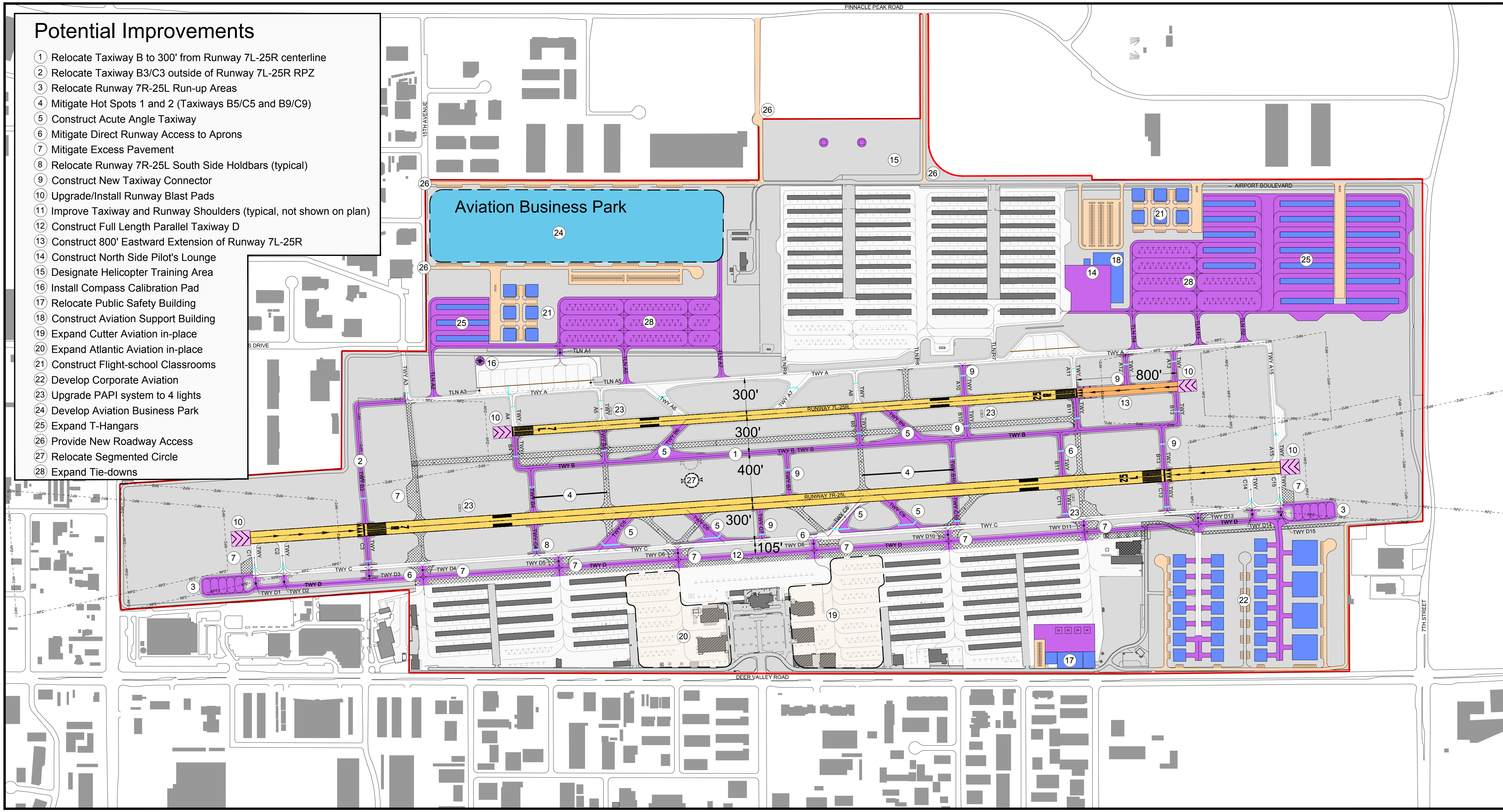
The aviation business park (30.5 acres) includes the development of aviation related business facilities and business or industrial airpark. Facilities may include aircraft hangar and ramp space with direct taxiway access. Development may be undertaken by a large single-purpose user or a third-party developer accommodating multiple smaller scale businesses. If in the future the aviation business park needs to expand the small north general aviation area currently recommended as a helicopter training area for helicopters could be re-purposed.

The recommended on-airport land use plan also includes areas for expansions of the two existing FBOs on the south side of DVT property once one or both of the flight schools, which sublease their facilities from the FBOs, relocate to the north side of DVT. North side non-secure access would be provided to the aviation business park development from Pinnacle Peak Road and 15th Avenue. This new access roadway would end past the development parcel and would not connect to airside facilities. Additional north side roadway access to the north hangars would be provided by developing the 3rd Avenue right-of-way from Pinnacle Peak Road. In addition, 7th Avenue would be extended to Airport Boulevard providing access to the ATCT and north hangar facilities. Airside gates would be maintained at the ATCT and north hangar entrances. The 150-foot wide easement along 7th Avenue which was previously provided for future through-the-fence access is not recommended to be maintained under current FAA guidelines which discourage through-the-fence agreements. However, the no development is currently identified along this easement in the recommended on-airport land use plan.

6.4 Master Plan Recommended Alternative

DVT's Master Plan Recommended Alternative, presented in **Figure 6-2**, meets DVT's facility needs through 2033. The major development project within this Master Plan's horizon is the implementation of the airfield geometry improvements, addition of a second parallel Taxiway D south of Runway 7R-25L, relocation and reconstruction of Taxiway B, and 800 foot extension of Runway 7L-25R. The land-use development recommended in this plan also meets the 2033 facility requirements. It is important to note that the layout of proposed land-use facilities (e.g. general aviation or corporate hangars, tie-downs, buildings, ramp taxilanes) is shown as one potential configuration. However, the actual configuration of such facilities will likely be different, depending heavily on market conditions and how tenants develop individual parcels.



Master Plan Recommended Alternative

Figure 6-2

LEGEND

- Airport Property Boundary
- Airfield Ramp, Taxiway & Shoulder
- Existing Runway Pavement
- Existing on-Airport Building
- Holding Position
- Runway Protection Zone
- Proposed Expansion In-place
- Proposed Removal
- Proposed Airfield Pavement
- Proposed Runway Pavement
- Proposed Building
- Proposed Roadway/Parking

N

0' 800'

1" = 800'

DVT

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6.4.1 Description of Projects

Each of the projects included in the Master Plan Recommended Alternative are identified with a numbered tag. The description along with the purpose and function of each project are explained below:

1. **Relocate Taxiway B to 300 feet from Runway 7L-25R Centerline:** Similar to the Taxiway A relocation program, which moved and reconstructed Taxiway A from 200 feet to 300 feet north of Runway 7L-25R's centerline, the relocation and reconstruction of Taxiway B is needed for Runway 7L-25R to meet ARC B-II design standards. While the future RDC for Runway 7L-25R is B-II, and the required runway to taxiway design standard separation is a minimum of 240 feet, relocating Taxiway B to the RDC D-II standard of 300 feet from the runway centerline allows full redundancy in case of an incident on Runway 7R-25L.

2. **Relocate Taxiway B3/C3 Outside of the Runway 7L-25R RPZ:** Existing Taxiway B3 serves as a north-south taxi route connecting the Northwest Industrial Airpark with Runway 7R-25L. Taxiway B3, while not officially recognized as an FAA hot spot, has geomtery similar to Taxiways B5 and B9 such that aircraft have the potential to miss runway holdbars due to an extended straight through taxi route. The Recommended Alternative relocates Taxiway B3 to the west outside of the Runway 7L arrival RPZ. When Taxiway B3 is shifted further to the west, it will be located outside and underneath all critical safety surfaces including the Runway 25R TERPS Departure Surface, Runway 7L Threshold Siting Surface, Runway 7L Part 77 Approach Surface, RSA, ROFA, and RPZ. The relocation improves pilot situational awareness as aircraft originating from the Northwest Industrial Airpark would have to make a turn onto Taxiway A, prior to turning south on the relocated Taxiway B3.

3. **Relocate Runway 7R-25L Run-up Areas:** The existing run-up areas for Runway 7R-25L are located inside of the RSA and conflict with future plans to relocate the runway holdbars south of Runway 7R-25L to their design-standard separation. Additionally, the existing run-up areas do not accommodate existing demand due to their limited size as the two flight schools often depart multiple aircraft from their ramps resulting in departure queues of up to 15 aircraft at the end of the runway. The proposed run-up areas located at each end of Runway 7R-25L accommodate 6 ADG-I aircraft positions each, and provide enhanced sequencing ability by having a dedicated entrance and exit taxilane while also allowing aircraft to bypass other aircraft without conflict. The relocated run-up areas are located beyond the ends of the runway and allow aircraft that are ready to depart the ability to bypass the aircraft in the run-up area without having to take an intersection departure.

   The two proposed run-up areas were also reviewed to assess their impact on existing airspace procedures. Since DVT, similar to most airports, lands and departs aircraft in the same direction as the prevailing wind, there isn't a need to assess the impacts of the TERPS Departure Surface on the two run-up areas. Aircraft that are performing their run-up will be on the approach end of the runway, and the TERPS Departure Surface is effective for the departure end of the runway. Due to the displaced arrivals thresholds on each end of the runway, the threshold siting surfaces are clear of the maximum expected tail height at each run-up position. The Part 77 approach and transitional surfaces were also analyzed to determine if there were any penetrations. The Part 77 approach surface on both ends of Runway 7R-25L is clear of penetrations. The Part 77 transitional surface is penetrated by 1 foot on the Runway 7R end under the assumption that the run-up area is at the same elevation as the Runway 7R end and that the tail height of an aircraft in the first run-up position is 20 feet (the maximum ADG-I tail height). The Part 77 transitional surface is also penetrated by 2.5 feet on the Runway 25L end under the assumption that the run-up area is at the same elevation as the Runway 25L end and that the tail height of an aircraft in the first run-up position is 20 feet (the maximum ADG-I tail height). In reality, the majority of ADG-I aircraft have tail heights below 20 feet. Additionally, it is likely that designed grades could be adjusted such that the run-up aprons are lower than the runway ends.

4. **Mitigate Hot Spots 1 and 2 (Taxiways B5/C5 and B9/C9):** To address the FAA-identified hot spots, the Master Plan Recommended Alternative proposes to eliminate the straight through taxi paths that currently exist on Taxiways B5 and B9 and require aircraft to make a turn onto Taxiway B in order to cross to the north or south. Requiring an aircraft to make a turn onto Taxiway B enhances pilot and controller situational awareness as it provides more visual cues for pilots to understand their location on the airfield. This reduces the risk of a pilot missing runway holdbars and causing an incursion in these two locations. Additionally, existing Taxiway B9 is proposed to be relocated so that it will no longer be a crossing point located in the "high-energy" middle third of the runway.

5. **Construct Acute Angle Taxiways:** There are five new / relocated and one enhanced existing acute angle taxiway connectors proposed under the Master Plan Recommended Alternative. Acute angle taxiways are needed in order to minimize runway occupancy time so that minimum in-trail arrival separations can be maintained which optimizes the capacity of the airfield. Existing acute angle taxiway connectors C6 and C7 meet in a closed "V" intersection and also both directly feed into the ramp entrance. In order to remedy these non-standard geometries, the Recommended Alternative proposes to relocate both acute angle taxiway connectors to the east and west. The Recommended Alternative also proposes to reconfigure acute angle taxiway connectors C8 and C9 to better accommodate a larger share of the fleet mix. Westbound acute angle Taxiway C9 would remain in its current location, however, its fillet would be widened to meet current design standards. Taxiway C9 will continue to accommodate the majority of the propeller-driven fleet. The eastbound acute angle Taxiway C8 would be relocated

approximately 800 feet east of its existing location. Two new acute angle taxiway connectors are proposed connecting Runway 7L-25R with Taxiway B. These two taxiways will be able to accommodate the majority of the propeller driven fleet.

6. **Mitigate Direct Runway Access to Aprons:** There are three existing taxiways that lead directly from the ramp to a runway. In order to prevent loss of pilot situational awareness, ramp entrances that previously led directly to a runway will now require the pilot to make a conscious turn onto a taxiway prior to encountering a runway. The relocation of Taxiway B3/C3 moves the intersection with Taxiway C west of Taxilane R1. Ramp entrance Taxilane R4 is proposed to be relocated to the west to avoid direct ramp entrances from aircraft coming off of an acute angle taxiway. Taxiway B11/C11 is also realigned to the west to avoid a double runway crossing leading from the northeast run-up area across both runways and into Taxilane R6.

7. **Mitigate Excess Pavement:** Excess pavement will be removed, or marked unusable, to the extent practicable once other geometry improvements are completed. The six taxiway entrances to/from the southside aprons all have taxiway widths that exceed FAA design standards and can cause signs to be located outside of a pilot's peripheral vision resulting in a loss of pilot situational awareness. Instead of demolishing the extra pavement width and its associated fillets, the extra pavement could be painted to identify it as shoulder pavement, while still being able to accommodate the occasional ADG-III aircraft which requires wider pavement. The exiting run-up aprons should be demolished to avoid having extra pavement inside of the RSA.

8. **Relocate Runway 7R-25L South Side Holdbars:** The existing holdbars south of Runway 7R-25L do not meet current FAA separation standards. The holdbars are located 150 feet south of the Runway 7R-25L centerline, but the required separation is 250 feet south of runway centerline. In addition to surface painted markings, it is recommended that each taxiway connecting to Runway 7R-25L include in-pavement and elevated runway guard lights to further enhance situational awareness and warn pilots that they are approaching a runway. This project requires the implementation of Taxiway D as an enabling project.

9. **Construct New Taxiway Connectors:** Several new taxiway connectors are needed to provide efficient airfield access. New taxiway connectors are proposed to provide a new runway crossing opportunity near the east end of Taxiway B. A Runway 25R entrance taxiway is proposed to serve the future extension of Runway 7L-25R by providing an opportunity for intersection departures or to facilitate the rapid exit of an aircraft that aborts its departure. Additional Runways 7L-25R and 7R-25L 90 degree taxiway exits are included to reduce runway occupancy time.

10. **Upgrade/Install Runway Blast Pads:** The existing runway blast pads for Runway 7R-25L do not meet existing design standards. The Master Plan Recommended Alternative proposes to widen the Runway 7R-25L blast pads by 20 feet to 120 feet and add 95 feet wide by 150 feet long blast pads to Runway 7L-25R, which currently does not have them, in order to meet B-II design standards.

11. **Improve Taxiway and Runway Shoulders:** Runway 7R-25L, as well as many of the taxiways on the south side of the airfield, does not have shoulders. To meet standards, it is proposed that 10 foot shoulders be added to Runway 7R-25L during its next major rehabilitation and 15 foot shoulders be incorporated into the design of all new taxiways on the south side of the airfield.

12. **Construct Full Length Parallel Taxiway D:** A new full length parallel taxiway, denoted as Taxiway D, south of existing Taxiway C is included in the Master Plan Recommended Alternative. Taxiway D's centerline would be located 105 feet south of Taxiway C's centerline and meet the ADG-II design standards. Taxiway D provides a comprehensive solution for relocating the holdbars south of Runway 7R-25L to their standard location because a second parallel taxiway enables the segregation of aircraft allowing departing and arriving aircraft to operate on separate taxiways. The segregation of aircraft between taxiways would reduce ATC's workload and improve pilot and controller situational awareness, by allowing arriving aircraft to taxi directly onto Taxiway C without risk of a head-to-head conflict with an aircraft taxiing to departure and aircraft would no longer need to hold short of Taxiway C upon arrival to avoid other taxiing aircraft. Taxiway D impacts the first row of north facing t-hangar and shade hangar buildings west of the Terminal and south of Taxiway D as well as the Police Air Support Unit facility and some transient parking positions north of the Terminal.

13. **Construct 800 Foot Eastward Extension of Runway 7L-25R:** The Master Plan Recommended Alternative includes an extension of Runway 7L-25R 800 feet to the east for a total length of 5,300 feet. Chapter 3, Facility Requirements, reviewed DVT's runway length requirements for the next 20 years based on the projected fleet mix and concluded that airport operations would benefit from extending Runway 7L-25R to over 5,000 feet. Exceeding 5,000 feet will allow corporate aircraft to use the runway and provides the capability to better balance the utilization between two runways. An 800 foot extension of Runway 7L-25R maximizes the ability to use the additional runway length bi-directionally. The additional runway length would be used for departures and arrivals in east flow and departures in west flow. In discussions with DVT's tenants and users it was stated that due to the high number of student pilots making converging approaches it was preferred not to move the Runway 25R arrival threshold closer to the Runway 25L arrival threshold as a result of the proposed displaced threshold arrivals in west flow would not benefit from the added runway length. By not aligning the arrival thresholds, aircraft entering the pattern for Runway 25R will be at a higher

altitude than the aircraft entering the Runway 25L pattern, reducing the risk of inflight incident should one or both aircraft overshoot their final approach course. For departures to the east, the 800 foot extension is the maximum distance that does not cause the departure climb to exceed a 500 foot per nautical mile climb gradient over obstacles to the east of the runway.

14. **Construct North Side Pilot's Lounge:** Tenant and user surveys indicated a need for a small-scale pilot's lounge on the north side of the airfield. Currently, the only pilot's lounge available to the public is inside the Terminal on the south side. The new north side lounge would provide a small area for route planning as well as restrooms.

15. **Designate Helicopter Training Area:** Helicopter training is prevalent at DVT; however, ATC has had challenges managing helicopter training touch and go operations on the south side of the airfield given all of the activity located there. The DVT ATCT recommended that a helicopter training area be sited north of the north t-hangars so that helicopters could perform touch and go operations under direct line-of-sight from the ATCT while not disrupting other airfield operations.

16. **Install Compass Calibration Pad:** Prior to its reconstruction, DVT maintained a compass calibration pad located on the northwest run-up apron. A compass calibration pad enables pilots to calibrate their on-board magnetic compass by aligning their aircraft on known magnetic headings and making adjustments to the compass and/or placard markings to indicate the required corrections. Since the decommissioning of the former compass calibration pad, users have requested that this important air navigation function be restored at DVT and it was the most requested facility in the survey of DVT based pilots. The Master Plan Recommended Alternative proposes to locate the compass calibration pad on the northwest run-up apron. It is possible that this area may not fully meet the magnetic interference requirements presented in AC 150/5300-13A, but this location provides the most cost-effective and accessible solution of the alternatives that were reviewed.

17. **Relocate Public Safety Building:** The majority of the existing Police Air Support Unit apron falls within proposed Taxiway D's OFA and construction of the taxiway adjacent to the Runway 25L end will require the relocation of the Police Air Support Unit facility. In addition, the facility has exceeded its useful service life and will require reconstruction or significant rehabilitation in the future. The relocated Police Air Support Unit will also include space for a landside fire station at such time that City of Phoenix Fire Station 36, which has also exceeded its useful service life, is replaced. The fire station would be configured to provide direct airside and landside services to DVT and the community at large. A new traffic signal may be required along Deer Valley Road to serve the fire station.

18. **Construct Aviation Support Building:** Aviation support services were also frequently requested in the survey of DVT based pilots. Aviation support services include facilities that would support general aviation pilots at DVT such as propeller or paint shops and avionics repair. An area has been reserved adjacent to the north side pilot's lounge for a third party developer/tenant to construct such facilities. A large parking lot would also be included with the aviation support building to provide employee and customer parking for those and other adjacent north side facilities.

19. **Expand Cutter Aviation In-Place:** As aviation demand continues to grow, it is likely that the FBOs will expand to capitalize on the market. This specific expansion assumes that Cutter Aviation will expand their services to areas currently sub-leased to TransPac should TransPac relocate to the north side.

20. **Expand Atlantic Aviation In-Place:** As aviation demand continues to grow, it is likely that the FBOs will expand to capitalize on the market. This specific expansion assumes that Atlantic Aviation will expand their services to areas currently sub-leased to Westwind should Westwind relocate to the north side.

21. **Construct Flight School Classrooms:** As activity grows on the south side of the airfield and the FBOs expand business, it is assumed that the flight schools would eventually relocate to new facilities on the north side. This development may be through the existing FBOs or a new tenant on the north. Flight school classrooms are proposed to support the eventual relocation of both flight schools to the north side. The actual design and layout of the flight schools will be determined by the developer/tenant.

22. **Develop Corporate Aviation:** A corporate aviation development has been long planned for the southeastern corner of the airfield. DVT has already graded the site, provided utility stub-outs and constructed a taxilane and roadway to foster future development. The Master Plan Recommended Alternative includes a second taxilane connecting to Taxiway D and additional roadways with parking to serve the corporate hangars. The actual configuration of the corporate aviation facilities will be determined by the developer/tenant.

23. **Upgrade PAPI System to 4 Lights:** Each of DVT's four existing PAPI visual slope indicators are two light systems. Two light systems indicate whether a pilot is above or below the runway's glide path angle. A four light system conveys to pilots additional relative information about the glide path including whether the pilot is marginally above/below the glide path angle or substantially above/below the glide path angle. Four-light PAPIs enhance pilot situational awareness on an approach and increase overall safety. The Master Plan Recommended Alternative includes the replacement of DVT's two light PAPIs with four light PAPIs.

24. **Develop Aviation Business Park:** As discussed in Section 6.3, On-Airport Land use, the Master Plan Recommended Alternative includes an aviation business park which encompasses aviation related business facilities and business or industrial airpark. Facilities may include aircraft hangar and ramp space with direct taxiway access. Development may be undertaken by a large single-purpose user or a third-party developer accommodating multiple smaller scale businesses. The actual configuration of the aviation business park facilities will be determined by the developer/tenant.

25. **Expand T-Hangars:** The expansion of t-hangars is needed to meet DVT's forecast growth and to replace impacted t-hangars from the development of Taxiway D. All of the t-hangar growth is included on the north side of the airfield, largely in the northeast corner. The over 400,000 square feet of t-hangars added in the Master Plan Recommended Alternative meets the 2028 facility requirements. The configuration of the hangars will be determined as the sites are developed.

26. **Provide New Roadway Access:** North side non-secure access would be provided to the aviation business park development from Pinnacle Peak Road and 15th Avenue. This new access roadway would end past the development parcel and would not connect to airside facilities. Additional roadway access to the north hangars would be provided by developing 3rd Avenue from Pinnacle Peak Road. In addition, 7th Avenue would be extended to Airport Boulevard providing access to the ATCT and north hangar facilities. Airside gates would be maintained at the ATCT and north hangar entrances. Two additional entrances to the aviation business park and flight school are proposed to connect to 15th Avenue.

27. **Relocate Segmented Circle:** As a result of the proposed relocation and reconstruction of Taxiway B, the existing segmented circle will require relocation. The Recommended Alternative proposes a location approximately 100 feet south of its existing location.

28. **Expand Tie-Downs:** Aircraft tie-down parking positions are needed to support the flight schools' operations as the vast majority of their aircraft are kept outside. The total expansion of tie-down area shown exceeds the 2033 Facility Requirement by 200,000 square feet.

7.0 Implementation Plan

7.1 Implementation and Phasing Plan

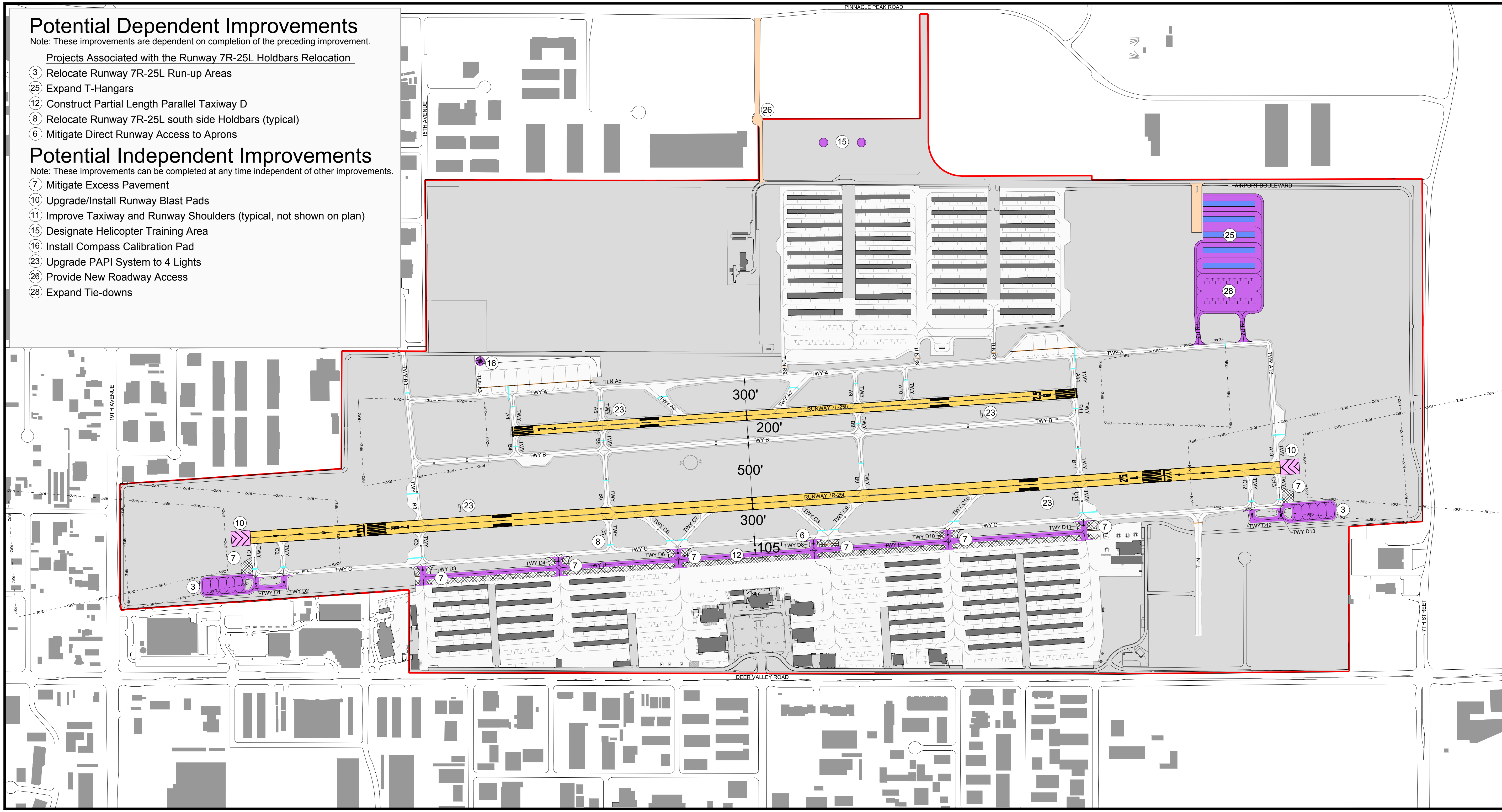
The potential phasing of individual projects proposed in the Master Plan Recommended Alternative are separated into five-year increments through the planning horizon representing projects that are likely to be developed during each time period. The projects are presented as dependent, which are projects that must be completed in order to implement other improvements, and independent, which are improvements that can be made without association to any other projects. The project identification numbers in the phasing plans correspond to the Master Plan Recommended Alternative projects described in Section 6.4.1 and on **Figure 6-2**. If funding or facility needs arise sooner or later than projected in the phasing plan, projects can be shifted between phases, but dependent projects would need to be completed in the same time period. The proposed project phasing is presented on **Figure 7-1** through **Figure 7-4**.

7.1.1 Phase 1 (2015 - 2018)

Phase 1 projects, anticipated for the 2015-2018 Calendar Year timeframe, are depicted on **Figure 7-1**. The proposed dependent improvements in Phase 1 consist of the relocation of the Runway 7R-25L south side holdbars (MP Project 8). In order to implement this project, the Runway 7R-25L run-up areas must be relocated (MP Project 3) and partial-length parallel Taxiway D must be constructed (MP Project 12). The initial portion of Taxiway D constructed during Phase 1 would be primarily developed on existing apron pavement between Taxiways C3 and C11. This pavement would need to be analyzed to determine if the strength and condition meet requirements for a taxiway, or if pavement upgrades will be required. To allow for the construction of Taxiway D, the airplanes housed in the northern-most row of t-hangars facing Taxiway C along the southwest end of Taxiway C must be relocated and are proposed to be accommodated in new t-hangars on the north (MP Project 25) and direct access from the south apron to Runway 7R-25L should be mitigated (MP Project 6). Additional t-hangars would be developed to accommodate growth in demand (MP Project 25).

The proposed independent improvements for Phase 1 include mitigation of excess taxiway pavement (MP Project 7), upgrade of blast pads on both ends of Runway 7R-25L (MP Project 10), improvements to taxiway and runway shoulders (MP Project 11), designation of the helicopter training area (MP Project 15), installation of the compass calibration pad (MP Project 16), upgrade of the PAPI system to four light systems (MP Project 23), new roadway access on the north side of the airfield connecting Pinnacle Peak Road to Airport Boulevard by expanding and extending 7th Avenue (MP Project 26) and expansion of tie-downs on the northeast near the t-hangar expansion area (MP Project 28).

PHOENIX DEER VALLEY AIRPORT MASTER PLAN UPDATE



PHASE 1 (2015-2018)

Figure 7-1

LEGEND

Airport Property Boundary	Proposed Removal
Airfield Ramp, Taxiway & Shoulders	Proposed Airfield Pavement
Existing Runway Pavement	Proposed Building
Existing on-Airport Building	Proposed Roadway/Parking
Holding Position	
Runway Protection Zone	

N

0' 800'

1" = 800'

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7.1.2 Phase 2 (2019 - 2023)

Phase 2 projects, anticipated for the 2019-2023 timeframe, are depicted on **Figure 7-2**. The proposed dependent improvements in Phase 2 consist of three primary projects: the construction of full length Taxiway D, the resolution of Hot Spots, and the relocation of one flight school to the north. The extension of Taxiway D to full length matching Runway 7R-25L (MP Project 12) will require the relocation of the Police Air Support Unit (MP Project 17). Currently the apron for the Air Support Unit falls within proposed Taxiway D's OFA and use of the hangar would conflict with operations on Taxiway D. As a result, construction of the taxiway adjacent to the Runway 25L end will require the relocation of the Police Air Support Unit facility. The facility is proposed to be relocated closer to Deer Valley Road in order to support the integration of a landside fire station, at such time that City of Phoenix Fire Station 36 requires replacement.

The second dependent improvement involves the resolution of Hot Spots. The mitigation of FAA-identified Hot Spots 1 and 2 (MP Project 4), located at Taxiways B5/C5 and B9/C9, involves shifting the taxiways along Taxiway B to require aircraft to make a turn onto Taxiway B in order to cross to the north or south. While reconstructing those Taxiways, Taxiway B should be relocated from 200-feet to 300-feet from the Runway 7L-25R centerline (MP Project 1) which will require the relocation of the segmented circle (MP Project 27) to accommodate the relocated taxiway, construction of new taxiway connectors (MP Project 9) and mitigation of direct runway access to ramps by shifting Taxiway B11/C11 (MP Project 6).

The third dependent improvement is the relocation of one flight school to the north along Airport Boulevard which would require construction of new tie-downs (MP Project 28) and new classroom buildings (MP Project 21).

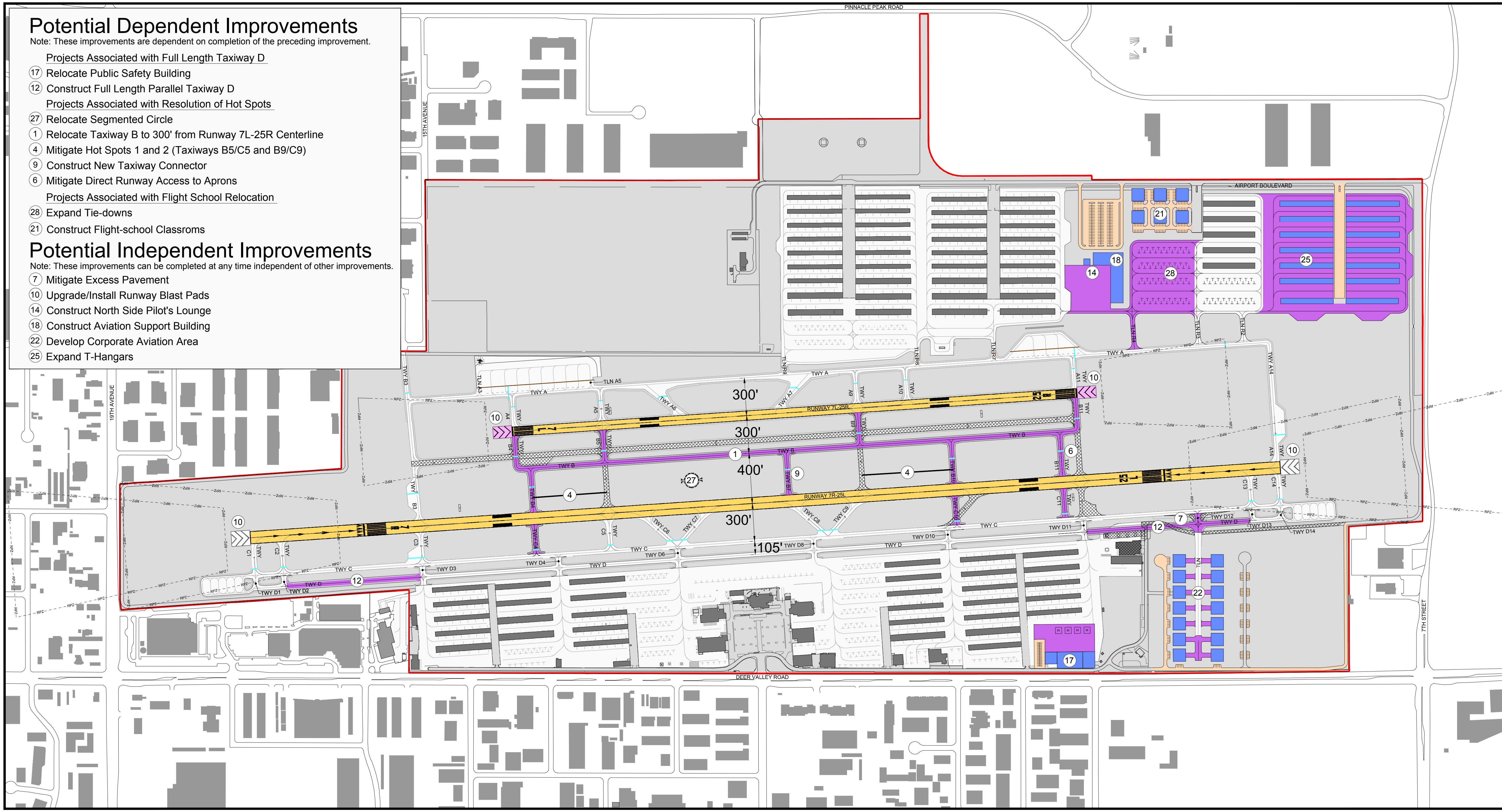
Proposed independent improvements include installation of runway blast pads on Runway 7L-25R (MP Project 10), construction of a pilot's lounge (MP Project 14) and aviation support building (MP Project 18) on the north, development of the corporate aviation area on the south (MP Project 22), and expansion of t-hangars on the north (MP Project 25) to accommodate continued growth in demand.

7.1.3 Phase 3 (2024 – 2028)

Phase 3 projects, anticipated for the 2024-2028 timeframe, are depicted in **Figure 7-3**. The proposed dependent improvements in Phase 3 consist of the relocation of the second flight school to the north within the northwest parcel. Relocation to this site would require new north-side access (MP Project 26) from Pinnacle Peak Road and the west side of DVT. The flight school would also require construction of new tie-downs (MP Project 28) and new classrooms (MP Project 21).

Proposed independent improvements include relocation of Taxiway B3/C3 outside of the Runway 7L-25R RPZ (MP Project 2), construction of acute angle taxiways (MP Project 5) and a new taxiway connector connecting Taxiway C and Runway 7R-25L (MP Project 9), continued development of the corporate aviation area on the south (MP Project 22) and expansion of t-hangars on the north (MP Project 25).

PHOENIX DEER VALLEY AIRPORT MASTER PLAN UPDATE



PHASE 2 (2019-2023)

Figure 7-2

LEGEND

- Airport Property Boundary
- Airfield Ramp, Taxiway & Shoulders
- Existing Runway Pavement
- Existing on-Airport Building
- Holding Position
- Runway Protection Zone
- Proposed Removal
- Proposed Airfield Pavement
- Proposed Building
- Proposed Roadway\Parking

N

0' 800'

1" = 800'

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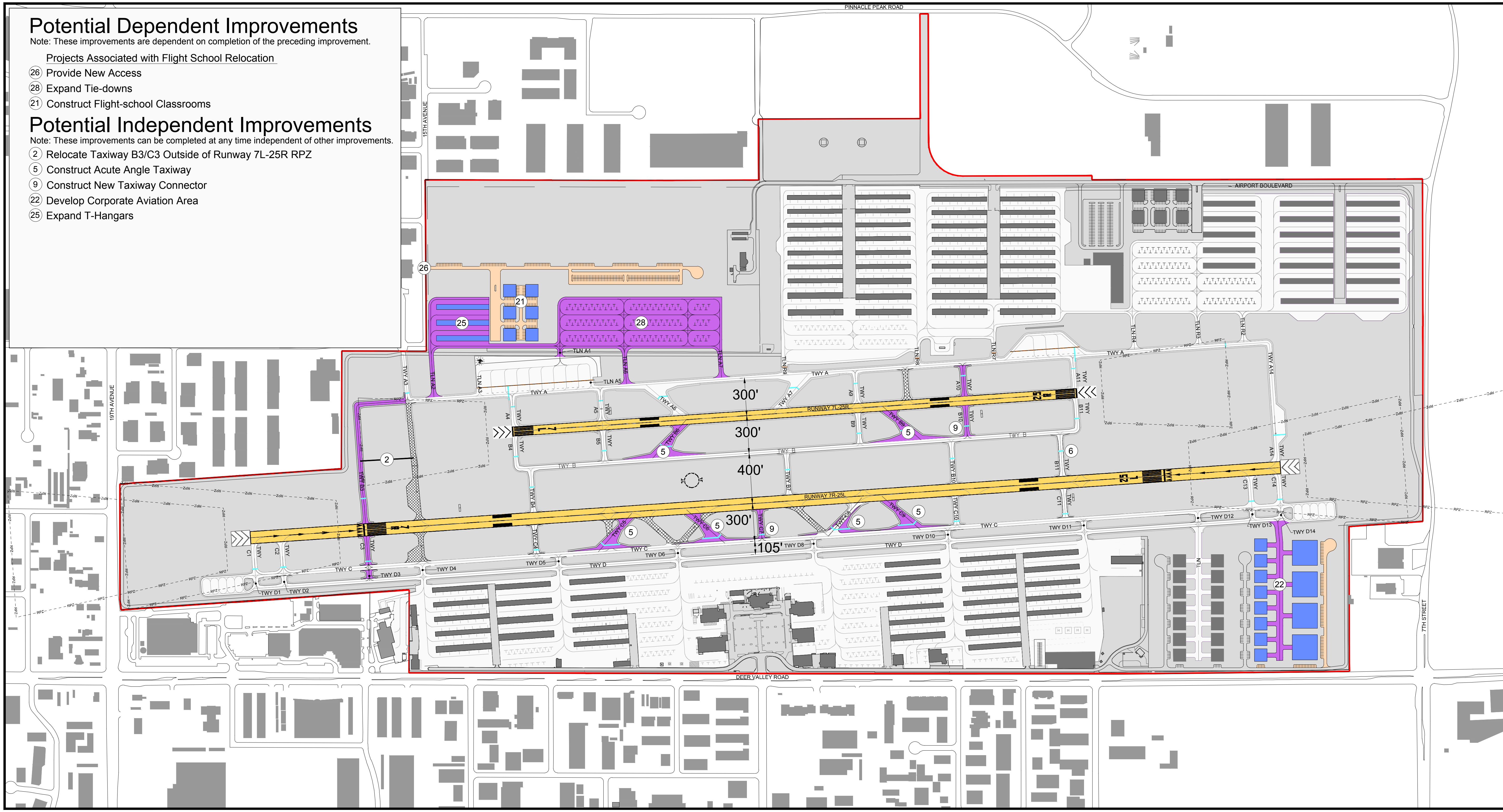
PHOENIX DEER VALLEY AIRPORT MASTER PLAN UPDATE



PHASE 3 (2024-2028)

Figure 7-3

LEGEND

- Airport Property Boundary
- Airfield Ramp, Taxiway & Shoulders
- Existing Runway Pavement
- Existing on-Airport Building
- Holding Position
- Runway Protection Zone
- Proposed Removal
- Proposed Airfield Pavement
- Proposed Building
- Proposed Roadway\Parking

N

0' 800'

1" = 800'

DVT

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7.1.4 Phase 4 (2029 – 2033)

Phase 4 projects, anticipated for the 2029-2033 timeframe, are depicted in **Figure 7-4**. The proposed dependent improvements in Phase 4 consist of two projects. The first is the 800 foot extension of Runway 7L-25R to the east (MP Project 13) which requires a new taxiway connector between Taxiway A and Taxiway C (MP Project 9). The second is the development of the aviation business park (MP Project 24) which requires new roadway access on the north from 15th Avenue and Pinnacle Peak Road (MP Project 26) to segregate it from the dedicated airport access point, segregating airport and non-airport traffic.

Proposed independent improvements include installation of a runway blast pad on Runway 25R (MP Project 10), expansion of the existing Cutter Aviation and Atlantic Aviation facilities in their existing locations (MP Projects 19 and 20), and new north-side access from Pinnacle Peak Road along 3rd Avenue (MP Project 26).

7.2 Environmental Considerations

The environmental considerations identify environmental factors that could affect the feasibility of the Master Plan Recommended Alternative and confirm that potential environmental impacts will not constrain development. This analysis is intended to summarize the environmental factors surrounding the recommended development and potential follow on environmental studies that may be required; however, it does not constitute a National Environmental Policy Act (NEPA) analysis.

7.2.1 NEPA Levels of Documentation

The implementation of projects in the Master Plan Recommended Alternative is expected to constitute Federal actions, which will require NEPA analysis and documentation. As a Federal agency, the FAA must ensure that the requirements of NEPA are met prior to taking any action that has the potential to affect the environment.

There are three levels of environmental documentation typically used to satisfy NEPA requirements prior to development of individual projects:

Categorical Exclusion: A categorical exclusion addresses actions which the FAA and the Council on Environmental Quality (CEQ) have determined do not normally have the potential to generate significant environmental impacts. A wide range of actions have been identified as categorical exclusions. These actions are generally related to repair and maintenance of existing facilities, minor development which is not likely to result in significant impacts, landscaping, equipment acquisition, projects to carry out noise compatibility programs, property acquisition for these purposes, and Federal release of airport land. In addition, the construction and expansion of passenger handling facilities is categorically excluded. If a normally excluded action might generate significant impacts, an Environmental Assessment (EA) is required. This requirement also applies to actions which are likely to be highly controversial on environmental grounds. A Categorical Exclusion typically takes 3 to 9 months to complete.

Potential Dependent Improvements

Note: These improvements are dependent on completion of the preceding improvement.

Projects Associated with the Extension of Runway 7L-25R

- (13) Construct 800' Eastward Extension of Runway 7L-25R
- (9) New Taxiway Connector

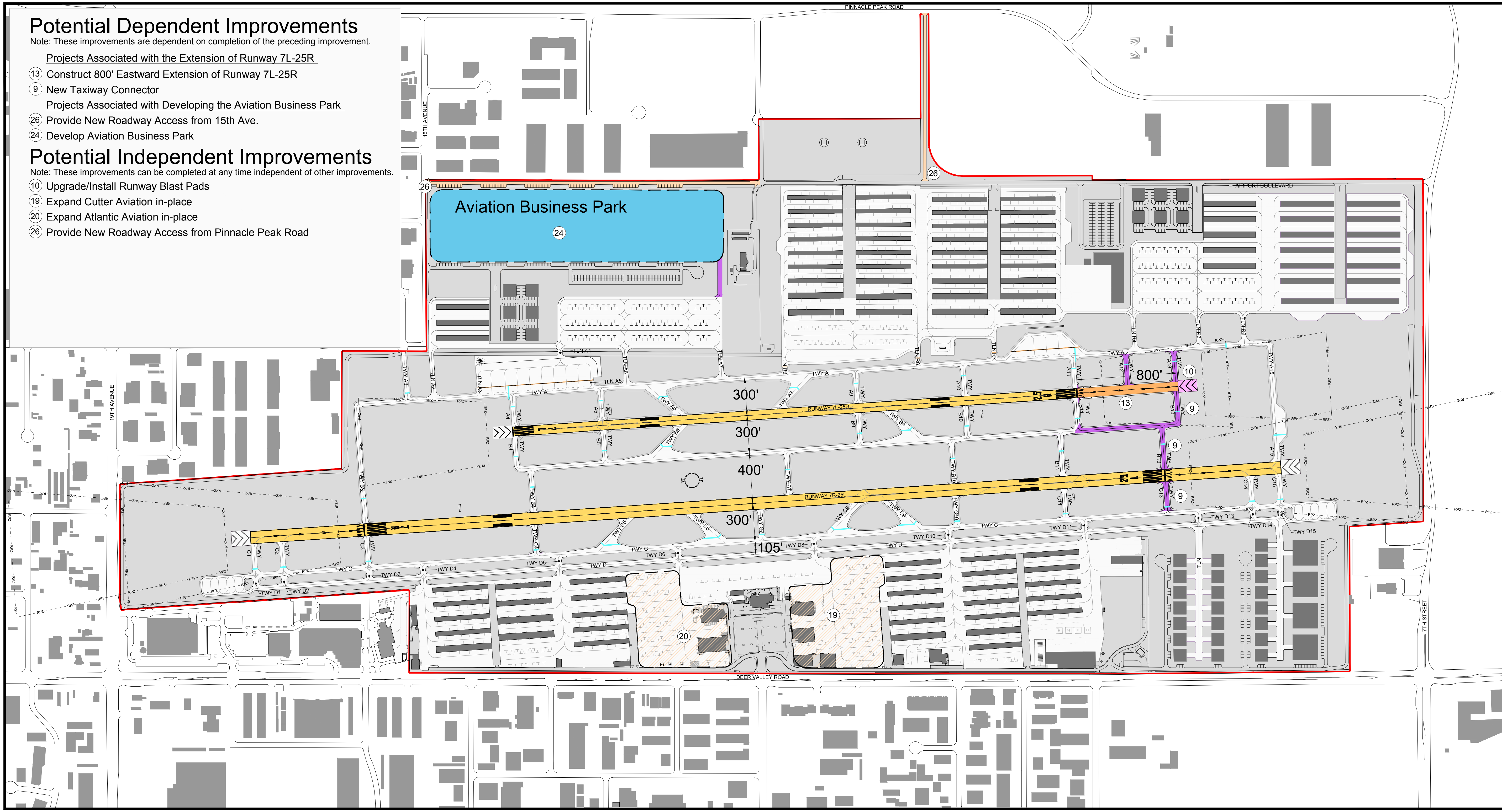
Projects Associated with Developing the Aviation Business Park

- (26) Provide New Roadway Access from 15th Ave.
- (24) Develop Aviation Business Park

Potential Independent Improvements

Note: These improvements can be completed at any time independent of other improvements.

- (10) Upgrade/Install Runway Blast Pads
- (19) Expand Cutter Aviation in-place
- (20) Expand Atlantic Aviation in-place
- (26) Provide New Roadway Access from Pinnacle Peak Road



PHASE 4 (2029-2033)

Figure 7-4

LEGEND

- Airport Property Boundary
- Airfield Ramp, Taxiway & Shoulders
- Existing Runway Pavement
- Existing on-Airport Building
- Holding Position
- Runway Protection Zone
- Proposed Removal
- Proposed Airfield Pavement
- Proposed Building
- Proposed Roadway\Parking
- Proposed Runway Pavement

N

0' 800'

1" = 800'

DVT

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Environmental Assessment: An EA is conducted to determine if the action under consideration could generate significant impacts requiring preparation of an Environmental Impact Statement (EIS). If no significant impacts are identified in the EA, a Finding of No Significant Impact (FONSI) would be issued. An EA typically takes 9 months to 2 years to complete. In accordance with FAA Order 5050.4B, the following types of airport actions normally require preparation of an EA.

- A normally categorically excluded action involving extraordinary circumstances
- Helicopter facilities or operations (if the project has the potential to generate significant noise or other impacts)
- New airport serving general aviation (not in MSA)
- New runway (not in MSA)
- Major runway strengthening or major runway extension (major runway extension has the potential to generate significant noise or other impacts)
- Conversion of prime and unique farmland
- Dredging or filling of a waterway or wetland under certain circumstances
- Land acquisition associated with the above actions or highly controversial actions
- Other circumstance, particularly when controversy exists because a special purpose law is involved

Environmental Impact Statement: An EIS addresses projects having the potential to create significant environmental impact and, unlike other environmental documentation which is led by the airport sponsor, an EIS is led by the FAA. An EIS documents the need for the action, alternatives to the proposed action which would entail less environmental impact, and mitigation measures to offset or reduce impacts. An EIS may be required after an EA if the EA indicates that proposed mitigation would not reduce the action's environmental impacts below significant impact thresholds, or it may be triggered without an EA if there is an expectation for significant environmental impact or extensive public controversy. An EIS typically takes 3 to 5 years to complete. In accordance with FAA Order 5050.4B, the following airport actions normally require an EIS:

- A new commercial service airport in an MSA - initial ALP approval or airport location approval
- A new runway in an MSA - financial participation in and/or ALP approval

7.2.2 Summary of Environmental Documentation for Recommended Improvements

Table 7-1 outlines the proposed improvements in the Master Plan Recommended Alternative and normal environmental documentation. The determination for environmental documentation is based on FAA Order 1050.1E (Change 1) sections 309, 310 and 401. Once a project horizon approaches, the Aviation Department and FAA NEPA staff will discuss and confirm the appropriate level of NEPA documentation required.

Table 7-1: Potential Environmental Documentation for Recommended Improvements

Project	Improvement	Environmental Documentation*	Reference (FAA Order 1050.1E, Change 1)
		Runway Improvements	
13	Construct 800' Extension of Runway 7L-25R	EA	401k.
3	Relocate Runway 7R-25L Run-up Areas	Categorical Exclusion[1]	310e.
6	Mitigate Direct Runway Access to Aprons	Categorical Exclusion[1]	310e.
8	Relocate Runway 7R-25L South Side Holdbars	Categorical Exclusion[1]	310e.
10	Upgrade/Install Runway Blast Pads	Categorical Exclusion[1,2]	310e.
23	Upgrade PAPI system to 4 lights	Categorical Exclusion[1]	309c.
		Taxiway Improvements	
1	Relocate Taxiway B to 300’ from Runway 7L-25R centerline	Categorical Exclusion[1]	310e.
2	Relocate Taxiway B3/C3 outside of Runway 7L-25R RPZ	Categorical Exclusion[1]	310e.
12	Construct Full Length Parallel Taxiway D	Categorical Exclusion[1]	310e.
4	Mitigate Hot Spots 1 and 2 (Taxiways B5/C5 and B9/C9)	Categorical Exclusion[1]	310e.
5	Construct Acute Angle Taxiway	Categorical Exclusion[1,2]	310e.
9	Construct New Taxiway Connectors	Categorical Exclusion[1]	310e.
11	Improve Taxiway and Runway Shoulders	Categorical Exclusion[1]	310e.
7	Mitigate Excess Pavement	Categorical Exclusion[1]	310e.
27	Relocate Segmented Circle	Categorical Exclusion[1]	309e.
		Parking and Roadway Improvements	
19	Expand Cutter Aviation in-place	Categorical Exclusion[1]	310f.
20	Expand Atlantic Aviation in-place	Categorical Exclusion[1]	310f.
26	Provide New Roadway Access	Categorical Exclusion[1,3]	310a.

Project	Improvement	Environmental Documentation*	Reference (FAA Order 1050.1E, Change 1)
		Aprons and Aircraft Parking	
25	Expand T-Hangars	EA (unpaved area)[5]	401. (Not identified as a Categorically Excluded Action)
28	Expand Tie-downs	EA (unpaved area)[5]	401. (Not identified as a Categorically Excluded Action)
		General Aviation Facilities	
18	Construct Aviation Support Building	EA[5]	401. (Not identified as a Categorically Excluded Action)
21	Construct Flight-school Classrooms	Categorical Exclusion[1]	310h.
22	Develop Corporate Aviation	EA	401. (Not identified as a Categorically Excluded Action)
24	Develop Aviation Business Park	EA	401. (Not identified as a Categorically Excluded Action)
14	Construct North Side Pilot's Lounge	Categorical Exclusion[1]	310h.
15	Designate Helicopter Training Area	Categorical Exclusion[1,4]	310t.
		Support Facilities	
16	Install Compass Calibration Pad	Categorical Exclusion	309d.
17	Relocate Public Safety Building	EA	401. (Not identified as a Categorically Excluded Action)

Notes:

* Multiple projects may be combined into one NEPA document, dependent upon project implementation schedules.

[1] Assumes no extraordinary circumstances.

[2] Potential EA associated with Runway 7L-25R extension and Taxiway B relocation.

[3] Assumes no reduction to Level of Service on local traffic systems below acceptable levels, as determined by ADOT. May require input from ADOT and/or Maricopa County relative to environmental requirements.

[4] Assumes that facility would not significantly increase noise over noise sensitive areas.

[5] The use of a Categorical Exclusion may be possible for this improvement, discussion with the FAA should be held to verify appropriate environmental documentation. An EA is identified herein as the most conservative level of documentation without benefit of coordination with the FAA.

7.2.3 Environmental Factors

The following sections include an inventory of environmental factors which may be impacted by future airport development, based on existing data. The Recommended Master Plan Alternative projects are evaluated in accordance with guidelines specified in the FAA's Order 1050.1E (Change 1) *Environmental Impacts: Policies and Procedures* and FAA Order 5050.4B *National Environmental Policy Act (NEPA Implementing Instructions for Airport Actions)*. Only categories in which potential environmental impacts have been identified are discussed in detail.

The following resources are not found within the DVT airport environs, and therefore are not discussed in detail:

- Coastal Resources
- Department of Transportation Act Section 4(f) Properties
- Socioeconomic Impacts, Environmental Justice, and Children's Environmental Health Risks
- Farmlands
- Floodplains
- Wild and Scenic Rivers

The impact categories, as defined by FAA in Order 1050.1E, are reviewed for the Recommended Master Plan Alternative in the sections that follow. For this review, noise and compatible land use have been combined.

7.2.3.1 Air Quality

The Clean Air Act is the primary Federal legislation addressing ambient air quality, which required the establishment of NAAQS. NAAQS apply to six criteria pollutants: carbon monoxide (CO), lead (Pb), nitrogen oxides (NO_x), ozone (O_3), particulate matter (PM_{10}), and sulfur dioxide (SO_2). Areas that exceed the applicable standards for a criteria pollutant are designated non-attainment for that pollutant. The Clean Air Act requires any state that has a designated non-attainment area to develop a State Implementation Plan (SIP). The SIP is the plan developed by the State to bring non-attainment areas into conformance with NAAQS in accordance with applicable deadlines.

DVT is located within the Phoenix area. The Phoenix area is designated as a non-attainment area for particulate matter (PM_{10}) and ozone (8-hour), and is designated as a maintenance area for carbon monoxide. Recommended improvements including extending Runway 7L-25R to the east by 800 feet, taxiway relocations and improvements, expansion of parking lots, construction of several aviation support facilities and buildings, new roadway access and upgrades to the navigation system do not change the airport capacity or operational conditions and are consistent with the current airport functions. It should be noted that with the extension of Runway 7L-25R, there may be changes to runway use, however these changes would be expected to have minimal impact on overall taxi-time and therefore minimal impact on overall air pollutant emissions.

In accordance with Federal Register (FRN)/Vol. 72, No. 145, the FAA has developed a list of Presumed to Conform actions based on a survey of airport projects and project findings. Presumed to Conform actions have been proven to be "reliably and consistently *de minimis"* and as a result do not require air quality analysis. Presumed to Conform Actions generally involve maintenance, navigation, construction, safety, and security activities, along with new technology and vehicle systems. Of the projects included in the Master Plan Recommended Alternative, "non-runway pavement work" such as the expanded tie-down areas, t-hangar areas, relocated run-up areas, mitigation of excess pavement and improvement of taxiway and runway shoulders that do not exceed the square footage required in FRN/vol. 72, No. 145, *Table III-1: Presumed to Conform Limits for Selected Projects* for PM_{10} and ozone, are not anticipated to require an air quality assessment, however a construction emissions inventory may still be required.

To determine the significance of potential air quality impacts for the remaining recommended improvement projects, including the Runway 25R extension, construction of full length parallel Taxiway D and the construction of new aviation support buildings, an emissions inventory would be needed to determine if the project meets General Conformity outlined within the SIP. Additionally, mandatory lead monitoring is conducted at DVT. In conjunction with strengthening the lead NAAQS in 2008, EPA improved the lead monitoring network by requiring monitors be placed in areas with sources such as industrial facilities or airports that emit one ton or more per year (TPY) of lead. Since Federal emissions inventories indicated that the DVT area emits more than one TPY of lead, monitoring sites are in place. The lead monitoring data collected to date indicates that DVT area levels are significantly lower than the NAAQS standard[7]. Sources of lead emitted into the air typically originate from sources such as ore and metal processing and aircraft that use leaded aviation gasoline. The Master Plan Recommended Alternative proposed improvements do not induce aircraft operations and are not anticipated to emit lead; however, Potential to Emit (PTE) should be further considered during environmental documentation to determine if the projects individually, or cumulatively, have the potential to contribute to ambient lead concentrations that approach or exceed NAAQS.

In addition, projects over 1/10 of an acre require a Dust Control Permit from the Maricopa County Air Quality Department. A Dust Control Plan would be required to describe the measures that must be implemented by the contractor at the site to prevent dust particle emissions.

7.2.3.2 Construction Impacts

Construction impacts typically relate to the effects on specific impact categories, such as air quality or noise, during construction. Most of the improvements in the Master Plan Recommended Alternative will result in some temporary impact during

[7] EPA Office of Transportation and Air Quality, "Airport Lead Monitoring," June 2013, http://www.epa.gov/otaq/regs/nonroad/aviation/420f13032.pdf and Maricopa County Air Quality Department, "Air Monitoring," http://www.pagnet.org/documents/Air/AQForum2010/am-3-AirMonitoring.pdf, both accessed 5/21/15.

construction to ambient noise levels, air quality, and potentially localized water quality if runoff occurs. Noise impacts during construction are expected, however, noise impacts would be localized in the vicinity of the specific construction sites. Construction equipment and vehicles would create localized increases in noise levels, but these temporary noise impacts would not result in significant impacts to any residential development.

Although the majority of construction-related emissions associated with the recommended improvements would likely be presumed to conform and are temporary in duration, these emissions could be further reduced by employing the best management practices (BMPs) such as reduction of equipment idling times, use of covered haul trucks and conveyors during materials transportation, and daily watering of exposed surfaces and demolition activities. As part of the NEPA review, construction-related air emissions inventory will need to be estimated to determine any air quality impacts for any improvements that are not presumed to conform.

If uncontrolled, construction activities have the potential to cause erosion and sedimentation which can impact water quality. Short-term construction impacts would be minimized by strict adherence to erosion and sediment control procedures.

Construction impacts related to noise, air quality and water quality would be short-term in nature, lasting for the duration of construction activities, and would be mitigated by BMPs. Temporary contractor staging areas would be required throughout construction to store construction equipment and materials. An AZPDES Construction General Permit is required when the total construction area is greater than 1 acre and permit requirements would be adhered to and would minimize or mitigate any potential temporary impacts due to construction. Specific requirements to ensure compliance with the permit would be addressed as part of mitigation in the NEPA document(s) specific to each project.

7.2.3.3 Fish, Wildlife and Plants

DVT is located in the Sonoran Desert which is home to numerous threatened and endangered plant and animal species along with special status species. **Table 1-14** depicts the 21 federally-registered threatened and endangered species and species of special concern listed for Maricopa County. Based on two biological evaluations completed in 1999 for parcels adjacent to DVT and the Arizona Game and Fish Department's HabiMap tool, threatened and endangered species, special status species, and the habitats required of these species are not known to exist on DVT property; however, it should be noted that federally listed transient species may occur in the project area. Such appearances would be expected to be infrequent, as the habitat which supports most of the species identified consists of treed areas or locations near rivers, streams, or marshes. However, field surveys would be needed to verify this determination.

The improvements in the Master Plan Recommended Alternative do not involve alteration of vast land areas since much of DVT's property is disturbed by airport development as well as commercial and industrial development. However, ground-disturbing activity in several areas of undisturbed airport land is anticipated as a result of the Master Plan Recommended Alternative projects. Development is planned in the northeast part of the airport property for airside support facilities, including the expansion of t-Hangars, tie-downs, a new pilot's lounge and flight-school classrooms. Corporate aviation development is planned for the southeast corner of the airport property, and an aviation business park, additional tie-downs, t-hangars and classrooms are proposed in the northwest corner. Biological surveys for threatened and endangered species, and special status species, would likely be required in these undisturbed areas for any suspected transient species or habitat. Coordination with the Arizona Game and Fish Department, U.S. Department of Agriculture Wildlife Services (USDA WS), and U.S. Fish and Wildlife Service (USFWS) would be necessary to confirm that no endangered or threatened species or special status species exist in these areas. Additionally, coordination with the City of Phoenix Section 404 Program Coordinator will be necessary to confirm that no special status species exist in the project vicinity. If special status species are found to occur, DVT would work with the City's Section 404 Program Coordinator, USDA WS, USFWS and the Arizona Game and Fish Department to determine the most appropriate method to avoid or minimize impacts to species.

As shown previously in **Table 1-15**, sixteen birds are on the Migratory birds of concern list for the DVT vicinity. While no burrowing owls have been witnessed at DVT, suitable habitat for burrowing owls exists on DVT property and an owl survey is recommended prior to conducting any new ground-disturbing activity including construction haul routes, construction staging areas, and the placement of millings and rock for dust control purposes.

7.2.3.4 Hazardous Materials, Pollution Prevention, and Solid Waste

DVT is listed as a Small Quantity Generator of hazardous waste. As identified in Section 1.7.6, the most recent review of agency databases (2008) reported ten underground storage tanks (USTs) were formerly operated on DVT property; and two leaking UST (LUST) cases were on DVT property but remediated in 1997. The nearby Lone Cactus Landfill did not receive hazardous waste, hazardous spills, or illegally dumped materials. Small amounts of regulated materials are stored on DVT's property in the Aviation Department's maintenance yard, and at each of the larger tenant sites.

The Master Plan Recommended Alternative improvements would pose no known threat related to hazards or hazardous materials on or around Airport property. Prior to construction of the recommended improvements, any undisturbed areas should be surveyed for prior land uses that may have used oils or chemicals, including potential USTs or Above Ground Storage Tanks (ASTs) that may contain petroleum products. If any new construction is proposed in the vicinity of land that previously had chemicals or oil use, removal and remediation may be required.

Any solid waste resulting from pavement removal or building demolition would be recycled when possible or discarded in an approved construction materials accepted landfill where capacity exists. Asphalt would be milled and recycled for use on roadway rehabilitation projects or taxiway shoulders.

7.2.3.5 Historical, Architectural, Archaeological, and Cultural Resources

As Federal undertakings, the Master Plan Recommended Alternative projects would be subject to Section 106 of the National Historic Preservation Act of 1966, as amended, and the Archaeological and Historic Preservation Act of 1974. Both of these Federal laws require consultation with the State Historic Preservation Officer (SHPO). No significant archaeological resources have been found during previous surveys at DVT; however, because of the potential for significant resources given the area's rich prehistory, an archaeological survey would likely be required during NEPA analysis for any areas not previously surveyed.

An Archaeology Assessment Request would be submitted to the City Archaeologist for any of the projects that would require subsurface excavation. The recommended improvement projects that would likely require additional field investigation and study include the expansion of t-Hangars, tie-downs, the new Pilot's Lounge and flight-school classrooms (undeveloped area in the northeast part of airport property); the corporate aviation development planned for the southeast corner, and the aviation business park, additional tie-downs, t-hangars and classrooms proposed in the undeveloped northwest corner. As documented in the previous Master Plan Update, a summary of the previous studies completed for DVT is provided in **Table 7-2**.

No historic structures currently exist on DVT property; however, if the existing City of Phoenix Police Support Unit building and associated aircraft/helicopter apron is nearing 50 years old, an architectural historian may be required to determine the eligibility of the existing structures as historic, depending on the SHPO's determination. Eligibility is based on the structure's historic context (e.g., why the property is historic and why the property is of exceptional importance). Because the majority of the recommended improvements occur on land that has been significantly altered over the last 50 years, the potential for impacts under this category would be minimal.

7.2.3.6 Light Emissions and Visual Impacts

Consideration must be given to the impact that additional lighting requirements for DVT could have on the surrounding community, and also to the visual effects in terms of the projects' consistency with the existing environment, architecture, and land use. The proposed projects in the Master Plan Recommended Alternative would not alter the nature of current airport lighting. The conversion of the current PAPI system from a 2-light system to a 4-light system, the positioning of runway and taxiway lighting, and runway end identifier lights in conjunction with the proposed Runway 25R extension is not anticipated to disrupt or shine into residential areas or other light sensitive facilities in the surrounding area.

Table 7-2: Previous Cultural, Architectural and Archaeological Studies - Phoenix Deer Valley Airport

Quad	Township, Range and Section	Report Reference	Project Type	Results	PGM Number
Union Hills	T4N R3E Section 17	Schmidt, Cara and Douglas Mitchell, 2004, Cultural resources Survey of 40-Acres at the Deer Valley Airport in Phoenix, Maricopa County, Arizona. SWCA Cultural Resources Report No. 04-256.	Survey	9 isolated occurrences	2004-19
Union Hills	T4N R3E Sections 17 and 18	Cable, John, 1985, Archaeological Survey of the Phoenix-Deer Valley Airport, Phoenix, Arizona, Letter report, Ms. on file, City of Phoenix Archaeology Office.	Survey	Nothing encountered	1985-05
Union Hills	T4N R3E Section 18	Schmidt, Cara and John M. Lindly, 2004, Cultural Resources Survey of 80-Acres at the Deer Valley Airport in Phoenix, Maricopa County, Arizona. SWCA Cultural Resources Report No. 04-287.	Survey	4 isolated occurrences	2004-22
Union Hills	T4N R3E Section 9	Doyel, David, 1985, An Archaeological Survey for a Signal Beacon Tower for Deer Valley Airport on Fort Mountain, Maricopa County, Arizona, Letter report, Ms. on file, City of Phoenix Archaeology Office.	Survey	Fort Mountain Site, AZT:8:34(ASU), Re-evaluated.	1985-01

Source: 2007 Master Plan Update, Appendix B (Table B2).

The new roadway access to DVT from Pinnacle Peak Road may require additional lighting; however, Pinnacle Peak Road near DVT is surrounded by industrial and vacant land uses, therefore any additional lighting for this new roadway access would not be expected to adversely affect any light-sensitive uses.

The additional hangar space, corporate aviation development, pilot's lounge and other aviation support facilities recommended as part of the Master Plan Recommended Alternative are aviation-related and are consistent with current airport operations. Additional lighting for these facilities would be minimal and would not impact the surrounding area. The land use surrounding DVT is urbanized with commercial and industrial development; therefore any changes to light emissions at DVT are not expected to create an annoyance among light-sensitive land uses or result in adverse impacts.

The airfield improvements with the modifications to Runway 25R and other taxiway improvements are not expected to result in change in the visual quality of the airport area. The design of the recommended additional airside and landside support facilities would be visually consistent with the existing airport environment so as to ensure compatibility with existing structures and airport appearance. Therefore, no significant impact from a visual perspective is anticipated due to implementation of the Master Plan Recommended Alternative improvements.

7.2.3.7 Natural Resources and Energy Supply

Natural resource and energy supply impacts focus on actions that have the potential to change energy requirements or use consumable natural resources. There would be additional energy used by DVT due to the Master Plan Recommended Alternative improvements but the changes would not be considered major on a regional level.

The proposed runway extension, modifications to the taxiways and expansion/construction of new parking facilities and support buildings would not change the quantity of fuel consumption by a measurable amount, nor is it expected that the proposed projects would cause an increase in the number of aircraft operations or motor vehicle operations at DVT. Any increase in fuel consumption associated with changes to taxiing distances of aircraft to/from the runways, new t-Hangars, or other airside facilities is not expected to be significant.

No scarce or unusual materials would be expected for use during construction. Construction materials would be acquired through local suppliers and contractors. Based on these factors, it is not expected that there would be significant impacts to the energy supply or to natural resources due to implementation of the Master Plan Recommended Alternative improvements.

7.2.3.8 Noise/Compatible Land Use

Airport noise is often the most significant environmental issue that the FAA considers when evaluating proposed airport actions. Airport development actions that change airport runway configurations, aircraft operations and/or movements, aircraft types using the airport, or aircraft flight characteristics may affect existing and future noise levels. The primary consideration when analyzing noise is how an action would change the cumulative noise exposure of individuals to aircraft noise in areas surrounding the airport. Land use compatibility with aircraft noise is typically determined on the basis of the annual average Day-Night Average Sound Level. DNL is measured in decibels (dBs) and is normally illustrated by lines, or contours, joining equal noise values drawn over a base map of an airport and surrounding area. FAA has established land use compatibility guidelines relative to certain DNL noise levels in 14 Code of Federal Regulations (CFR) Part 150.

DVT is located in the Deer Valley Village which is comprised of industrial zoned land along with residential and park/open space such as the Adobe Recreation Area. The Master Plan Recommended Alternative improvements are consistent with on-airport land use and the adjacent surrounding industrial and commercial land uses.

The DNL 65^+ dB noise contour is the Federal noise level at which residential and noise-sensitive land uses are considered non-compatible. The most recent noise contours at DVT were developed in 2007. The 2007 existing DNL 65 dB extends approximately 1,300 feet beyond 7^{th} Street to the east and 900 feet beyond 19^{th} Street to the west. In the long term, the DNL 65 dB is projected to extend approximately 2,700 feet beyond 7^{th} Street to the east and 1,600 feet beyond 19^{th} Street to the west. The long term (20 year) noise contour developed in 2007 only affects compatible industrial and commercial uses and does not extend into residential areas. As discussed in Section 4.5 and shown on **Figure 4-5**, the DVT Public Airport Disclosure Map also depicts the DNL 65^+ dB noise contour and is intended to ensure that the owners and potential purchasers of property are notified that the property is located in or outside of a territory in the vicinity of a public airport.

As part of an EA for the extension of Runway 7L-25R, a noise analysis would be required to ensure that land use compatibility to the east of DVT is not significantly impacted by the proposed 800-foot runway extension. Currently, the land to the east of DVT, a potential Section 4(f) property, is undeveloped and owned by the Arizona State Land Trust. The nearest schools include Woodbridge Private School, approximately 0.32 miles north of DVT, the Adams Traditional Academy and Valley Academy Public Charter School, both approximately ½-mile south of DVT, and Esperanza Elementary School, just under one mile south of DVT. It is unlikely that the DNL 65^+ dB noise contour would expand to areas of incompatible land uses such as residential development, Section 4(f) properties, or other noise-sensitive facilities due to the runway extension, however, the City should continue to monitor rezoning and the potential development of the areas to the east of DVT in particular to ensure that only compatible land uses are introduced.

The other Master Plan Recommended Alternative improvements would not be expected to impact airport noise beyond the temporary period of construction. The slight modifications to the airfield, including the relocation of the helicopter training area and the Runway 7R-25L run-up areas, would not be expected to significantly impact noise exposure levels in the airport environs. The relocation and expansion of the Runway 7R-25L run-up areas would move these facilities slightly closer to the edge of airport property. The existing land uses near this area are industrial in nature, and therefore impacts due to the slight relocation are not expected to be significant.

7.2.3.9 Secondary (Induced) Impacts

The evaluation of secondary impacts is usually associated with major development and focuses on the potential shift in patterns of population movement and growth; public service demands (typically, level of service for roadways), and changes in business and economic activity to the extent influenced by airport development. The implementation of Master Plan Recommended Alternative improvements would not involve the need to relocate any residence or business, disrupt or divide established communities, or change any planned community development.

The proposed additional roadway access to the north side of DVT would slightly alter surface transportation patterns but would not disrupt the surrounding community nor reduce level of service along any of the affected roadways.

7.2.3.10 Water Quality

The Master Plan Recommended Alternative improvements include additional impervious surface area due to the recommended development of corporate aviation, an aviation business park, additional hangars, tie-down areas, and additional support facilities and buildings. Modifications to the airfield, including taxiway changes, additional runway and run-up areas may also result in additional impervious area. The primary water quality issues associated with additional impervious area is related to stormwater discharges. Potential stormwater-related water quality impacts include the following:

- Discharge of sediments and other pollutants in runoff from construction sites.
- Discharge of fuels, oils, or other pollutants as a result of spills.
- Increased pollutant loadings as a result of runoff from new impervious surfaces which are subject to vehicle or aircraft operations, parking, and maintenance.
- More erosion and sediment transport as a result of higher stormwater discharge rates.

Construction activities associated with the implementation of the Master Plan Recommended Alternative improvements could promote erosion and sedimentation. Construction activities are regulated under AZPDES Construction General Permit (CGP)-2008, through a Notice of Intent to Discharge, and a Construction SWPPP. DVT and all applicable contractors would need to obtain and comply with the requirements and procedures of the construction-related CPG-2008, including the preparation of a *Notice of Intent* and a modification to DVT's SWPPP, prior to the initiation of project construction activities. The Construction SWPPP is only in effect during construction and once final stabilization is in effect, the contractor may enter a *Notice of Termination*.

Following construction of the proposed improvement(s), the Aviation Department will need to continue compliance with the MSGP-2010, effective February 1, 2011. The MSGP-2010 requires that the SWPPP be updated to reflect newly constructed areas and activities with chemicals or oils. Areas with a potential for significant soil erosion due to topography, land disturbance (e.g., construction) or other factors will be identified, and the structural, vegetative and/or stabilization control measures that will be implemented to limit erosion will be developed. The SWPPP must be amended whenever there is a change in design, construction, operation or maintenance that has a significant effect on the discharge or potential for discharge of pollutants from the facility. SWPPP modifications are documented, signed and dated on a SWPPP Modification Log.

Although the recommended improvements will include additional impervious area and grade alteration in some cases, adequate stormwater management and compliance and sediment and erosion control during construction would limit, if not eliminate, any significant disturbance to the natural environment. Accordingly, water quality impacts due to runoff from construction activities associated with the Master Plan Recommended Alternative are not anticipated to be significant.

Water Pressure Issues – As noted in the previous Master Plan Update, the southwest corner of airport property is at an elevation of 1,430 feet, while the northeast portion is at 1,490 feet. The elevation for the northeast corner is the upper limit of Pressure Zone 4A as defined by the City of Phoenix Water Service Department. The 60 feet of elevation change translates into approximately 26 psi of water pressure change. The City of Phoenix tries to maintain, at the top of any Pressure Zone, a minimum pressure of 50 psi. The City of Phoenix Water Service Department recommends that any water or pressure demanding facilities not be located in the northeast corner of airport property. The recommended projects include expansion of t-hangars and tie-down areas, as well as flight school classrooms, a pilot’s lounge, and an aviation support building. Several of the proposed improvements proposed in this area may require water for emergencies, such as a fire sprinkler and/or fire suppression system for maintenance activities. Implementation of measures such as a water pressure boost pump may be needed to address such deficiencies and will be determined during follow on design studies.

7.2.3.11 Wetlands

The ACOE previously determined there were no wetlands on DVT property. A review of NWI maps prepared by the U.S. Fish and Wildlife Service also indicate a lack of wetland resources within the DVT environs. Therefore it is expected that there would be no impact to wetlands due to the Master Plan Recommended Alternative improvements; however, this should be confirmed during development of necessary NEPA documentation.

7.3 Program Cost Estimates

A preliminary program cost estimate was prepared for the projects identified in the Master Plan Recommended Alternative. The costs for each project by development phase are shown on **Tables 7-3** through **7-6.** The costs are presented in 2014 dollars and represent a planning level estimate. The costs include hard construction cost for each project and an estimate of the total cost for each phase inclusive of soft costs and owner's contingency. The construction costs include a 25% planning contingency. As projects are further refined through the design process these numbers may be adjusted. The funding plan in Section 7.4 breaks out soft costs by project. All soft costs include design, permitting, environmental monitoring, program management, contract procurement, and direct staff costs, including testing and inspection by other City departments. Some soft costs differ depending on whether or not the project uses FAA or ADOT grant funding as described in Section 7.4. For example, project management costs were included for projects that were not eligible for grants. However, these costs were limited to construction administration for grant-eligible projects. As projects are further defined cost estimates may be further refined. The financial analysis in Section 7.4 addresses escalation of project costs as part of the financial plan. The quantities of material were estimated from the plan by performing detailed quantity take-offs. The unit prices used in the development of this estimate reflects recent construction bids in the Phoenix market for similar scopes of work.

Table 7-3: Phase 1 – Construction Cost Estimate

Project	Improvement	2014 Hard Construction Cost
3	Relocate Runway 7R-25L Run-up Areas	$1,112,575
25	Expand T-Hangars	$5,559,170
12	Construct Partial Length Parallel Taxiway D	$438,066
8	Relocate Runway 7R-25L South Side Holdbars	$603,750
6	Mitigate Direct Runway Access to Aprons	$74,539
7	Mitigate Excess Pavement	$848,475
10	Upgrade/Install Runway Blast Pads	$210,416
11	Improve Taxiway and Runway Shoulders (South Runway & Taxiway Only)	$426,229
15	Designate Helicopter Training Area	$45,029
16	Install Compass Calibration Pad	$12,500
23	Upgrade PAPI system to 4 lights	$250,000
26	Provide New Roadway Access (On-Airport)	$142,180
28	Expand Tie-downs	$829,301
	Total Construction Cost	**$10,552,230**
	Soft Costs	*$2,894,561*
	Total Phase 1 Program Cost	**$13,446,791**

Source: AZTEC Analysis based on comparable construction projects.

Note: All dollars are 2014 and do not include escalation. See Tables 7-7 through 7-10 for project cost breakdown.

Table 7-4: Phase 2 - Construction Cost Estimate

Project	Improvement	2014 Construction Cost
17	Relocate Public Safety Building with Fire Station	$10,041,728[1]
12	Construct Full Length Parallel Taxiway D	$957,213
27	Relocate Segmented Circle	$25,000
1	Relocate Taxiway B to 300' from Runway 7L-25R Centerline	$2,795,474
4	Mitigate Hot Spots 1 and 2 (Taxiways B5/C5 and B9/C9)	$633,269
9	Construct New Taxiway Connector	$146,760
6	Mitigate Direct Runway Access to Aprons	$353,285
28	Expand Tie-downs	$1,328,108
21	Construct Flight-school Classrooms	$7,871,763[2]
7	Mitigate Excess Pavement	$170,700
10	Upgrade/Install Runway Blast Pads	$166,493
14	Construct North Side Pilot's Lounge	$415,843
18	Construct Aviation Support Building	$7,980,709[2]
22	Develop Corporate Aviation Area	$1,103,419[2]
25	Expand T-Hangars	$16,657,829[2]
	Total Construction Cost	**$50,647,620**
	Soft Costs	*$14,866,634*
	Total Phase 2 Program Cost	**$65,514,254**

Source: AZTEC Analysis based on comparable construction projects.
Note: All dollars are 2014 and do not include escalation. See Tables 7-7 through 7-10 for project cost breakdown.

1. Costs for the public safety building may be shared among City departments (Aviation, Police, Fire).
2. Third-party funding may be utilized to develop facilities see Section 7.4 for more discussion.

Table 7-5: Phase 3 - Construction Cost Estimate

Project	Improvement	2014 Construction Cost
26	Provide New Roadway Access	$1,179,375
28	Expand Tie-downs	$2,371,623
25	Expand T-Hangars	$4,209,200[1]
21	Construct Flight-school Classrooms	$7,573,295[1]
2	Relocate Taxiway B3/C3 outside of Runway 7L-25R RPZ	$877,350
5	Construct Acute Angle Taxiway	$1,913,588
9	Construct New Taxiway Connector	$356,349
22	Develop Corporate Aviation Area	$1,295,855[1]
	Total Construction Cost	**$19,776,635**
	Soft Costs	*$5,759,814*
	Total Phase 2 Program Cost	**$25,536,449**

Source: AZTEC Analysis based on comparable construction projects.
Note: All dollars are 2014 and do not include escalation. See Tables 7-7 through 7-10 for project cost breakdown.

1. Third-party funding may be utilized to develop facilities see Section 7.4 for more discussion.

Table 7-6: Phase 4 - Construction Cost Estimate

Project	Improvement	2014 Construction Cost
13	Construct 800' Eastward Extension of Runway 7L-25R	$734,231
9	Construct New Taxiway Connector	$908,706
26	Provide New Roadway Access	$543,861
24	Develop Aviation Business Park	$320,360[1]
10	Upgrade/Install Runway Blast Pads	$83,273
19	Expand Cutter Aviation in-place	N/A
20	Expand Atlantic Aviation in-place	N/A
	Total Construction Cost	**$2,590,431**
	Soft Costs	*$700,310*
	Total Phase 2 Program Cost	**$3,290,741**

Source: AZTEC Analysis based on comparable construction projects.
Note: All dollars are 2014 and do not include escalation. See Tables 7-7 through 7-10 for project cost breakdown.
1. Third-party funding may be utilized to develop facilities see Section 7.4 for more discussion.
NA = Not applicable. Expansion cost funded by FBOs.

7.4 Funding Plan

This section discusses the funding plan for the Master Plan Recommended Alternative program at DVT, including an assessment of potential funding sources, key assumptions, project funding eligibility, a description of the proposed capital program, and an assessment of financial risk.

7.4.1 Potential Funding Sources

Financing capital improvements at DVT will not rely exclusively upon operating revenue or local financial resources. Capital improvements funding is available through various grant-in-aid programs on Federal levels. DVT has four potential sources of funding for capital projects at this time:

1. FAA AIP Funds
2. ADOT Grants
3. Third Party sources (private, etc.)
4. City sources

AIP Funds

Funding is provided to airports through the AIP as awarded by the FAA. AIP funds are divided into two categories: entitlement funds and discretionary funds. As of this writing, U.S. Congress is discussing a renewal of FAA's long-term funding program, which may change the provisions of the AIP program. The current provisions are as follows:

Entitlement Funds

Each primary airport is eligible for annual AIP entitlement grants to fund eligible projects based upon the number of passenger boardings at the airport. Non-primary airports, such as DVT, are currently eligible to receive annually the lesser of (a) 20% of the five-year cost of their current NPIAS value or (b) $150,000.

Also, under current law in any fiscal year the total amount made available for AIP grant funding under Section 48103 of Title 49 U.S.C. must be $3.2 billion or more. If the fiscal year appropriation is less than $3.2 billion, no entitlement funds are dispersed to non-primary airports.

Discretionary Funds

Discretionary funds are awarded at the discretion of the FAA for projects based on a national priority system. The highest weights are assigned to safety, reconstruction, and capacity projects. The airport sponsor cannot commence the work on projects funded using discretionary funds until the grant has been awarded and must be able to commence work during the same fiscal year as the grant agreement or within 6 months, whichever is later. As a non-primary airport in Arizona, DVT can fund up to 91.06% of eligible costs with grants; however, the portion covered by discretionary grants may be lower dependent on the amount of available discretionary funds allocated.

Future levels of AIP funding will be dependent on Congressional reauthorization. This analysis assumes that AIP funding will be maintained at current levels; however, with the national deficit, the long-term funding of AIP at these levels cannot be guaranteed.

Project Eligibility for AIP Funding

Most airfield capital projects and some revenue-generating projects such as terminals, hangars and fuel farms are eligible for AIP funding. However, operating and maintenance (O&M) costs, salaries, supplies, landscaping, and vehicles are generally not eligible.

ADOT Grants

ADOT has a program similar to the FAA's AIP which distributes grants to Arizona airports to:

- Assist in matching Federal grants;
- Fund projects that may not be funded by the FAA but still achieve the State system goals in safety, security, capacity, environmental, planning, or sustainability;
- Assist in airport pavement management;
- Assist statewide aviation planning; or
- Fund low-interest loans for airport projects.

The maximum amount of ADOT funds awarded to an airport in any fiscal year may not exceed 10% of the prior three fiscal years average revenue from all airports to the Arizona Aviation Fund. According to the ADOT draft 2014-2018 Airport Capital Improvement Program, this was approximately $2.1 million in FY 2014.

Third-Party Sources

Third-party sources, such as tenant-funded projects, may provide an alternative funding approach for new hangars, FBOs such as flight training facilities, aviation support or other revenue-generating facilities not operated by the airport.

Local Revenues

DVT is operated by the City of Phoenix Aviation Department, and therefore is not an independent financial entity. Ideally, however, the revenues at DVT would be sufficient to cover O&M costs as well as the local share of capital improvements. Since DVT is owned by the City, local funding options such as direct City funding and bond financing are possible. Local revenues are typically used to match Federal or state grants or to fund projects that are not eligible for, or cannot obtain, funding from other sources.

7.4.2 Key Financial Assumptions

Funding projections are necessarily reliant on a set of assumptions about future conditions. These are set forth as follows.

Activity Forecast

The FAA-approved DVT Master Plan Aviation Activity Forecast is the basis of the capacity-driven facility requirements analysis used to develop the proposed capital program. The phasing of projects such as the eastward extension of Runway 7L-25R, t-Hangar, tie-down, and FBO expansions, is dependent on the Forecast.

Cost Escalation

Master Plan Recommended Alternative project costs have been calculated in 2014 dollars. Inflation and cost escalation will no doubt increase these costs in the future, especially for Phase 3 and Phase 4 projects. The cost escalation rate is assumed to be 2.0% per year for the purpose of this analysis, based on recent inflation levels.

AIP Funding Levels and Discretionary Funding

AIP funding levels are assumed to remain unchanged through the forecast period. It is assumed that the national AIP funding level will remain at $3.2 billion or higher, allowing AIP grant availability to be similar to levels in recent years.

ADOT Funding

The ADOT funding program is assumed to continue in its present state. The maximum available funding is assumed to be $2.1 million per year.

7.4.3 Proposed Capital Program

Tables **7-7**, **7-8**, **7-9**, and **7-10** describe the proposed capital program by phase, cost breakout, and funding eligibility. Each phase is defined by Federal Fiscal Year (FY) ending September 30th. Phase 1 projects are projected to be implemented between FY 2015 and FY 2018, Phase 2 projects between FY 2019 and FY 2023, Phase 3 projects between FY 2024 and FY 2028, and Phase 4 projects between FY 2029 and FY 2033. Projects in the current 2015 Capital Improvement Program (CIP), which include FAA Airports Capital Improvement Program (ACIP) projects and ADOT grant projects, are also listed. Each project is listed by its Master Plan Recommended Alternative project number (see Section 6.4.1) and ACIP or ADOT Project Identifier as appropriate. In some instances there is an overlap between Master Plan and ACIP or ADOT projects.

Several steps were taken to estimate the project costs. The base construction costs for the Master Plan Recommended Alternative projects were developed earlier in this study (see Section 7.3) and include a 25% planning contingency to account for the preliminary nature of master plan concepts compared to detailed designs. All soft cost estimates include design, permitting, environmental monitoring, program management, contract procurement, and direct staff costs, including testing and inspection by other City departments. Some soft costs differ depending on whether or not the project uses FAA or ADOT grant funding. For example, project management costs were included for projects that were not eligible for grants. However, these costs were limited to construction administration for grant-eligible projects.

Since the Master Plan Recommended Alternative project costs were estimated in 2014 dollars, an escalation factor was included for future projects to reflect the impact of inflation. This is fairly minor for Phase 1 projects (5.1%) but significant for Phase 4 projects (40%).

The ACIP and ADOT grant requests are for total project amounts. Therefore, it was assumed that soft costs and escalation were already included as appropriate for these projects.

The FAA has a Facilities & Equipment (F&E) program separate from AIP entitlement and discretionary grants that is used to modernize and improve ATC, air navigation, and aviation safety systems, including aircraft lighting. No local match is required and the projects remain under the control of the FAA. It was assumed that the PAPI system upgrade would be funded from the F&E program.

Table 7-7: Phase 1 Costs by Funding Eligibility (2015-2018)

MP/ACIP/ ADOT Project	Improvement	Hard Construction Costs[1]	Soft Costs[2]	Total Costs (2014 Prices)[3]	Escalation[4]	Total Costs (Including Escalation)	AIP Eligible[5]	F&E Eligible[5]	ADOT Eligible[5]	Third Party Funding	Local
3, ACIP-2015-2	Relocate Runway 7R-25L Run-up Areas	$1,112,575	$285,487	$1,398,062	5.1%	$1,469,017	$1,337,687	-	$65,665	-	$65,665
26, ADOT 2015-1	Provide New Roadway Access (On-Airport)	$142,180	$36,483	$178,663	5.1%	$187,731	$170,948	-	$8,392	-	$8,392
ADOT 2015-1	Reconstruct Existing Perimeter Road - Phase I[6]					$1,742,269	$1,586,510	-	$77,879	-	$77,879
ACIP-2016-1	Reconstruct North Ramp - Phase I					$4,830,000	$4,398,198	-	$215,901	-	$215,901
ADOT 2016-1	Reconstruct Existing Perimeter Road - Phase II					$2,100,000	$1,912,260	-	$93,870	-	$93,870
ACIP-2017-1	Reconstruct North Ramp - Phase II					$3,930,000	$3,578,658	-	$175,671	-	$175,671
ADOT 2017-1	Reconstruct Existing Perimeter Road - Phase III					$2,100,000	$1,912,260	-	$93,870	-	$93,870
ADOT 2018-1	Reconstruct Southwest Ramp Pavement					$1,500,000	$1,365,900	-	$67,050	-	$67,050
25	Expand T-Hangars - Required by Taxiway D construction	$1,853,057	$475,494	$2,328,551	5.1%	$2,446,731	$2,227,993	-	$109,369	-	$109,369
25	Expand T-Hangars - Required to Accommodate Growth	$3,706,113	$1,103,681	$4,809,794	5.1%	$5,053,903	-	-	-	$5,053,903	-
12	Construct Partial Length Parallel Taxiway D	$438,066	$112,408	$550,474	5.1%	$578,412	$526,702	-	$25,855	-	$25,855
8	Relocate Runway 7R-25L South Side Holdbars (typical)	$603,750	$154,922	$758,672	5.1%	$797,177	$725,909	-	$35,634	-	$35,634
6	Mitigate Direct Runway Access to Aprons	$74,539	$19,127	$93,666	5.1%	$98,419	$89,621	-	$4,399	-	$4,399
7	Mitigate Excess Pavement	$848,475	$217,719	$1,066,194	5.1%	$1,120,306	$1,020,150	-	$50,078	-	$50,078
10	Upgrade/Install Runway Blast Pads	$210,416	$53,993	$264,409	5.1%	$277,828	$252,990	-	$12,419	-	$12,419
11	Improve Taxiway and Runway Shoulders (South Runway & Taxiway Only)	$426,229	$109,370	$535,599	5.1%	$562,782	$512,470	-	$25,156	-	$25,156
15	Designate Helicopter Training Area	$45,029	$11,554	$56,583	5.1%	$59,455	$54,140	-	$2,658	-	$2,658
16	Install Compass Calibration Pad	$12,500	$3,208	$15,708	5.1%	$16,505	$15,029	-	$738	-	$738
23	Upgrade PAPI system to 4 lights	$250,000	$64,150	$314,150	5.1%	$330,094	-	$330,094	-	-	-
28	Expand Tie-downs	$829,301	$246,966	$1,076,267	5.1%	$1,130,890	-	-	-	$1,130,890	-
	Total	**$10,552,230**	**$2,894,561**	**$13,446,791**		**$30,331,518**	**$21,687,425**	**$330,094**	**$1,064,603**	**$6,184,793**	**$1,064,603**

Sources: As noted and HNTB analysis

[1]DVT Master Plan Recommended Alternative - Phase 1 Project Costs and Phoenix Deer Valley Airport 2015 Five-Year Capital Improvement Program Project Request Data Sheet.
[2]Includes design, permits, environmental, program management, contract procurement, and direct staff for all projects. Includes construction administration for grant projects and project management for non-grant projects.
[3]Total of hard and soft costs.
[4]Assumes escalation of 2% per year to mid-point of Phase 1 for Master Plan projects. Escalation assumed to be imbedded in ACIP and ADOT project costs.
[5]See text for details. Eligibility does not guarantee funding.
[6]ACIP cost estimate less cost of new Access Roadway (MP 26)

Table 7-8: Phase 2 Costs by Funding Eligibility (2019-2023)

MP/ACIP/ ADOT Project	Improvement	Hard Construction Costs[1]	Soft Costs[2]	Total Costs (2014 Prices)[3]	Escalation[4]	Total Costs (Including Escalation)	AIP Eligible[5]	F&E Eligible[5]	ADOT Eligible[5]	Third Party Funding	Local
17	Relocate Public Safety Building with Fire Station	$10,041,728	$2,990,427	$13,032,155	14.9%	$14,969,849	-	-	-	$14,969,849	-
12	Construct Full Length Parallel Taxiway D	$957,213	$245,621	$1,202,834	14.9%	$1,381,678	$1,258,156	-	$61,761	-	$61,761
27	Relocate Segmented Circle	$25,000	$6,415	$31,415	14.9%	$36,086	$32,860	-	$1,613	-	$1,613
1, ACIP 2018-1	Relocate Taxiway B to 300' from Runway 7L-25R Centerline	$2,795,474	$717,319	$3,512,793	14.9%	$4,035,095	$3,674,357	-	$180,369	-	$180,369
ACIP 2019-1	Rehabilitate Runway 7R/25L					$4,000,000	$3,642,400	-	$178,800	-	$178,800
ADOT 2019-1	Reconstruct Southeast Ramp Pavement					$1,500,000	$1,365,900	-	$67,050	-	$67,050
ADOT 2019-2	Rehabilitate Taxiway C					$1,200,000	$1,092,720	-	$53,640	-	$53,640
4	Mitigate Hot Spots 1 and 2 (Taxiways B5/C5 and B9/C9)	$633,269	$162,497	$795,766	14.9%	$914,085	$832,366	-	$40,860	-	$40,860
9	Construct New Taxiway Connector	$146,790	$37,666	$184,456	14.9%	$211,882	$192,940	-	$9,471	-	$9,471
6	Mitigate Direct Runway Access to Aprons	$353,285	$90,653	$443,938	14.9%	$509,945	$464,356	-	$22,795	-	$22,795
28	Expand Tie-downs	$1,328,108	$395,511	$1,723,619	14.9%	$1,979,896	-	-	-	$1,979,896	-
21	Construct Flight-school Classrooms	$7,871,763	$2,344,211	$10,215,974	14.9%	$11,734,943	-	-	-	$11,734,943	-
7	Mitigate Excess Pavement	$170,700	$43,802	$214,502	14.9%	$246,395	$224,367	-	$11,014	-	$11,014
10	Upgrade/Install Runway Blast Pads	$166,493	$42,722	$209,215	14.9%	$240,322	$218,838	-	$10,742	-	$10,742
14	Construct North Side Pilot's Lounge[6]	$415,843	$123,838	$539,681	14.9%	$619,924	$564,503	-	$27,711	-	$27,711
18	Construct Aviation Support Building	$7,980,709	$2,376,655	$10,357,364	14.9%	$11,897,356	-	-	-	$11,897,356	-
22	Develop Corporate Aviation Area	$1,103,416	$328,597	$1,432,013	14.9%	$1,644,933	-	-	-	$1,644,933	-
25	Expand T-Hangars	$16,657,829	$4,960,701	$21,618,530	14.9%	$24,832,896	-	-	-	$24,832,896	-
	Total	**$50,647,620**	**$14,866,634**	**$65,514,254**		**$81,955,285**	**$13,563,762**	**-**	**$665,825**	**$67,059,873**	**$665,826**

Sources: As noted and HNTB analysis

[1]DVT Master Plan Recommended Alternative - Phase 2 Project Costs and Phoenix Deer Valley Airport 2015 Five-Year Capital Improvement Program Project Request Data Sheet.
[2]Includes design, permits, environmental, program management, contract procurement, and direct staff for all projects. Includes construction administration for grant projects and project management for non-grant projects.
[3]Total of hard and soft costs.
[4]Assumes escalation of 2% per year to mid-point of Phase 2 for Master Plan projects. Escalation assumed to be imbedded in ACIP and ADOT project costs.
[5]See text for details. Eligibility does not guarantee funding.
[6]Assumed to be Airport constructed. If an FBO develops facilities on the North Side, this may become a component and be funded by third party funding.

Table 7-9: Phase 3 Costs by Funding Eligibility (2024-2028)

MP/ACIP/ ADOT Project	Improvement	Hard Construction Costs[1]	Soft Costs[2]	Total Costs (2014 Prices)[3]	Escalation[4]	Total Costs (Including Escalation)	AIP Eligible[5]	F&E Eligible[5]	ADOT Eligible[5]	Third Party Funding	Local
26	Provide New Roadway Access	$1,179,375	$351,218	$1,530,593	26.8%	$1,941,162	-	-	-	$1,941,162	-
28	Expand Tie-downs	$2,371,623	$706,269	$3,077,892	26.8%	$3,903,512	-	-	-	$3,903,512	-
25	Expand T-Hangars	$4,209,200	$1,253,500	$5,462,700	26.8%	$6,928,024	-	-	-	$6,928,024	-
21	Construct Flight-school Classrooms	$7,573,295	$2,255,327	$9,828,622	26.8%	$12,465,070	-	-	-	$12,465,070	-
2	Relocate Taxiway B3/C3 outside of Runway 7L-25R RPZ	$877,350	$225,128	$1,102,478	26.8%	$1,398,209	$1,273,209	-	$62,500	-	$62,500
5, ACIP 2018-2	Construct Acute Angle Taxiway	$1,913,588	$491,027	$2,404,615	26.8%	$3,049,633	$2,776,996	-	$136,319	-	$136,319
9	Construct New Taxiway Connector	$356,349	$91,439	$447,788	26.8%	$567,904	$517,133	-	$25,385	-	$25,385
22	Develop Corporate Aviation Area	$1,295,855	$385,906	$1,681,761	26.8%	$2,132,879	-	-	-	$2,132,879	-
	Total	**$19,776,635**	**$5,759,814**	**$25,536,449**		**$32,386,391**	**$4,567,338**	**-**	**$224,204**	**$27,370,646**	**$224,204**

Sources: As noted and HNTB analysis.

[1]DVT Master Plan Recommended Alternative - Phase 3 Project Costs and Phoenix Deer Valley Airport 2015 Five-Year Capital Improvement Program Project Request Data Sheet.
[2]Includes design, permits, environmental, program management, contract procurement, and direct staff for all projects. Includes construction administration for grant projects and project management for non-grant projects.
[3]Total of hard and soft costs.
[4]Assumes escalation of 2% per year to mid-point of Phase 3 for Master Plan projects. Escalation assumed to be imbedded in ACIP and ADOT project costs.
[5]See text for details. Eligibility does not guarantee funding.

Table 7-10: Phase 4 Costs by Funding Eligibility (2029-2033)

MP/ACIP /ADOT Project	Improvement	Hard Construction Costs[1]	Soft Costs[2]	Total Costs (2014 Prices)[3]	Escalation[4]	Total Costs (Including Escalation)	AIP Eligible[5]	F&E Eligible[5]	ADOT Eligible[5]	Third Party Funding	Local
13	Construct 800' Eastward Extension of Runway 7L-25R	$734,231	$188,404	$922,635	40.0%	$1,291,911	$1,176,414	-	$57,748	-	$57,748
9	Construct New Taxiway Connector	$908,706	$233,174	$1,141,880	40.0%	$1,598,908	$1,455,965	-	$71,471	-	$71,471
26	Provide New Roadway Access	$543,861	$161,962	$705,823	40.0%	$988,322	-	-	-	$988,322	-
24	Develop Aviation Business Park	$320,360	$95,403	$415,763	40.0%	$582,169	-	-	-	$582,169	-
10	Upgrade/Install Runway Blast Pads	$83,273	$21,368	$104,641	40.0%	$146,522	$133,423	-	$6,550	-	$6,550
19	Expand Cutter Aviation in-place	-	-	-	40.0%	-	-	-	-	-	-
20	Expand Atlantic Aviation in-place	-	-	-	40.0%	-	-	-	-	-	-
	Total	**$2,590,431**	**$700,310**	**$3,290,741**		**$4,607,833**	**$2,765,803**	**-**	**$135,769**	**$1,570,491**	**$135,769**

Sources: As noted and HNTB analysis.

[1]DVT Master Plan Recommended Alternative - Phase 4 Project Costs and Phoenix Deer Valley Airport 2015 Five-Year Capital Improvement Program Project Request Data Sheet.
[2]Includes design, permits, environmental, program management, contract procurement, and direct staff for all projects. Includes construction administration for grant projects and project management for non-grant projects.
[3]Total of hard and soft costs.
[4]Assumes escalation of 2% per year to mid-point of Phase 4 for Master Plan projects. Escalation assumed to be imbedded in ACIP and ADOT project costs.
[5]See text for details. Eligibility does not guarantee funding.

Although some public-access revenue generating projects are eligible for AIP or ADOT grants, it is assumed that these projects would primarily be funded by third parties. These projects include most t-hangar and tie-down ramp expansion, flight school classrooms, aviation support buildings, corporate aviation areas, a new aviation business park and related roadways, and expansion of current FBOs. Some of the t-hangar expansion would be required by the proposed Taxiway D construction, and therefore it is expected that grant funding would be sought for those t-hangars.

Table 7-11 summarizes the project costs by phase and eligibility. A little more than 50% of Master Plan costs are scheduled for Phase 2, but most of these are revenue-generating projects that are anticipated to attract third-party funding. The majority of grant-eligible projects are expected to occur in Phase 1, primarily because of the apron and perimeter road reconstruction projects expected to occur during that period.

7.4.4 Funding Capacity and Risk Analysis

The ability to implement the Master Plan Recommended Alternative projects will in large part depend on the amount of grant funding obtained from the FAA and ADOT. **Table 7-12** presents the history of grant funding for DVT projects during the 2004-2013 period. As shown, DVT has been very successful in obtaining grants over that time, including a high of $11.6 million in AIP funding in FY 2010 and a high of $2.4 million in ADOT funding in 2007. The 2007 ADOT funding amount was close to the maximum allowable amount under ADOT rules.

DVT obtained an average of $4.2 million per year in FAA grants and an average of $0.9 million in ADOT grants during that time. Even taking the average of the five lowest years in that span results in an average of $1.7 million per year in FAA grants and over $300,000 per year in ADOT grants. As long as Congress appropriates at least $3.2 billion in AIP funds, DVT would be eligible for at least $150,000 in entitlement funds. However, DVT has significantly exceeded that amount in recent years.

As noted earlier, funding eligibility is not a guarantee of funding. Three alternative funding scenarios were prepared to evaluate the funding risk, as shown in **Table 7-13**. The three funding scenarios are as follows:

- **Baseline Scenario**: This scenario assumes that FAA and ADOT continue to provide funding at historical levels similar to the past nine years.
- **Aggressive Scenario**: This scenario assumes that eligible projects are funded at their full eligible amount.
- **Conservative Scenario**: This scenario assumes that FAA and ADOT grant levels are reduced to levels comparable to the average of the four lowest years of funding in **Table 7-12**.

Table 7-11: Summary of Project Costs by Phase and Eligibility

Phase	Total Costs (Including Escalation)	AIP Eligible	F&E Eligible	ADOT Eligible	Third Party Funding	Local
1	$30,331,518	$21,687,425	$330,094	$1,064,603	$6,184,793	$1,064,603
2	$81,955,285	$13,563,762	-	$665,825	$67,059,873	$665,826
3	$32,386,391	$4,567,338	-	$224,204	$27,370,646	$224,204
4	$4,607,833	$2,765,803	-	$135,769	$1,570,491	$135,769
Total	**$149,281,028**	**$42,584,327**	**$330,094**	**$2,090,401**	**$102,185,804**	**$2,090,402**

Sources: Tables 7-7 through 7-10

Table 7-12: Recent FAA and ADOT Grant History at DVT

Federal Fiscal Year	FAA Grants	ADOT Grants	Total
2004	$1,821,000	$550,000	$2,371,000
2005	$442,500	$585,000	$1,027,500
2006	$3,000,000	$1,305,000	$4,305,000
2007	$4,400,799	$2,400,000	$6,800,799
2008	$1,093,316	$990,000	$2,083,316
2009	$8,230,962	$162,840	$8,393,802
2010	$11,590,000	-	$11,590,000
2011	$6,289,400	$387,538	$6,676,938
2012	$3,239,299	$411,311	$3,650,610
2013	$2,329,401	$1,953,000	$4,282,401
Total	**$42,436,677**	**$8,744,689**	**$51,181,366**
Average Annual	*$4,243,668*	*$874,469*	*$5,118,137*
Average of Four Lowest Years	*$1,716,243*	*$302,338*	*$2,039,581*

Source: City of Phoenix Aviation Department

Under the baseline scenario, the FAA would fully fund the Master Plan Recommended Alternative projects during Phases 2, 3, and 4. In Phase 1, $17.3 million of the $21.7 million eligible amount would be funded. ADOT would be able to fund some of the shortfall, but the local share would rise from $1.0 million under the aggressive scenario to $3.4 million. Under the conservative scenario, there would be a significant shortfall in FAA and ADOT funding in Phase 1 and a more moderate shortfall in Phase 2. Projects in Phases 3 and Phase 4 could be funded to their full eligible amount even under the conservative scenario.

It should be noted that many of the Master Plan Recommended Alternative projects are safety-related projects and therefore should receive a high priority from FAA and ADOT. This, combined with DVT's past history of successfully obtaining grant funding, suggest that DVT should be able to meet or exceed the baseline funding scenario. If there is a shortfall, the Aviation Department has the option of delaying the phasing of some projects or committing additional local resources.

Ideally, the Aviation Department would be able to cover the local share of costs from net revenues collected at DVT. **Tables 7-14** and **7-15** present revenues and O&M costs at DVT from FY 2006 through 2014.

Table 7-13: Potential Grant Funding Scenarios at DVT

Phase	FAA Grants	ADOT Grants	Third Party Funding	Local	Total
Baseline Funding Scenario[1]					
1	$17,304,765	$3,420,980	$6,184,793	$3,420,980	$30,331,518
2	$13,563,762	$665,825	$67,059,873	$665,825	$81,955,285
3	$4,567,338	$224,204	$27,370,646	$224,204	$32,386,391
4	$2,765,803	$135,769	$1,570,491	$135,769	$4,607,833
Total	**$38,201,667**	**$4,446,778**	**$102,185,804**	**$4,446,778**	**$149,281,028**
Aggressive Funding Scenario[2]					
1	$22,017,519	$1,064,603	$6,184,793	$1,064,603	$30,331,518
2	$13,563,762	$665,825	$67,059,873	$665,825	$81,955,285
3	$4,567,338	$224,204	$27,370,646	$224,204	$32,386,391
4	$2,765,803	$135,769	$1,570,491	$135,769	$4,607,833
Total	**$42,914,421**	**$2,090,401**	**$102,185,804**	**$2,090,401**	**$149,281,028**
Conservative Funding Scenario[3]					
1	$7,279,067	$1,209,351	$6,184,793	$15,658,307	$30,331,518
2	$8,686,217	$1,511,689	$67,059,873	$4,697,506	$81,955,285
3	$4,567,338	$224,204	$27,370,646	$224,204	$32,386,391
4	$2,765,803	$135,769	$1,570,491	$135,769	$4,607,833
Total	**$23,298,425**	**$3,081,013**	**$102,185,804**	**$20,715,786**	**$149,281,028**

Sources: As noted and HNTB analysis

[1]Assumes FAA and ADOT provide grant funding at the same average annual rate as the last nine years.
[2]Assumes FAA and ADOT fund projects to their full eligible amount.
[3]Assumes FAA and ADOT provide grants at reduced levels, comparable to the four lowest funding years during the last nine years.

Table 7-14: Historical Operating Revenues at DVT

	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014
Revenue Categories									
Landing Fees	$2,544	$1,476	$296	-	-	-	-	-	-
Commercial Tenant Office	-	-	-	-	-	-	-	-	-
Commercial Tenant Food & Bev	$148,026	$120,403	$100,779	$88,344	$87,165	$90,242	$91,776	$91,251	$93,853
Commercial Tenant Retail	$22,878	$20,453	$19,291	$19,418	$37,819	$44,132	$41,450	$36,634	$43,479
FBO Fees	$104,911	$263,146	$92,698	$172,257	$143,174	$129,690	$128,971	$130,997	$128,150
SASO[1] Fees	-	-	-	$47,344	$148,180	$162,021	$162,076	$169,219	$161,796
Car Rental	$38,741	$35,015	$42,760	$29,267	$31,067	$20,154	$9,503	$11,346	$16,392
Hangars	$1,762,320	$2,008,044	$1,958,488	$1,891,326	$1,954,992	$1,977,130	$1,982,277	$2,090,226	$2,013,441
Tie Downs	$259,643	$287,247	$277,916	$246,074	$225,812	$196,134	$172,195	$160,393	$156,152
Land Rental	$21,968	$188,918	$31,786	$42,077	$34,532	$33,004	$34,092	$34,395	$34,331
Building Rental	$108,022	$23,861	$7,793	$7,793	$113,893	$117,297	$120,536	$123,880	$127,210
Fuel Flowage	$284,676	$243,658	$215,461	$214,674	$225,492	$211,057	$209,907	$207,811	$228,045
Other	$18,988	$5,358	$(5,896)	$(27,337)	$13,314	$244,885	$7,008	$6,203	$9,773
Total	**$2,772,717**	**$3,197,579**	**$2,741,373**	**$2,731,236**	**$3,015,439**	**$3,225,744**	**$2,959,791**	**$3,062,356**	**$3,012,622**

Source: City of Phoenix Aviation Enterprise Fund, Deer Valley Operating Fund - Revenues

[1]Specialized Aviation Service Operations.

Table 7-15: Historical Operating Expenditures at DVT

	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014
Expenditure Categories									
Runway/Taxiway	$155,007	$245,080	$261,535	$182,288	$349,102	$514,032	$384,299	$629,675	$611,788
Commercial	$28,034	$17,740	$21,534	$50,292	$45,654	$36,972	$18,215	$28,539	$194,271
FBOs	$41	$1,375	$87	-	-	$73	-	-	-
Executive Hangars	$5,604	$2,414	$2,780	$15,638	$8,704	$3,528	$21,403	$6,897	$6,362
GA Terminal	$44,007	$53,241	$59,049	$43,203	$63,892	$197,727	$94,830	$80,917	$58,446
GA Ramps	$49,577	$74,297	$47,978	$55,166	$85,458	$130,609	$150,742	$205,170	$209,844
Terminal Hangars	$108,446	$102,964	$100,415	$88,615	$139,556	$172,959	$131,031	$171,927	$166,635
Open Tie-Downs	$4,125	$2,905	$1,930	$1,791	$5,664	$1,073	$2,182	$26,702	$4,944
Fuel	$230	$344	$1,812	-	$525	-	$1,323	-	$1,320
Transient Ramp	$193	$257	$481	-	$370	-	$123	$2,936	$18,100
Covered Tie-Downs	$1,124	$892	$1,222	$348	$853	$218	$368	$526	$2,589
Administration	$488,282	$563,546	$603,364	$621,777	$661,919	$674,693	$613,914	$693,405	$627,515
Roadways	$75,779	$70,877	$74,912	$84,350	$166,596	$227,190	$226,565	$244,842	$151,378
Vehicle Maintenance	$5,284	$3,493	$6,509	$3,941	$7,319	$12,318	$18,640	$15,336	$50,997
Maintenance Supplies	$203,345	$224,450	$258,781	$245,763	$420,853	$524,570	$398,187	$452,206	$480,986
GA Services	$557,312	$554,849	$599,378	$734,718	$420,477	$112,276	$410,661	$295,290	$545,832
Other	$320	$4,900	$4,924	$60,668	-	$510	$355	-	-
Total	**$1,726,710**	**1,923,623**	**$2,046,691**	**$2,188,558**	**$2,376,941**	**$2,608,747**	**$2,472,835**	**$2,854,367**	**$3,131,007**

Source: City of Phoenix Aviation Enterprise Fund, Deer Valley Operating Fund - Expenditures

In FY 2006 and FY 2007, DVT revenues exceeded DVT O&M costs by a substantial amount, in excess of $1.0 million. However, revenues have remained flat while O&M costs have been steadily increasing, especially in O&M related to runways, taxiways and apron. Typically these costs rise at the end of airfield reconstruction cycles and will presumably go down once the current runway and ramp rehabilitation and reconstruction projects are completed.

In addition, anticipated third-party development should generate new revenue opportunities for DVT. As an example, one upcoming corporate hangar project is anticipated to potentially generate $650,000 in new revenue for the Aviation Department over a five year period.

The above analysis suggests that DVT should be able to obtain most of the required funding from FAA and ADOT grants or third-party developers. Although these sources will minimize the required local funding, it is unlikely that the Aviation Department will be able to fund the local share solely from DVT net revenues, at least during the short term. Thus, some infusions from elsewhere in the City's aviation system, such as PHX, may be required.

7.5 Five Year Capital Improvement Program

The recommended five year CIP for DVT represents a year-by-year phasing of DVT's priority projects from FY 2015 through FY 2019. The CIP includes all of the Phase 1 projects and the first year of the Phase 2 projects. **Table 7-16** presents the DVT 5-Year CIP including eligible funding sources.

The year-by-year phasing of the CIP projects was based on the phasing plan presented in Section 7.1. Specifically, the relocation of the Runway 7R-25L south side holdbars (MP Project 8) must be preceded by the relocation of the Runway 7R-25L run up areas (MP Project 3) and construction of partial-length parallel Taxiway D (MP Project 12). Taxiway D will displace the northern-most row of t-hangars which will need to be relocated to the north side of DVT (MP 25) and will require the mitigation of direct access between the south apron and Runway 7R-25L (MP Project 6). Finally, in 2019 the relocation of Taxiway B from 200-feet to 300-feet from the Runway 7L-25R centerline (MP Project 1)and the relocation of the segmented circle (MP Project 27) will be required to mitigate Hot Spots 1 and 2 (MP Project 4) in future years.

Other independent Master Plan Recommended Alternative projects were phased to spread AIP and ADOT funding requests as evenly as possible over the five year period.

The resulting CIP would require $3.4 million in funding in FY 2015, $11.8 million in FY 2016, $6.6 million in FY 2017, $8.5 million in FY 2018, and $10.8 million in FY 2019.

Table 7-16: Proposed DVT 5-Year CIP

Project	Improvement	Total Escalated Costs	AIP Eligible	F&E Eligible	ADOT Eligible	Third Party Funding	Local
		FY 2015					
3, ACIP-2015-2	Relocate Runway 7R-25L Run-up Areas	$1,469,017	$1,337,687	-	$65,665	-	$65,665
26, ADOT-2015-1	Provide New Roadway Access (On-Airport)	$187,731	$170,948	-	$8,392	-	$8,392
ADOT 2015-1	Reconstruct Existing Perimeter Road - Phase I (f)	$1,742,269	$1,586,510	-	$77,879	-	$77,879
		FY 2016					
ACIP-2016-1	Reconstruct North Ramp - Phase I	$4,830,000	$4,398,198	-	$215,901	-	$215,901
ADOT 2016-1	Reconstruct Existing Perimeter Road - Phase II	$2,100,000	$1,912,260	-	$93,870	-	$93,870
25	Expand T-Hangars - Required by Taxiway D construction (g)	$2,446,731	$2,227,993	-	$109,369	-	$109,369
28	Expand Tie-downs	$1,130,890	-	-	-	$1,130,890	-
8	Relocate Runway 7R-25L South Side Holdbars	$797,177	$725,909	-	$35,634	-	$35,634
6	Mitigate Direct Runway Access to Aprons	$98,419	$89,621	-	$4,399	-	$4,399
23	Upgrade PAPI system to 4 lights	$330,094	-	$330,094	-	-	-
15	Designate Helicopter Training Area	$59,455	$54,140	-	$2,658	-	$2,658
16	Install Compass Calibration Pad	$16,505	$15,029	-	$738	-	$738
		FY 2017					
ACIP-2017-1	Reconstruct North Ramp - Phase II	$3,930,000	$3,578,658	-	$175,671	-	$175,671
ADOT 2017-1	Reconstruct Existing Perimeter Road - Phase III	$2,100,000	$1,912,260	-	$93,870	-	$93,870
12	Construct Partial Length Parallel Taxiway D	$578,412	$526,702	-	$25,855	-	$25,855
		FY 2018					
ADOT 2018-1	Reconstruct Southwest Ramp Pavement	$1,500,000	$1,365,900	-	$67,050	-	$67,050
11	Improve Taxiway and Runway Shoulders (South Runway & Taxiway Only)	$562,782	$512,470	-	$25,156	-	$25,156
7	Mitigate Excess Pavement	$1,120,306	$1,020,150	-	$50,078	-	$50,078
10	Upgrade/Install Runway Blast Pads	$277,828	$252,990	-	$12,419	-	$12,419
25	Expand T-Hangars - Required to Accommodate Growth (h)	$5,053,903	-	-	-	$5,053,903	-
		FY 2019					
27	Relocate Segmented Circle	$36,086	$32,860	-	$1,613	-	$1,613
1, ACIP 2018-1	Relocate Taxiway B to 300' from Runway 7L-25R Centerline	$4,035,095	$3,674,357	-	$180,369	-	$180,369
ACIP 2019-1	Rehabilitate Runway 7R/25L	$4,000,000	$3,642,400	-	$178,800	-	$178,800
ADOT 2019-1	Reconstruct Southeast Ramp Pavement	$1,500,000	$1,365,900	-	$67,050	-	$67,050
ADOT 2019-2	Rehabilitate Taxiway C	$ 1,200,000	$1,092,720	-	$53,640	-	$53,640
		Totals by Fiscal Year					
	2015	$3,399,017	$3,095,145	-	$151,936	-	$151,936
	2016	$11,809,271	$9,423,150	$330,094	$462,568	$1,130,890	$462,568
	2017	$6,608,412	$6,017,620	-	$295,396	-	$295,396
	2018	$8,514,819	$3,151,510	-	$154,703	$5,053,903	$154,703
	2019	$10,771,181	$9,808,237	-	$481,472	-	$481,472
	Total	**$41,102,699**	**$31,495,662**	**$330,094**	**$1,546,075**	**$6,184,793**	**$1,546,075**

Sources: Table 7-7, Table 7-8, and HNTB analysis

8.0 Sustainability Considerations

The City is committed to demonstrating environmental responsibility and incorporating sustainability principles and practices into its operational, management and administrative processes. As part of the commitment to sustainability, the Aviation Department completed a Sustainability Management Plan for the City's airports. The Sustainability Management Plan addresses economic, environmental, and social sustainability by focusing initiatives on seven key areas:

- Air Quality: Supporting initiatives to maintain and improve local air quality
- Energy: Investing in renewable and energy efficient technologies
- Greenhouse Gas Emissions: Minimizing greenhouse gases resulting from airport operations
- Outreach: Working with neighbors, business partners, and customers to improve community outreach
- Policies and Contracts: Integrating economic, environmental, and sustainability into business practices
- Waste and Recycling: Reducing waste and increasing recycling opportunities for tenants, customers and employees
- Water Conservation: Minimizing water consumption for airport operations and landscaping

This Sustainability Considerations Chapter presents sustainability initiatives, considering the intent of the Sustainability Management Plan, which may be undertaken at DVT during the implementation of the Master Plan Recommended Alternative.

8.1 Design and Construction

In 2010 the Aviation Department developed the Sustainable Horizontal Design and Construction Green Guide (DCS Green Guide) to address sustainability considerations for horizontal construction projects (e.g. non-building design and construction where vertical guidelines do not apply). The DCS Green Guide outlines performance standards for horizontal design and construction and is intended to be complementary to the sustainability initiatives for building design and construction through implementation of Leadership in Energy and Environmental Design (LEED®) standards. Similar to LEED®, credits are earned for satisfying criteria designed to address specific environmental impacts inherent to the project's design and construction. The DCS Green Guide includes Life Cycle Cost Analysis tools for use during project development. Specific construction and life cycle related goals are also applied to each project, such as recycling pavement materials. Where feasible, excavated soils, asphalts, and concrete removed during rehabilitation projects are reused in new pavement designs, reducing waste and debris transportation emissions. For example, during the relocation and construction of Taxiway A at DVT, millings from the old asphalt were recycled for use as shoulder pavement for the new taxiway.

By incorporating sustainable technology reviews into the project design process and low impact practices during construction, the DCS Green Guide strives to reduce or avoid impacts to natural resources and neighboring communities. Additional benefits of this initiative occur through the long-term reduction of resource use and operating costs.

8.1.1 Heavy Civil Design and Construction

At the onset of the design and construction phases for each of the Master Plan Recommended Alternative projects, the selected design and construction teams will meet with the Aviation Department and DCS project managers to review the Horizontal Design Sustainability Checklist presented in the DCS Green Guide and select the appropriate project Performance Standards. The Design and Construction Performance Standards and associated points are summarized in **Tables 8-1** and **8-2,** respectively, and both are described in greater detail in the DCS Green Guide.

Table 8-3 identifies potential DCS Green Guide Design and Construction Performance Standards that might be applicable to the Master Plan Recommended Alternative projects. The identified standards are meant as a guideline and each project should be reviewed independently with the selected design and construction teams as the design and subsequent construction phases begin. As details of the project are solidified, these identified potential criteria may change.

8.1.2 LEED® Considerations

LEED® Standards are also recommended during new construction or major building renovation corresponding with City guidelines. LEED® has several rating systems, including one for design and construction, and each rating system includes requirements that address the unique needs of building and project types for LEED® certification. The rating systems include credit categories which identify specific prerequisites the projects must satisfy and a variety of credits that projects can pursue to earn points toward LEED® certification. Categories include:

- Materials and Resources – Encourages using sustainable building materials and reducing waste
- Water Efficiency – Promotes smarter use of water to reduce potable water consumption
- Energy and Atmosphere – Promotes better building energy performances through innovative strategies
- Sustainable Sites – Encourages strategies that minimize the impacts on ecosystems and water resources
- Indoor Environmental Quality – Promotes better indoor air quality and access to daylight and views

Four levels of LEED® certification are available and the certification a project receives is based on the number of points the project earns. Typical certification thresholds are:

- Certified: 40 to 49 points
- Silver: 50 to 59 points

- Gold: 60 to 79 points
- Platinum: 80 or more points

Similar to the DCS Green Guide, the City has specific LEED points that are required for City construction projects, outlined in the City's Building Standards. Planning ahead to identify what points are achievable is important, as it is easier to integrate LEED® items into the project at the onset rather than trying to alter the project to capture points once it is well into the design phase.

Most vertical projects in the Master Plan Recommended Alternative would be completed by third-party owners and operators. However, as building development is identified, the City should discuss sustainability and LEED® considerations with the developer. LEED® certification should also be considered as a minimum standard for development at DVT and any building owned by the City must be constructed to LEED® standards.

8.2 Operations and Maintenance

The Aviation Department has completed a Sustainability Management Plan for the City's airports. This plan includes recommendations for assessing and improving sustainability, including those associated with the operations and maintenance of DVT. Initiatives that are on-going or recommended for further review relative to DVT include:

- Implementation of a water conservation strategy based on the water use baseline audit completed in March 2015 as part of the Sustainability Management Plan including:
    - Developing minimum specifications for intense water use equipment and systems
    - Establishing a Water Management Task Force and coordinating with Stakeholders through the Aviation Department's Business and Properties Division (B&P) Tenant Outreach Program
    - Developing a draft Water Conservation Master Plan (WCMP)
    - Drafting an Aviation Department Standard Operating Procedure (SOP) for managing water accounts that includes opening, closing, tracking, and database updating and sets key performance indicators and procedures to maintain meter database.
- Development of an energy conservation strategy, planned to be completed by the City over the next year
- Completion of an annual greenhouse gas inventory and General Air Quality Conformity analysis
- Purchase of low emissions vehicles for the airport fleet
- Increase the use of Environmentally Preferable Purchasing products
- Use of LED airfield lighting
- Conduct community and tenant outreach to spread awareness of solid waste recycling, water usage and energy conservation programs
- Improve solid waste recycling by engaging tenants in program development and supplying infrastructure and waste pick up

- Review of tenant contracts, identifying ways to encourage tenant recycling and use of water and energy-conserving equipment
- Implementation of a xeriscaping program which would utilize drought-tolerant landscaping to reduce or eliminates the need for supplemental water from irrigation

Also of note, the two flight schools that operate at DVT train a large number of foreign pilots and have measures in place to reduce vehicle trips by providing busing between the primary student housing and DVT. These practices should be encouraged to help limit vehicular trips to and from DVT.

Relative to airfield operations, extended taxi hold time and taxi delays contributes to air emissions. Airport flight operations emissions are captured in emission inventories by the Maricopa Association of Governments in association with the Maricopa County Air Quality Department. These inventories are used for decision making for the SIP to meet requirements of the Clean Air Act. Extended taxi hold times and delays are the second biggest contributor to air emissions at an airport next to the number of flight operations. Several Master Plan Recommended Alternative airfield projects would help reduce airfield delay, including:

- **Relocate Runway 7R-25L Run-up Areas:** The proposed run-up areas would have a dedicated entrance and exit taxilane, avoiding a mandatory first-in, first-out system. The run-up areas are also located beyond the ends of the runway allowing aircraft ready to depart the ability to bypass aircraft waiting in the run-up area. These features will help reduce airfield delay by allowing aircraft to be more optimally sequenced and not incur additional delays as a result of inadequate runway access.
- **Construct Full Length Parallel Taxiway D:** The proposed full length parallel Taxiway D, located south of existing Taxiway C, will enable the segregation of aircraft allowing departing and arriving aircraft to operate on separate taxiways once the holdbars south of Runway 7R-25L are relocated. The segregation of aircraft between taxiways would allow arriving aircraft to taxi directly onto Taxiway C, no longer requiring them to hold short of Taxiway C upon arrival to avoid other taxiing aircraft, thus reducing taxi hold time and taxi delays.
- **Construct 800 Foot Eastward Extension of Runway 7L-25R:** The proposed extension of Runway 7L-25R 800 feet to the east for a total length of 5,300 feet will allow corporate aircraft to use the runway and provides the capability to better balance the utilization between two runways and reduce airfield delay in the future as facilities expand to the north side of the airfield. The runway extension will reduce the need for cross-field taxiing as both runways will be capable of serving the majority of the fleet.
- **Construct Acute Angle Taxiways:** The five proposed new/relocated and one enhanced existing acute angle taxiway connectors will help minimize runway occupancy time so that minimum in-trail arrival separations can be maintained, which optimizes the capacity of the airfield and reduces delay. The proposed location of the acute angle taxiways will accommodate the majority of the propeller driven fleet and increase airfield efficiency.

- **Construct New Taxiway Connectors:** The proposed new taxiway connectors will provide new runway crossing opportunity near the east end of Taxiway B and additional 90 degree taxiway exits from Runways 7L-25R and 7R-25L. These new connectors will reduce runway occupancy time and the proposed connector serving the future extension of Runway 7L-25R will provide an opportunity for intersection departures and facilitate the rapid exit of an aircraft that aborts its departure, reducing airfield delay.

8.3 Recycling and Waste Reduction

As part of the Master Plan inventory, DVT tenant and user surveys, which included questions about recycling, were distributed to tenants and based pilots. Tenants were asked if they had a recycling program and where they disposed of hazardous waste. The FBOs indicated that they contracted with third-party contractors to dispose of hazardous waste while all other unregulated tenants (under the Resource Conservation and Recovery Act [RCRA]) responded that they deposited fuel and batteries in one of the four on-airport hazardous waste accumulation sites supplied by the Aviation Department for general aviation pilots. No tenants indicated they had solid waste recycling programs. However, most indicated they would participate if a recycling program was available.

The DVT pilot's survey asked respondents if they would participate if the Aviation Department provided an expanded recycling program for soda cans, water bottles, and paper items beyond the terminal's recycling program. Seventy-seven percent (77%) of users responded affirmatively that they would participate.

The Aviation Department is initiating a solid waste management plan for the City's airports which will review opportunities for reducing solid waste and increasing recycling. Initiatives that should be considered for further review relative to recycling and waste reduction include:

- Conducting an airport-wide waste audit
- Improving DVT's solid waste recycling by providing blue bins throughout the airport and including opportunities for tenants to participate in the program
- Recycling and reuse of construction debris
- Recycling or composting landscaping and other green waste

8.4 Financial Sustainability

The City's sustainability initiatives extend to economic considerations. To be financially sustainable requires being fiscally responsible. This includes initiating projects as they are needed, which not only limits the waste of resources spent maintaining unused facilities, but avoids having infrastructure sit underutilized for a portion of its limited life cycle. It is also important to build infrastructure that is required for short-term needs in a way or location that can be repurposed for long-term needs. For example, the proposed helicopter training area requires very little infrastructure or investment and the site could be reused for other purposes without requiring the demolition of costly facilities. Surface parking is another low investment short-term use for a site that might be designated for more significant development in the long-term.

In an effort to reduce solid waste and limit unnecessary expenditure, the Master Plan Recommended Alternative projects limit the amount of airfield pavement that must be altered to meet safety requirements. For instance, proposed taxiway reconfigurations account for the location of existing taxiways and limit the removal and relocation of pavement to the extent feasible while still ensuring taxiways are located to adequately accommodate the forecast fleet mix and required safety standards. By limiting the relocation and removal of taxiways, the amount of required pavement demolition and associated cost is reduced. In addition, the recommended removal of excess pavement may be accomplished by striping areas non-usable rather than demolishing pavement.

To support financial sustainability relative to Master Plan Recommended Alternative projects, "just in time" development is proposed which would allow projects to be constructed just prior to being needed, but not so far ahead that underutilized development occurs. In the interest of financial sustainability, Master Plan Recommended Alternative projects are included in the phasing plans as they are needed. However, activity at DVT will be monitored through the 20-year planning horizon and adjustments made to the phasing as activity deviates from the Forecast.

Table 8-1: Design - DCS Green Guide Performance Standards

Standard	Title	Points
Administrative		
HD-AD-1	LEED® Accredited Professional with Pavement Design Experience - Roles and Responsibilities	Required for all projects
HD-AD-2	Environmentally Preferred Purchasing	1 point
HD-AD-3	Low Impact Development	1 point
Pavement		
HD-PV-1	Subgrade Materials Enhancement, Supplements, Review, Engineering and Testing	2 points
HD-PV-2	Long Life Pavement	2 points
HD-PV-3	Alternative and Innovative Pavements	2 points
HD-PV-4	Maximize Recycling and Reuse of Existing Pavements and Materials	
	Recycle 25% to 50% of materials	1 point
	Recycle 51% to 75% of materials	1 point
Lighting, Mechanical and Utility Systems Design		
HD-LM-1	Lighting Technologies Review and Energy Conservation Return on Investment	2 points
HD-LM-2	Mechanical Technologies Review and Energy Conservation Return of Investments	2 points
HD-LM-3	Flexibility and Reusability Reviews	2 points
Landside Site Design		
HD-LD-1	Urban Design Principals: Pedestrian Comfort, Urban Heat Island and Increased Connectivity	1 point
	Develop report and review two urban design principles for project	1 point
	Develop report and review four urban design principles for project	1 point
	Successful implementation of at least two approved pedestrian comfort designs	2 points
HD-LD-2	Landscape to Reduce Irrigation Needs and Urban Heat Island Effect (non-roof)	1 point
	Reduce potable water use for landscaping irrigation	2 points
	Eliminate potable water use for landscaping irrigation	1 point

Standard	Title	Points
Parking Lots and Structures		
HD-PS-1	Surface Parking Lots	
	Analyze listed Required Actions	1point
	Design all City project manager approved initiatives	2 points
HD-PS-2	Parking Structures	
	Analyze listed Required Actions	1 point
	Design all City project manager approved initiatives	2 points
Innovation		
HD-ID-1	Innovation in Design	Variable points

Source: The City's Sustainable Horizontal Design and Construction Green Guide

Table 8-2: Construction - DCS Green Guide Performance Standards

Standard	Title	Points
Implementation		
HC-IM-1	Construction Health and Safety Planning	Required for all projects
HC-IM-2	LEED® Accredited Professional/Construction Sustainability Liaison	Required for all projects
HC-IM-3	Contractor and Subcontractor Sustainability Training	1 point
HC-IM-4	Sustainability Inspection Program and Reporting	1 point
HC-IM-5	Construction Scheduling and Sequencing	1 point
HC-IM-6	Promote Use of Regional Materials and Local Suppliers	
	Local supplier-preferred procurement policy and 20%-40% utilization of local suppliers	1 point
	Regional materials procurement policy and 20%-40% use of regional materials	1 point
	40% or more regional materials used	1 point
Construction Air Quality		
HC-AQ-1	Low-Emission Diesel Construction Vehicles, Equipment and Generators Using alternative fuels	
	25% increase of low emission vehicles	1 point
	50% increase of low emission vehicles	1 point
	75% increase of low emission vehicles	1 point
	100% increase of low emission vehicles	1 point
HC-AQ-2	Construction Vehicles, Equipment and Material Delivery - Idling Restrictions	2 points
HC-AQ-3	Alternative Transportation Plan During Construction	1 point

Standard	Title	Points
HC-AQ-4	Track Project Criteria Air Pollutant Emissions	1 point
HC-AQ-5	Construction Materials Conveying Plan	1 point
Site Management		
HC-SM-1	Low Impact Development and Minimizing Site Disturbance	
	Develop Construction Site Plan	1 point
	Successful follow through of Construction Site Plan	1 point
HC-SM-2	Use of City-Approved Dust Palliatives	1 point
Energy Management		
HC-EM-1	Project Energy Requirements and Management Plan/Stationary Power	
	Develop and implement Project Energy Requirements Plan	1 point
	Stationary power can be used for at least one process	1 point
HC-EM-2	Energy Efficient Lighting and Equipment and Energy Requirements Plan	
	Develop and implement Project Energy Requirements Plan	1 point
	Utilize energy efficient or less emitting equipment or renewable energy sources	1 point
HC-EM-3	Energy Systems Commissioning and Installed Systems Testing	2 points
Materials & Resources		
HC-MR-1:	Construction Waste Management Plan	Required for all projects
HC-MR-2:	ON-SITE Reuse or Recycling of Construction Materials and Infrastructure	
	15% to 25% reused or salvaged	1 point
	26% to 40% reused or salvaged	1 point
HC-MR-3:	OFF-SITE Recycling for Reuse of Construction Materials and Infrastructure	
	15% recycled	1 point
	25% recycled	1 point
HC-MR-4:	Use of Recycled Content Materials	1 point
Environmental Quality		
HC-EQ-1	Noise and Vibration Mitigation Plan	2 points
HC-EQ-2	Light Pollution Reduction	1 point
Innovation		
HD-IC-1	Innovation in Horizontal Construction	Variable points

Source: The City's Sustainable Horizontal Design and Construction Green Guide

Table 8-3: Potential DCS Green Guide Design Performance Standards Applicable to Recommended Projects

	Performance Standard	
Project	**Design**	**Construction**
Runway Improvements		
Construct 800 Foot Eastward Extension of Runway 7L-25R	HD-AD-1 & 2 HD-PV-1, 2 and 4 HD-LM-1 HD-ID-1	HC-IM-1 through 6 HC-AQ-1 through 5 HC-SM-1 & 2 HC-EM-1 through 3 HC-MR-1 through 4 HC-EQ-1 & 2 HC-IC-1
Relocate Runway 7R-25L Run-up Areas	HD-AD-1 & 2 HD-PV-1 through 4 HD-LM-1 HD-ID-1	HC-IM-1 through 6 HC-AQ-1 through 5 HC-SM-1 & 2 HC-EM-1 through 3 HC-MR-1 through 4 HC-EQ-1 & 2 HC-IC-1
Mitigate Direct Runway Access to Aprons	HD-AD-1 & 2 HD-PV-1 through 4 HD-LM-1 & 3 HD-ID-1	HC-IM-1 through 6 HC-AQ-1 through 5 HC-SM-1 & 2 HC-EM-1 through 3 HC-MR-1 through 4 HC-EQ-1 & 2 HC-IC-1
Relocate Runway 7R-25L South Side Holdbars	HD-AD1 & 2 HD-LM-1 HD-ID-1	HC-IM-1 through 6 HC-AQ-1 through 5 HC-SM-1 & 2 HC-EM-1 through 3 HC-MR-1 through 4 HC-EQ-1 & 2 HC-IC-1

	Performance Standard	
Project	**Design**	**Construction**
Upgrade/Install Runway Blast Pads	HD-AD-1 & 2 HD-PV-1 through 4 HD-ID-1	HC-IM-1 through 6 HC-AQ-1 through 5 HC-SM-1 & 2 HC-EM-1 through 3 HC-MR-1 through 4 HC-EQ-1 & 2 HC-IC-1
Upgrade PAPI system to 4 lights	HD-AD-1 & 2 HD-LM-1 & 3	HC-IM-1 through 6 HC-AQ-1 through 5 HC-SM-1 & 2 HC-EM-1 through 3 HC-MR-1 through 4 HC-EQ-1 & 2 HC-IC-1
Taxiway Improvements		
Relocate Taxiway B to 300 Feet from Runway 7L-25R Centerline	HD-AD-1 & 2 HD-PV-1 through 4 HD-LM-1 HD-ID-1	HC-IM-1 through 6 HC-AQ-1 through 5 HC-SM-1 & 2 HC-EM-1 through 3 HC-MR-1 through 4 HC-EQ-1 & 2 HC-IC-1
Relocate Taxiway B3/C3 Outside of Runway 7L-25R RPZ	HD-AD-1 & 2 HD-PV-1 through 4 HD-LM-1 HD-ID-1	HC-IM-1 through 6 HC-AQ-1 through 5 HC-SM-1 & 2 HC-EM-1 through 3 HC-MR-1 through 4 HC-EQ-1 & 2 HC-IC-1

	Performance Standard	
Project	**Design**	**Construction**
Construct Full Length Parallel Taxiway D	HD-AD-1 & 2 HD-PV-1 through 4 HD-LM-1 HD-ID-1	HC-IM-1 through 6 HC-AQ-1 through 5 HC-SM-1 & 2 HC-EM-1 through 3 HC-MR-1 through 4 HC-EQ-1 & 2 HC-IC-1
Mitigate Hot Spots 1 and 2 (Taxiways B5/C5 and B9/C9)	HD-AD-1 & 2 HD-PV-1 through 4 HD-LM-1 HD-ID-1	HC-IM-1 through 6 HC-AQ-1 through 5 HC-SM-1 & 2 HC-EM-1 through 3 HC-MR-1 through 4 HC-EQ-1 & 2 HC-IC-1
Construct Acute Angle Taxiway	HD-AD-1 & 2 HD-PV-1 through 4 HD-LM-1 HD-ID-1	HC-IM-1 through 6 HC-AQ-1 through 5 HC-SM-1 & 2 HC-EM-1 through 3 HC-MR-1 through 4 HC-EQ-1 & 2 HC-IC-1
Construct New Taxiway Connector	HD-AD-1 & 2 HD-PV-1 through 4 HD-LM-1 HD-ID-1	HC-IM-1 through 6 HC-AQ-1 through 5 HC-SM-1 & 2 HC-EM-1 through 3 HC-MR-1 through 4 HC-EQ-1 & 2 HC-IC-1

	Performance Standard	
Project	**Design**	**Construction**
Improve Taxiway and Runway Shoulders	HD-AD-1 & 2 HD-PV-1 through 4 HD-ID-1	HC-IM-1 through 6 HC-AQ-1 through 5 HC-SM-1 & 2 HC-EM-1 through 3 HC-MR-1 through 4 HC-EQ-1 & 2 HC-IC-1
Mitigate Excess Pavement	HD-AD-1 HD-ID-1	HC-IM-1, 2 & 6 HC-AQ-1 & 2 HC-EQ-1 & 2 HC-IC-1
Relocate Segmented Circle	HD-AD-1 & 2 HD-ID-1	HC-IM-1, 2 & 6 HC-AQ-1 & 2 HC-EQ-1 & 2 HC-IC-1
Parking and Roadway Improvements		
Expand Cutter Aviation in-place	Third-party	Third-party
Expand Atlantic Aviation in-place	Third-party	Third-party
Provide New Roadway Access	HD-AD-1 through 3 HD-PV-1 through 4 HD-LM-1 & 3 HD-LD-1 & 2 HD-ID-1	HC-IM-1 through 6 HC-AQ-1 through 5 HC-SM-1 & 2 HC-EM-1 through 3 HC-MR-1 through 4 HC-EQ-1 & 2 HC-IC-1
Expand T-Hangars	HD-AD-1 through 3 HD-PV-1 through 4 HD-LM-1 HD-LD-1 HD-PS-1 HD-ID-1	HC-IM-1 through 6 HC-AQ-1 through 5 HC-SM-1 & 2 HC-EM-1 through 3 HC-MR-1 through 4 HC-EQ-1 & 2 HC-IC-1

	Performance Standard	
Project	**Design**	**Construction**
Expand Tie-downs	HD-AD-1 & 2 HD-PV-1 through 4 HD-LM-1 HD-LD-1 HD-ID-1	HC-IM-1 through 6 HC-AQ-1 through 5 HC-SM-1 & 2 HC-EM-1 through 3 HC-MR-1 through 4 HC-EQ-1 & 2 HC-IC-1
General Aviation Facilities		
Construct Aviation Support Building	HD-AD-1 through 3 HD-PV-1 through 4 HD-LM-1 through 3 HD-LD-1 & 2 HD-PS-1 HD-ID-1	HC-IM-1 through 6 HC-AQ-1 through 5 HC-SM-1 & 2 HC-EM-1 through 3 HC-MR-1 through 4 HC-EQ-1 & 2 HC-IC-1
Construct Flight-school Classrooms	HD-AD-1 through 3 HD-PV-1 through 4 HD-LM-1 through 3 HD-LD-1 & 2 HD-PS-1 HD-ID-1	HC-IM-1 through 6 HC-AQ-1 through 5 HC-SM-1 & 2 HC-EM-1 through 3 HC-MR-1 through 4 HC-EQ-1 & 2 HC-IC-1
Develop Corporate Aviation	HD-AD-1 through 3 HD-PV-1 through 4 HD-LM-1 through 3 HD-LD-1 & 2 HD-PS-1 HD-ID-1 Buildings third-party	HC-IM-1 through 6 HC-AQ-1 through 5 HC-SM-1 & 2 HC-EM-1 through 3 HC-MR-1 through 4 HC-EQ-1 & 2 HC-IC-1 Buildings third-party

	Performance Standard	
Project	**Design**	**Construction**
Develop Aviation Business Park	HD-AD-1 through 3 HD-PV-1 through 4 HD-LM-1 through 3 HD-LD-1 & 2 HD-PS-1 HD-ID-1 Buildings third-party	HC-IM-1 through 6 HC-AQ-1 through 5 HC-SM-1 & 2 HC-EM-1 through 3 HC-MR-1 through 4 HC-EQ-1 & 2 HC-IC-1 Buildings third-party
Construct North Side Pilot's Lounge	HD-AD-1 through 3 HD-PV-1 through 4 HD-LM-1 through 3 HD-LD-1 & 2 HD-PS-1 HD-ID-1	HC-IM-1 through 6 HC-AQ-1 through 5 HC-SM-1 & 2 HC-EM-1 through 3 HC-MR-1 through 4 HC-EQ-1 & 2 HC-IC-1
Designate Helicopter Training Area	HD-AD-1 through 3HD-LM-1 HD-ID-1	HC-IM-1, 2 & 6 HC-AQ-1 & 2 HC-EQ-1 & 2 HC-IC-1
Support Facilities		
Install Compass Calibration Pad	HD-AD-1 HD-ID-1	HC-IM-1, 2 & 6 HC-AQ-1 & 2 HC-EQ-1 & 2 HC-IC-1
Relocate Public Safety Building	HD-AD-1 through 3 HD-PV-1 through 4 HD-LM-1 through 3 HD-LD-1 & 2 HD-PS-1 HD-ID-1	HC-IM-1 through 6 HC-AQ-1 through 5 HC-SM-1 & 2 HC-EM-1 through 3 HC-MR-1 through 4 HC-EQ-1 & 2 HC-IC-1

Source: HNTB based on the City's Sustainable Horizontal Design and Construction Green Guide

APPENDIX A: Historical Socioeconomic and Fuel Cost

Table A-1: Historical Population

Year	Phoenix MSA	Arizona	U.S.	Phoenix MSA % of U.S.
1990	2,249,116	3,684,097	249,622,814	0.90%
1991	2,319,206	3,788,576	252,980,941	0.92%
1992	2,398,760	3,915,740	256,514,224	0.94%
1993	2,491,818	4,065,440	259,918,588	0.96%
1994	2,613,502	4,245,089	263,125,821	0.99%
1995	2,744,046	4,432,499	266,278,393	1.03%
1996	2,855,711	4,586,940	269,394,284	1.06%
1997	2,963,714	4,736,990	272,646,925	1.09%
1998	3,074,532	4,883,342	275,854,104	1.11%
1999	3,178,349	5,023,823	279,040,168	1.14%
2000	3,273,477	5,160,586	282,162,411	1.16%
2001	3,363,736	5,273,477	284,968,955	1.18%
2002	3,452,470	5,396,255	287,625,193	1.20%
2003	3,536,388	5,510,364	290,107,933	1.22%
2004	3,637,332	5,652,404	292,805,298	1.24%
2005	3,774,696	5,839,077	295,516,599	1.28%
2006	3,914,212	6,029,141	298,379,912	1.31%
2007	4,018,128	6,167,681	301,231,207	1.33%
2008	4,106,372	6,280,362	304,093,966	1.35%
2009	4,153,609	6,343,154	306,771,529	1.35%
2010	4,209,375	6,410,810	309,326,225	1.36%
2011	4,252,078	6,467,315	311,587,816	1.36%
2012	4,329,534	6,553,255	313,914,040	1.38%
		Average Annual Growth Rate		
1990-2012	3.0%	2.7%	1.0%	2.0%

Source: U.S. Department of Commerce, Bureau of Economic Analysis, 2014.

Table A-2: Historical Employment

Year	Phoenix MSA	Arizona	U.S.	Phoenix MSA % of U.S.
1990	1,111,191	1,692,440	109,527,000	1.01%
1991	1,112,977	1,714,176	108,427,000	1.03%
1992	1,129,117	1,753,007	108,802,000	1.04%
1993	1,181,491	1,837,980	110,935,000	1.07%
1994	1,273,891	1,977,860	114,398,000	1.11%
1995	1,362,438	2,096,332	117,407,000	1.16%
1996	1,421,233	2,148,895	119,836,000	1.19%
1997	1,465,750	2,201,211	122,951,000	1.19%
1998	1,534,521	2,282,731	126,157,000	1.22%
1999	1,591,133	2,359,801	129,240,000	1.23%
2000	1,609,059	2,410,247	132,019,000	1.22%
2001	1,648,750	2,467,782	132,074,000	1.25%
2002	1,687,138	2,510,972	130,628,000	1.29%
2003	1,727,856	2,565,469	130,318,000	1.33%
2004	1,783,726	2,642,021	131,749,000	1.35%
2005	1,847,545	2,725,659	134,005,000	1.38%
2006	1,930,609	2,835,935	136,398,000	1.42%
2007	1,975,503	2,898,787	137,936,000	1.43%
2008	1,976,979	2,911,887	137,170,000	1.44%
2009	1,900,253	2,822,763	131,233,000	1.45%
2010	1,875,333	2,781,504	130,275,000	1.44%
2011	1,870,535	2,761,199	131,842,000	1.42%
2012	1,889,202	2,773,831	134,104,000	1.41%
Average Annual Growth Rate				
1990-2012	2.4%	2.3%	0.9%	1.5%

Source: Woods & Poole Economics, 2014 State Profile: Arizona and New Mexico, 2014.

Table A-3: Historical Unemployment Rate

Year	Phoenix MSA	Arizona	U.S.	Phoenix MSA % of U.S.
1990	4.4	5.2	5.6	78.3%
1991	5.0	5.9	6.9	73.0%
1992	6.4	7.4	7.5	85.4%
1993	5.1	6.3	6.9	73.8%
1994	4.6	6.1	6.1	75.4%
1995	3.6	5.4	5.6	64.4%
1996	3.7	5.5	5.4	68.4%
1997	3.0	4.6	4.9	60.7%
1998	2.9	4.3	4.5	64.4%
1999	3.1	4.5	4.2	73.5%
2000	3.3	4.1	4.0	83.2%
2001	4.2	4.7	4.7	88.6%
2002	5.6	6.0	5.8	96.8%
2003	5.2	5.7	6.0	86.8%
2004	4.5	5.0	5.5	81.2%
2005	4.1	4.7	5.1	80.7%
2006	3.6	4.1	4.6	78.1%
2007	3.2	3.7	4.6	69.3%
2008	5.3	6.0	5.8	91.4%
2009	9.2	9.8	9.3	99.1%
2010	9.7	10.4	9.6	100.8%
2011	8.5	9.4	8.9	95.1%
2012	7.3	8.3	8.1	90.4%
Average Annual Growth Rate				
1990-2012	2.3%	2.1%	1.7%	0.7%

Source: Bureau of Labor Statistics.

Table A-4: Historical Personal Income (thousands of 2013 Dollars)

Year	Phoenix MSA	Arizona	U.S.	Phoenix % of U.S.
1990	65,816,330	98,430,612	7,680,448,156	0.86%
1991	66,830,961	100,610,921	7,716,983,527	0.87%
1992	69,190,438	104,295,943	8,000,700,520	0.86%
1993	72,248,737	109,271,789	8,132,337,248	0.89%
1994	78,528,185	117,945,560	8,408,587,994	0.93%
1995	84,521,495	125,497,337	8,697,448,810	0.97%
1996	90,660,969	133,433,319	9,052,500,036	1.00%
1997	97,571,555	142,323,045	9,452,995,707	1.03%
1998	107,198,288	155,370,080	10,085,158,352	1.06%
1999	113,067,410	163,242,220	10,450,336,023	1.08%
2000	122,239,206	174,995,273	11,033,191,991	1.11%
2001	126,432,950	181,572,741	11,366,666,598	1.11%
2002	129,327,633	185,828,669	11,418,651,546	1.13%
2003	133,360,097	191,946,957	11,605,278,971	1.15%
2004	141,661,932	204,188,107	12,003,394,286	1.18%
2005	152,893,627	219,971,132	12,324,205,511	1.24%
2006	166,209,607	237,577,885	12,875,499,077	1.29%
2007	170,117,208	244,227,661	13,238,798,126	1.28%
2008	165,705,097	240,706,080	13,317,045,638	1.24%
2009	157,888,328	231,023,125	12,944,254,510	1.22%
2010	157,085,037	229,660,523	13,102,341,509	1.20%
2011	162,797,289	236,118,193	13,575,127,633	1.20%
2012	166,410,844	240,203,472	13,884,602,668	1.20%
Average Annual Growth Rate				
1990-2012	4.3%	4.1%	2.7%	1.5%

Source: U.S. Department of Commerce, Bureau of Economic Analysis, 2014 and HNTB analysis.

Table A-5: Historical Per Capita Personal Income (2013 Dollars)

Year	Phoenix MSA	Arizona	U.S.	Phoenix % of U.S.
1990	29,263	26,718	30,768	95.1%
1991	28,816	26,556	30,504	94.5%
1992	28,844	26,635	31,190	92.5%
1993	28,994	26,878	31,288	92.7%
1994	30,047	27,784	31,957	94.0%
1995	30,802	28,313	32,663	94.3%
1996	31,747	29,090	33,603	94.5%
1997	32,922	30,045	34,671	95.0%
1998	34,867	31,816	36,560	95.4%
1999	35,574	32,494	37,451	95.0%
2000	37,342	33,910	39,102	95.5%
2001	37,587	34,431	39,887	94.2%
2002	37,459	34,437	39,700	94.4%
2003	37,711	34,834	40,003	94.3%
2004	38,947	36,124	40,994	95.0%
2005	40,505	37,672	41,704	97.1%
2006	42,463	39,405	43,151	98.4%
2007	42,337	39,598	43,949	96.3%
2008	40,353	38,327	43,793	92.1%
2009	38,012	36,421	42,195	90.1%
2010	37,318	35,824	42,358	88.1%
2011	38,287	36,509	43,568	87.9%
2012	38,436	36,654	44,231	86.9%
		Average Annual Growth Rate		
1990-2012	1.2%	1.4%	1.7%	-0.4%

Source: U.S. Department of Commerce, Bureau of Economic Analysis, 2014 and HNTB analysis.

Table A-6: Historical Oil and Fuel Prices

	Crude Oil (per barrel)		Jet Fuel (per gallon)	
Year	Nominal Prices	2013 Prices	Nominal Prices	2013 Prices
1990	24.53	39.00	0.76	1.21
1991	21.54	33.16	0.61	0.94
1992	20.58	30.86	0.57	0.86
1993	18.43	26.96	0.53	0.77
1994	17.20	24.65	0.49	0.71
1995	18.43	25.88	0.49	0.69
1996	22.12	30.41	0.61	0.84
1997	20.61	27.85	0.56	0.76
1998	14.42	19.34	0.40	0.54
1999	19.34	25.56	0.50	0.66
2000	30.38	39.18	0.85	1.10
2001	25.98	32.87	0.73	0.92
2002	26.18	32.69	0.69	0.86
2003	31.08	38.05	0.82	1.01
2004	41.51	49.61	1.15	1.38
2005	56.64	65.82	1.72	1.99
2006	66.05	74.75	1.92	2.18
2007	72.34	79.87	2.13	2.35
2008	99.67	106.79	2.96	3.18
2009	61.95	66.42	1.66	1.78
2010	79.48	83.82	2.15	2.27
2011	94.88	97.73	3.00	3.09
2012	94.05	95.12	3.06	3.09
		Average Annual Growth Rate		
1990-2012	6.3%	4.1%	6.5%	4.3%

Source: U.S. Energy Information Administration, 2014.

APPENDIX B:DVT Forecast Scenarios

Table B-1: Summary of Scenario 1 – New Flight School

	Year					Average Annual
	2013	**2018**	**2023**	***2028***	**2033**	**Growth Rate**
Based Aircraft						
Single Engine Piston	866	945	1102	*1307*	1444	2.6%
Multi Engine Piston	116	113	131	*152*	165	1.8%
Turboprop	(a)	35	50	*73*	82	5.3% (b)
Jet	18	32	40	*52*	68	6.9%
Helicopter	23	30	40	*51*	66	5.4%
Glider	10	12	14	*16*	19	3.3%
Total	1033	1167	1377	1652	1844	2.9%
Annual Operations by FAA Category						
Itinerant						
Air Carrier	17	18	20	*24*	28	2.5%
Air Taxi	4,622	4,820	5,442	6,407	7,553	2.5%
General Aviation	138,971	144,920	163,647	192,641	227,125	2.5%
Military	57	57	57	79	57	0.0%
Subtotal	143,667	149,815	169,166	199,150	234,763	2.5%
Local						
General Aviation	219,653	226,253	340,878	400,162	469,754	3.9%
Military	32	32	32	32	32	0.0%
Subtotal	219,685	226,285	340,910	400,194	469,786	3.9%
Total	363,352	376,100	510,076	599,344	704,549	3.4%
Annual Operations by Type (24-hour)						
Itinerant						
Single Engine Piston	120,601	122,732	136,715	*159,144*	185,253	2.2%
Multi Engine Piston	14,400	14,984	16,655	*19,299*	22,363	2.2%
Turboprop	3,229	3,669	4,418	*5,797*	7,606	4.4%
Jet	2,114	4,200	5,662	*7,499*	9,932	8.0%
Helicopter	3,323	4,230	5,716	*7,411*	9,609	5.5%
Subtotal	143,667	149,815	169,166	199,150	234,763	2.5%
Local						
Single Engine Piston	182,991	184,940	281,283	*327,430*	381,148	3.7%
Multi Engine Piston	21,850	22,579	34,268	*39,708*	46,011	3.8%
Helicopter	14,844	18,766	25,359	*32,878*	42,627	5.4%
Subtotal	219,685	226,285	340,910	*400,194*	469,786	3.9%
Total Annual Operations	363,352	376,100	510,076	599,344	704,549	3.4%
Peak Hour Operations	133	137	186	*218*	257	3.3%

(a) Distributed among single-engine and twin-engine piston during 2013.
(b) From 2014.

Sources: HNTB analysis.

Table B-2: Summary of Scenario 2 – High Economic Growth and Loss of Flight Training

	Year					Average Annual
	2013	2018	2023	*2028*	2033	Growth Rate
Based Aircraft						
Single Engine Piston	866	961	1065	*1194*	1442	2.6%
Multi Engine Piston	116	116	128	*141*	167	1.8%
Turboprop	(a)	35	36	*40*	66	4.1% (b)
Jet	18	32	42	*55*	73	7.3%
Helicopter	23	31	41	*54*	71	5.8%
Glider	10	13	15	*18*	21	3.8%
Total	1033	1188	1328	1502	1839	2.9%
Annual Operations by FAA Category						
Itinerant						
Air Carrier	17	18	21	25	30	2.8%
Air Taxi	4,622	4,904	5,637	6,750	8,094	2.8%
General Aviation	138,971	147,453	169,489	202,976	243,392	2.8%
Military	57	57	57	57	57	0.0%
Subtotal	143,667	152,432	175,204	209,808	251,573	2.8%
Local						
General Aviation	219,653	230,609	177,792	214,398	258,541	0.8%
Military	32	32	32	32	32	0.0%
Subtotal	219,685	230,641	177,823	214,429	258,572	0.8%
Total	363,352	383,073	353,027	424,237	510,145	1.7%
Annual Operations by Type (24-hour)						
Itinerant						
Single Engine Piston	120,601	124,810	141,460	*167,529*	198,401	2.5%
Multi Engine Piston	14,400	15,382	17,311	*20,400*	24,040	2.6%
Turboprop	3,229	3,669	4,629	*6,136*	8,134	4.7%
Jet	2,114	4,200	5,945	*7,962*	10,662	8.4%
Helicopter	3,323	4,371	5,859	*7,782*	10,336	5.8%
Subtotal	143,667	152,432	175,204	209,808	251,573	2.8%
Local						
Single Engine Piston	182,991	188,071	135,275	*160,204*	189,726	0.2%
Multi Engine Piston	21,850	23,178	16,555	*19,508*	22,989	0.3%
Helicopter	14,844	19,392	25,993	*34,525*	45,857	5.8%
Subtotal	219,685	230,641	177,823	*214,429*	258,572	0.8%
Total Annual Operations	363,352	383,073	353,027	*424,237*	510,145	1.7%
Peak Hour Operations	133	140	129	*155*	186	1.7%

(a) Distributed among single-engine and twin-engine piston during 2013.
(b) From 2014.

Sources: HNTB analysis.

Table B-3: Summary of Scenario 3 – Low Economic Growth and High Fuel Cost

	Year					Average Annual
	2013	**2018**	**2023**	***2028***	**2033**	**Growth Rate**
Based Aircraft						
Single Engine Piston	866	827	917	*1025*	1143	1.4%
Multi Engine Piston	116	99	109	*119*	131	0.6%
Turboprop	(a)	30	36	*46*	59	3.4% (b)
Jet	18	28	35	*44*	55	5.7%
Helicopter	23	26	34	*43*	54	4.4%
Glider	10	11	12	*14*	16	2.4%
Total	1033	1021	1143	1291	1458	1.7%
Annual Operations by FAA Category						
Itinerant						
Air Carrier	17	16	17	20	23	1.5%
Air Taxi	4,622	4,215	4,681	5,377	6,184	1.5%
General Aviation	138,971	126,732	140,745	161,680	185,962	1.5%
Military	57	57	57	57	57	0.0%
Subtotal	143,667	131,020	145,500	167,134	192,226	1.5%
Local						
General Aviation	219,653	197,860	177,792	214,398	258,541	1.4%
Military	32	32	32	32	32	0.0%
Subtotal	219,685	197,892	220,310	253,283	291,191	1.4%
Total	363,352	328,912	365,810	420,417	483,417	1.4%
Annual Operations by Type (24-hour)						
Itinerant						
Single Engine Piston	120,601	107,407	117,605	*133,608*	151,788	1.2%
Multi Engine Piston	14,400	13,127	14,295	*16,178*	18,310	1.2%
Turboprop	3,229	3,145	3,787	*4,858*	6,233	3.3%
Jet	2,114	3,675	4,954	*6,308*	8,033	6.9%
Helicopter	3,323	3,666	4,859	*6,181*	7,862	4.4%
Subtotal	143,667	131,020	145,500	167,134	192,226	1.5%
Local						
Single Engine Piston	182,991	161,847	177,215	*201,329*	228,724	1.1%
Multi Engine Piston	21,850	19,781	21,540	*24,378*	27,590	1.2%
Helicopter	14,844	16,264	21,555	*27,418*	34,877	4.4%
Subtotal	219,685	197,892	220,310	*253,283*	291,191	1.4%
Total Annual Operations	363,352	328,912	365,810	420,417	483,417	1.4%
Peak Hour Operations	133	120	133	*153*	176	1.4%

(a) Distributed among single-engine and twin-engine piston during 2013.
(b) From 2014.

Sources: HNTB analysis.

Table B-4: Summary of Scenario 4 – Loss of Flight Training

	Year					Average Annual
	2013	**2018**	**2023**	***2028***	**2033**	**Growth Rate**
Based Aircraft						
Single Engine Piston	866	945	1030	*1132*	1346	2.2%
Multi Engine Piston	116	113	123	*133*	155	1.5%
Turboprop	(a)	35	34	*37*	62	3.7% (b)
Jet	18	32	40	*52*	68	6.9%
Helicopter	23	30	40	*51*	66	5.4%
Glider	10	12	14	*16*	19	3.3%
Total	1033	1167	1281	1422	1716	2.6%
Annual Operations by FAA Category						
Itinerant						
Air Carrier	17	18	20	24	28	2.5%
Air Taxi	4,622	4,820	5,442	6,407	7,553	2.5%
General Aviation	138,971	144,920	163,647	192,662	227,125	2.5%
Military	57	57	57	57	57	0.0%
Subtotal	143,667	149,815	169,166	199,150	234,763	2.5%
Local						
General Aviation	219,653	226,253	177,792	214,398	258,541	0.5%
Military	32	32	32	32	32	0.0%
Subtotal	219,685	226,285	172,024	203,682	241,166	0.5%
Total	363,352	376,100	341,190	402,832	475,929	1.4%
Annual Operations by Type (24-hour)						
Itinerant						
Single Engine Piston	120,601	122,732	136,715	*159,144*	185,253	2.2%
Multi Engine Piston	14,400	14,984	16,655	*19,299*	22,363	2.2%
Turboprop	3,229	3,669	4,418	*5,797*	7,606	4.4%
Jet	2,114	4,200	5,662	*7,499*	9,932	8.0%
Helicopter	3,323	4,230	5,716	*7,411*	9,609	5.5%
Subtotal	143,667	149,815	169,166	*199,150*	234,763	2.5%
Local						
Single Engine Piston	182,991	184,940	130,737	*152,186*	177,154	-0.2%
Multi Engine Piston	21,850	22,579	15,928	*18,456*	21,385	-0.1%
Helicopter	14,844	18,766	25,359	*32,878*	42,627	5.4%
Subtotal	219,685	226,285	172,024	*203,682*	241,166	0.5%
Total Annual Operations	363,352	376,100	341,190	*402,832*	475,929	1.4%
Peak Hour Operations	133	137	124	*118*	173	1.3%

(a) Distributed among single-engine and twin-engine piston during 2013.
(b) From 2014.

Sources: HNTB analysis.

APPENDIX C: FAA Forecast Approval Letter

U.S. Department
of Transportation
Federal Aviation Administration

Federal Aviation Administration
Phoenix Airports Field Office

3800 N Central Ave
Suite 1025
Phoenix, AZ 85012

September 15, 2014

Mr. Randy Payne
Project Manager
City of Phoenix Aviation Department
3400 E. Sky Harbor Boulevard, Suite 3300
Phoenix, Arizona 85034

Dear Mr. Payne:

Deer Valley Municipal Airport (DVT)
Aviation Activity Forecast Approval

The Federal Aviation Administration (FAA) has reviewed the aviation forecast for the airport master plan for Deer Valley Municipal Airport (DVT) dated August 14, 2014. The FAA approves these forecasts for airport planning purposes, including Airport Layout Plan development.

In summary, the difference between the FAA Terminal Area Forecast (TAF) and DVT's forecast update regarding total operations was within the 10 percent and 15 percent allowance for the 5 and 10 year planning horizons. Therefore, the FAA approves this forecast for planning purposes at DVT. It is important to note that the approval of this forecast doesn't automatically justify all capital improvements that your master plan might recommend. All future projects will need to be justified by current activity levels reached at the time the projects are proposed for implementation.

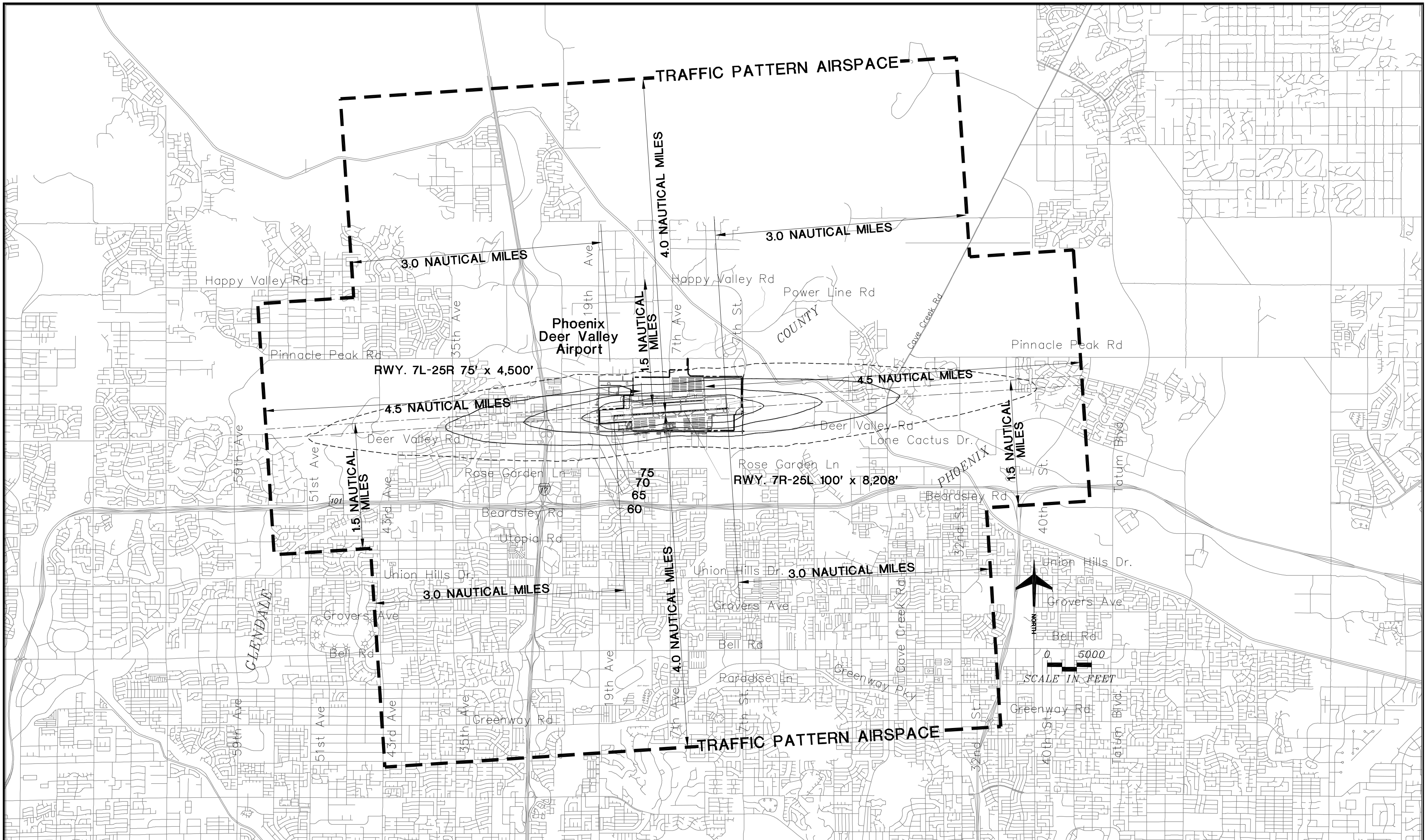
If you have any questions about this forecast approval, please call me at 602-792-1073.

Sincerely,

Kyler Erhard
Airport Planner

cc: Mr. Kenn Potts, ADOT, Airport Grant Manager

APPENDIX D: DVT Public Airport Disclosure Map



LEGEND:

TRAFFIC PATTERN AIRSPACE

75 NOISE CONTOURS DAY NIGHT LEVEL (DNL)

EXISTING AIRPORT PROPERTY LINE

EXTENDED RUNWAY CENTERLINE

NOTES:

1. This map was prepared in accordance with the A.R.S. Sect. 28-8486, related to public airport disclosure.
2. Traffic Pattern Airspace Boundaries have been established in accordance with the guidelines provided in FAA Order 7400.2F.
3. The Airport Noise Contours were developed with the Intergrated Noise Model (Version 6.0) are based on Total Annual Operations (Take-off and Landings) of 520,000.
4. 1 nautical mile = 6,080 feet or 1.1516 statute miles.
5. Base map derived from electronic USGS mapping and the Maricopa Association of Governments (MAG) street Map.

PHOENIX
DEER VALLEY AIRPORT

PUBLIC AIRPORT DISCLOSURE MAP

PHOENIX, ARIZONA

DETAILED BY: Maggie Beaver
APPROVED BY: James M. Harris, P.E.
January 25, 2007 SHEET 1 OF 1

Coffman Associates
Airport Consultants