CHAPTER 3
AFFECTED ENVIRONMENT

The Affected Environment chapter provides a description of the existing conditions in and around the vicinity of the Tucson International Airport (TUS or Airport) that may be directly or indirectly affected by the Proposed Action and the No Action Alternative as described in Chapter 2, *Alternatives* of this Environmental Impact Statement (EIS). Per 40 Code of Federal Regulations (C.F.R.) § 1508.8 (a), direct effects are caused by the Proposed Action and occur at the same time and place. Direct effects would include ground disturbance from construction activities. Per 40 C.F.R. § 1508.8 (b), indirect effects are caused by the Proposed Action that may occur later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems. The Affected Environment also provides a basis of comparison to determine the environmental consequences of the Proposed Action relative to existing social, economic, and environmental settings.

3.1 AIRPORT SETTING AND LOCATION

The following section provides a summary of the Airport Setting and Location, which has already been detailed in Chapter 1, *Purpose and Need*. The Tucson Airport Authority (TAA) is the owner and operator of TUS. TUS is located on 8,343 acres in Tucson, Arizona in Pima County south of the City of Tucson central business district. The Airport is near both Interstate 10 and Interstate 19. The United States Air Force (USAF) owned land, known as Air Force Plant 44 (AFP 44), is located along the southwest border of the Airport.

The passenger facilities at TUS are comprised of a terminal building with two concourses, referred to as Concourse A and Concourse B. International flights are processed through the Federal Inspection Service (FIS) Facility located in Concourse A. Tucson Air National Guard Base, which hosts the Arizona Air National Guard 162nd Wing (AANG), occupies 94 acres on the north side of the Airport along Valencia Road. Today, the facility is used to train F-16 Fighting Falcon pilots.

The TUS airfield is comprised of three runways as shown on Exhibit 1-2 in Chapter 1; one set of close parallel runways separated by a distance of 706 feet (oriented in a northwest/southeast direction) and one crosswind runway (oriented in a northeast/southwest direction).

Parallel Runways 11L/29R and 11R/29L measure 10,996 feet long by 150 feet wide and 8,408-feet long by 75-feet wide, respectively. The crosswind runway, Runway 3/21, measures 7,000 feet long by 150-feet wide. Runway threshold 11R is displaced 1,410 feet; this results in an available landing length of 6,998 feet. Runway threshold 3 is displaced 850 feet, resulting in an available landing length of 6,150 feet.

Runway 11L/29R is the primary runway at TUS and is the runway generally used by air carrier and military aircraft. During adverse wind conditions, air carrier and military aircraft occasionally use crosswind Runway 3/21. The crosswind runway is also used for convenience by General Aviation (GA) aircraft when conditions allow. Runway 11R/29L, originally built as a taxiway, has been converted to a runway primarily used by GA aircraft, due to its length and width.

The taxiway system provides aircraft access between the runways and the passenger terminal complex, general and corporate aviation areas, military facilities, airfreight terminals, and other aircraft parking areas.

Runway 11L/29R has a full-length parallel taxiway, identified as Taxiway A. Taxiway A is 75-feet wide and is located to the northeast of Runway 11L/29R at a separation of 537 feet from the runway centerline to the taxiway centerline. Runway 11L/29R is connected to Taxiway A at the thresholds, as well as at multiple intermediate points between the thresholds via 45-degree, 60-degree, and 90-degree connector taxiways.

Runway 3/21 has a parallel taxiway, identified as Taxiway D. Taxiway D is 75-feet wide and is located to the southeast of Runway 3/21 at a separation of 537.5 feet from the centerline of the runway to the centerline of the taxiway.

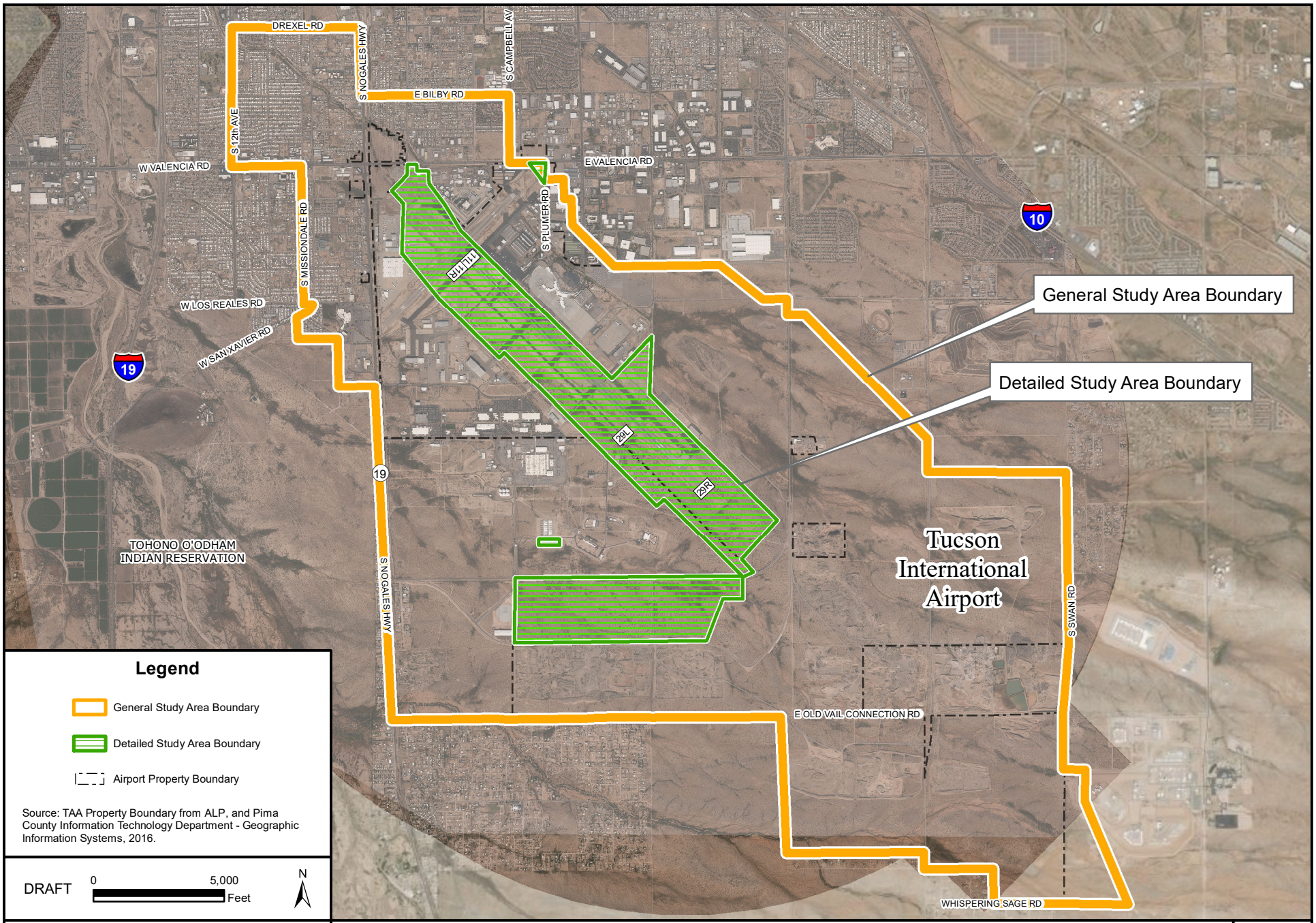
Runway 11R/29L does not have a parallel taxiway. Aircraft taxiing from Runway 11R/29L to the terminal and cargo areas must cross Runway 11L/29R. There is a separation of 706 feet from the Runway 11R/29L centerline to the Runway 11L/29R centerline. Runway 11R/29L is connected to Runway 11L/29R at the thresholds, as well as at five intermediate points between the thresholds via 90-degree connector taxiways.

3.2 IDENTIFICATION OF THE STUDY AREAS

For the purposes of this EIS, two study areas have been defined. The General Study Area depicts the areas surrounding the Airport. A further refined Detailed Study Area depicts the area that may be physically disturbed with the development of the Proposed Action. Both study areas are shown on **Exhibit 3-1.**

The General Study Area covers approximately 12,600 acres and is defined as the area where both direct and indirect impacts may result from the development of the Proposed Action. The General Study Area boundary lines were squared off to follow roadways and other identifiable features where available.

The Detailed Study Area covers approximately 1,500 acres and is defined as the area where direct impacts may result from the Proposed Action and its alternatives. The Detailed Study Area boundary was developed using the various alternative scenarios identified in Chapter 2, *Alternatives.*



Environmental Impact Statement
Tucson International Airport

EIS Study Areas

EXHIBIT: **3-1**

4/19/2018 Y:\TUS\TUS-EIS\E-L&B Work Product\2-GIS\MXD\DOCUMENT\ 3-1_EIS Study Areas.mxd

THIS PAGE INTENTIONALLY LEFT BLANK

3.3 ENVIRONMENTAL RESOURCES NOT AFFECTED

Due to the location of the Airport, there are several environmental resources identified in Federal Aviation Administration (FAA) Order 1050.1F that are not present in the Detailed Study Area or the General Study Area. Therefore the No Action or the Proposed Action alternatives would not affect:

- Coastal resources;
- Prime and unique farmlands; and,
- Wild and scenic rivers.

Since these resources are not present, there will be no further discussion and evaluation of them in the EIS.

3.4 AIR QUALITY

3.4.1 REGULATORY SETTING

An airport air quality assessment requires consideration under both the Clean Air Act of 1970, as Amended (CAA), and the National Environmental Policy Act of 1969, as Amended (NEPA). These two federal laws require distinct analyses and may be separately applicable to an airport project.

The CAA establishes standards and programs to evaluate, achieve, and maintain acceptable air quality in the United States. In accordance with CAA requirements, the United States Environmental Protection Agency (EPA) established the National Ambient Air Quality Standards (NAAQS), for six common air pollutants (known as "criteria air pollutants") that are potentially harmful to human health and welfare.[1]

The EPA considers the presence of the following six criteria pollutants to be indicators of air quality:

- Carbon monoxide (CO);
- Nitrogen dioxide (NO_2);
- Ground-level Ozone (O_3);
- Sulfur dioxide (SO_2);
- Particulate matter (PM_{10} and $PM_{2.5}$);[2] and,
- Lead (Pb);[3]

[1] EPA, 40 C.F.R. § 50, National Primary and Secondary Ambient Air Quality Standards (NAAQS).
[2] PM_{10} and $PM_{2.5}$ are airborne inhalable particles that are less than ten micrometers (coarse particles) and less than 2.5 micrometers (fine particles) in diameter, respectively.
[3] Airborne lead in urban areas is primarily emitted by vehicles using leaded fuels.

Since 1975, lead emissions have been in decline due in part to the introduction of catalyst-equipped vehicles and the decline in production of leaded gasoline. In general, an analysis of lead is limited to projects that emit significant quantities of the pollutant (*e.g.*, lead smelters) and is generally not applied to transportation projects. For lead, a major source, as defined by EPA for a Nonattainment New Source Review permitting program would be emitting over 100 tons per year. Lead emissions from piston driven aircraft at TUS would be considerably lower, therefore an analysis of lead is not included in this emissions inventory.

The NAAQS are summarized in **Table 3-1**. For each of the criteria pollutants, the EPA established primary standards intended to protect public health, and secondary standards to protect other aspects of public welfare, such as preventing materials damage, preventing crop and vegetation damage, and assuring good visibility. Areas of the country where air pollution levels consistently exceed these standards may be designated nonattainment by the EPA.

A nonattainment area is a homogeneous geographical area[4] (usually referred to as an air quality control region) that is in violation of one or more NAAQS and has been designated as nonattainment by the EPA. Some regulatory provisions, for instance the CAA General Conformity regulations, apply only to areas designated as nonattainment or maintenance.

A maintenance area describes the air quality designation of an area previously designated nonattainment by the EPA and subsequently redesignated attainment after emissions are reduced. Such an area remains designated as maintenance for a period up to 20 years at which time the state can apply for redesignation to attainment, provided that the NAAQS were sufficiently maintained throughout the maintenance period.

3.4.2 AFFECTED ENVIRONMENT

TUS is located within Pima County, Arizona, which is included in the Pima Intrastate Air Quality Control Region.[5] In the past, the Tucson area of Pima County was designated as nonattainment for CO. However, on July 10, 2000, the EPA determined the area had attained the standard and the region was redesignated to attainment. The area now operates under a maintenance plan for CO, therefore, General Conformity regulations apply.

Several specific areas within Pima County have separate classifications. The Ajo area, west of the Airport, has been designated as maintenance for the SO_2 standard. Ajo and Rillito have been designated as moderate nonattainment for PM_{10}. The Airport is not located within any of these areas; therefore, at the time of publication of this Draft EIS, the Airport area is considered attainment and not under a maintenance plan for all other criteria pollutants.

[4] A homogeneous geographical area, with regard to air quality, is an area, not necessarily bounded by state lines, where the air quality characteristics have been shown to be similar over the whole area. This may include several counties, encompassing more than one state, or may be a very small area within a single county.

[5] EPA, July 2003, 40 C.F.R. § 81.269.

Table 3-1
NATIONAL AMBIENT AIR QUALITY STANDARDS

POLLUTANT		PRIMARY/ SECONDARY	AVERAGING TIME	LEVEL	FORM
Carbon Monoxide (CO)		Primary	8 hour	9 ppm	Not to be exceeded more than once per year
			1 hour	35 ppm	
Lead (Pb)		primary and secondary	Rolling 3-month average	0.15 µg/m3 (1)	Not to be exceeded
Nitrogen Dioxide (NO_2)		Primary	1 hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		primary and secondary	1 year	53 ppb (2)	Annual Mean
Ozone (O_3)		primary and secondary	8 hour	0.070 ppm (3)	Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years
Particulate Matter	$PM_{2.5}$	Primary	1 year	12.0 µg/m3	annual mean, averaged over 3 years
		Secondary	1 year	15.0 µg/m3	annual mean, averaged over 3 years
		primary and secondary	24 hour	35 µg/m3	98th percentile, averaged over 3 years
	PM_{10}	primary and secondary	24 hour	150 µg/m3	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide (SO_2)		Primary	1 hour	75 ppb (4)	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		Secondary	3 hour	0.5 ppm	Not to be exceeded more than once per year

(1) In areas designated nonattainment for the Pb standards prior to the promulgation of the current (2008) standards, and for which implementation plans to attain or maintain the current (2008) standards have not been submitted and approved, the previous standards (1.5 µg/m3 as a calendar quarter average) also remain in effect.

(2) The level of the annual NO_2 standard is 0.053 ppm. It is shown here in terms of ppb for the purposes of clearer comparison to the 1-hour standard level.

(3) Final rule signed October 1, 2015, and effective December 28, 2015. The previous (2008) O_3 standards additionally remain in effect in some areas. Revocation of the previous (2008) O_3 standards and transitioning to the current (2015) standards will be addressed in the implementation rule for the current standards.

(4) The previous SO_2 standards (0.14 ppm 24-hour and 0.03 ppm annual) will additionally remain in effect in certain areas: (1) any area for which it is not yet one year since the effective date of designation under the current (2010) standards, and (2) any area for which an implementation plan providing for attainment of the current (2010) standard has not been submitted and approved and which is designated nonattainment under the previous SO_2 standards or is not meeting the requirements of a SIP call under the previous SO_2 standards (40 C.F.R. § 50.4(3)). A SIP call is an EPA action requiring a state to resubmit all or part of its State Implementation Plan to demonstrate attainment of the required NAAQS.

Notes: ppm is parts per million; ppb is parts per billion, and µg/m3 is micrograms per cubic meter.

Source: EPA, 40 C.F.R. § 50, National Primary and Secondary Ambient Air Quality Standards (NAAQS) accessed August 2017.

3.4.2.1 Air Quality Monitoring in Region

Pima County Code (PCC) 17.04.340A.212 established thresholds of significance for air quality pollutants. In addition, PCC Title 17 Air Quality Control Section 17.14.040 *Fugitive Dust Activity Permit* requires sponsors of construction activities to obtain a fugitive dust activity permit. The permit requires the permittee to control windblown dust, dust from haul roads, and dust emitted from land clearing, earthmoving, demolition, trenching, blasting, and road construction.

Pima County Department of Environmental Quality (PDEQ) has regulatory authority for air quality within Pima County. It has established an air monitoring network that measures air pollution at 16 stations located throughout the county. The Santa Clara monitoring station on the roof of the Santa Clara School is closest to the Airport. This station is located approximately 10,700 feet from Runway End 11L and only monitors PM_{10}. This monitor has recorded no exceedances of the PM_{10} standard in 2016.[6]

According to PDEQ, concentrations of the criteria pollutants have been stable over the past few years with ozone and PM_{10} being the major concern for Pima County. Ozone has been very close to the standard and PM_{10} levels are elevated during drought conditions and high winds, which have caused exceedances of the NAAQS.

3.4.2.2 Aircraft Activity Levels and Fleet Mix Characteristics

The number and type of aircraft operations at any airport directly affects the amount and type of emissions. The existing conditions emissions inventory information described below is based on the 2016 aircraft operations at TUS. The total aircraft operation counts include passenger, all-cargo, on-demand/limited service air taxi, general aviation, and military aircraft operations. For further discussion of the number and type of aircraft operations at TUS and the FAA Terminal Area Forecast, (see **Appendix B, *Aviation Activity Forecast***). There were a total of 140,271 aircraft operations in 2016 at TUS. **Table 3-2** provides the aircraft operations for the Existing (2016) Conditions.

Table 3-2
TOTAL AIRCRAFT OPERATIONS – EXISTING (2016)
Tucson International Airport

FISCAL YEAR	PASSENGER	ALL-CARGO	AIR TAXI	GENERAL AVIATION	MILITARY	TOTAL
2016	38,674	2,126	9,629	62,152	27,690	**140,271**

Sources: Tucson Airport Authority, Monthly Activity Overview; OAG Aviation Worldwide Ltd, OAG Schedules Analyser; Arizona Air National Guard, and Landrum & Brown analysis.

Emissions were computed using Version 2d of the Aviation Environmental Design Tool (AEDT). The AEDT was developed under the guidance of the FAA and is the only model generally approved by the FAA for use in air quality assessments for NEPA purposes.

[6] Pima County Environmental Quality, 2016, 2016 Ambient Air Monitoring Network Plan.

In the following table, the total aircraft operations at Tucson are broken down to show the types of aircraft operating at TUS. A representative aircraft for each type was determined based on the data obtained and JP Fleets[7] was used to assign engine types for each operation. **Table 3-3** provides the representative aircraft and engine combinations for the operations for the existing conditions.

Table 3-3
TOTAL AIRCRAFT OPERATIONS WITH REPRESENTATIVE AIRCRAFT AND ENGINE COMBINATIONS
Tucson International Airport

OPERATION TYPE	REPRESENTATIVE AIRCRAFT	REPRESENTATIVE ENGINE	AEDT ENGINE CODE	2016
Passenger	Boeing 757-200 Series	PW2037	4PW072	130
Passenger	Boeing 737-900 Series	CFM56-7B24	3CM032	664
Passenger	Boeing 737-800 with winglets	CFM56-7B26	3CM033	1,606
Passenger	Boeing MD-90	V2525-D5	1IA002	1,536
Passenger	Airbus A320-200 Series	CFM56-5B4/P	3CM026	80
Passenger	Boeing 737-700 Series	CFM56-7B22	3CM031	6,702
Passenger	Boeing 737-300 Series	CFM56-3-B1	1CM004	1,632
Passenger	Boeing MD-88	JT8D-217C	4PW070	5,554
Passenger	Airbus A319-100 Series	V2522-A5	3IA006	350
Passenger	Bombardier CRJ-900-ER	CF34-8C5	6GE092	5,748
Passenger	Embraer ERJ175-LR	CF34-8E5	6GE094	2,958
Passenger	Bombardier CRJ-700-ER	CF34-8C1	5GE083	4,024
Passenger	Bombardier CRJ-200-ER	CF34-3B	5GE084	7,200
Passenger	Embraer ERJ145-LR	AE3007A1	6AL007	490
Cargo	Boeing 767-300 ER Freighter	CF6-80C2B6	1GE029	922
Cargo	Boeing 757-200 Series	PW2037	4PW072	2
Cargo	Boeing MD-11 Freighter	CF6-80C2D1F	2GE049	2
Cargo	Airbus A300B4-600 Series	CF6-80C2A8	2GE040	50
Cargo	Raytheon Beech 1900-C	PT6A-65B	PT6A6B	62
Cargo	Piper PA-31 Navajo	TIO-540-J2B2	TIO540	500

[7] Flightblobal, 2013, JP Airline-Fleets International, World Airline Fleet Directory 2013/14, 4th edition.

Table 3-3, *Continued*
TOTAL AIRCRAFT OPERATIONS WITH REPRESENTATIVE AIRCRAFT AND ENGINE COMBINATIONS
Tucson International Airport

OPERATION TYPE	REPRESENTATIVE AIRCRAFT	REPRESENTATIVE ENGINE	AEDT ENGINE CODE	2016
Cargo	Embraer EMB120 Brasilia	PW118A	PW118A	550
Cargo	Fairchild SA-227-AC Metro III	TPE331-10	TPE10	38
On Demand Air Carrier	Boeing 737-200 Series	JT8D-15A	1PW011	928
Air Taxi/Commuter	Bombardier Challenger 600	ALF 502L-2	1TL001	5,898
Air Taxi/Commuter	Pilatus PC-12	PT6A-67	PT6A67	1,571
Air Taxi/Commuter	Cessna 172 Skyhawk	TSIO-360C	TSIO36	1,232
GA	Cessna 525 CitationJet	BIZLIGHTJET_F	BIZLIGHTJET_F	12,105
GA	Raytheon Super King Air 200	PT6A-61	PT6A61	10,743
GA	Cessna 172 Skyhawk	TSIO-360C	TSIO36	36,403
GA	Bell 206 JetRanger	250B17B	250B17	2,901
Military	Lockheed Martin F-16 Fighting Falcon	F100-PW-220 (w/AB)	F1022A	27,413
Military	Fairchild A-10A Thunderbolt II	TF34-GE-100-100A	TF3410	277
Total Operations				**140,271**

Sources: Tucson Airport Authority, Monthly Activity Overview; OAG Aviation Worldwide Ltd, OAG Schedules Analyser; Arizona Air National Guard, and Landrum & Brown analysis.

3.4.2.3 Auxiliary Power Units (APUs)

The larger jet aircraft use auxiliary power units (APUs) while at the gate to operate the heating, air conditioning, and electric systems. The APU is also used to 'start up' or restart the aircraft engines before departing from the gate area. Neither the Proposed Action nor the No Action alternative would affect APU emissions and therefore were not included in the inventory.

3.4.2.4 Mobile Sources

Mobile sources of air emissions include motor vehicles and other engines and equipment that can be moved from one location to another. These are typically classified as "road sources" and "non-road sources." Road sources include automobiles, light-duty and heavy-duty trucks. However, neither the Proposed Action nor the No Action alternative would affect road sources of emissions and therefore were not included in the inventory.

Non-road sources include airport ground support equipment (GSE) and construction equipment. Typical GSE items include airport equipment that provides air conditioning, air start, baggage tractors, belt loaders, catering vehicles, and emergency vehicles. Neither the Proposed Action nor the No Action alternative would affect GSE emissions and therefore were not included in the inventory.

3.4.3 2016 AEDT INVENTORY

The Existing (2016) emission inventory was developed for airport sources using the FAA's AEDT Version 2d. AEDT is a software system that models aircraft performance in space and time to estimate fuel consumption and emissions at airports. **Table 3-4** shows the annual air pollutant emissions for the Existing (2016) Conditions.

Table 3-4
AEDT ANNUAL AIR POLLUTANT EMISSIONS – EXISTING (2016)
Tucson International Airport

EMISSION SOURCE	TONS OF POLLUTANTS (2016)					
	CO	VOC	NO_X	SO_X	PM_{10}	$PM_{2.5}$
Aircraft	417.2	71.6	181.3	22.4	2.5	2.5

Source: Landrum & Brown analysis, 2018.

Carbon monoxide and oxides of nitrogen provide the greatest overall emissions contribution. These pollutants are produced from the incomplete combustion of aircraft engines.

3.5 BIOLOGICAL RESOURCES

3.5.1 REGULATORY SETTING

Biological resources are valued for their intrinsic, aesthetic, economic, and recreational qualities and include fish, wildlife, plants, and their respective habitats. Typical categories of biological resources include:

- terrestrial and aquatic plant and animal species;
- game and non-game species;
- special status species (state or Federally-listed threatened or endangered species, marine mammals, or species of concern, such as species proposed for listing or migratory birds); and
- environmentally-sensitive or critical habitats.

The primary statutes, regulations, Executive Orders (Eos), and guidance related to the protection of biological resources are discussed in the following paragraphs.

3.5.1.1 Federal Regulatory Setting

Endangered Species Act (ESA)

The United States Congress passed the Endangered Species Act of 1973, as Amended (ESA) 16 U.S.C. §1531 *et seq*., in 1973 to conserve those species that are endangered or threatened with extinction (Federally-listed species). Under ESA, Section 7, the FAA is required to consult with the United States Fish and Wildlife Service (USFWS) and/or the National Marine Fisheries Service (NMFS) to ensure that any action the agency authorizes, funds, or carries out is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. In accordance with Section 7 of the ESA, a Biological Assessment (BA) was prepared by the FAA to analyze the potential impacts of the Proposed Action on ESA-listed species and critical habitat under the jurisdiction of USFWS (see **Appendix D**).

Migratory Bird Treaty Act (MBTA)

The Migratory Bird Treaty Act of 1918, as Amended (MBTA), 16 U.S.C. § 703 *et seq.*, established in 1916, protects migratory birds by prohibiting any person from intentionally taking, selling, or conducting other activities that would harm migratory birds, their eggs, or nests (such as the removal of an active nest or nest tree), unless a permit has been obtained.[8] The list of migratory birds includes all bird species native to the United States The statute was extended in 1974 to include parts of birds, as well as eggs and nests. Although there is currently a split of opinion in various United States Courts of Appeals, the United States Ninth Circuit Court of Appeal (in which Arizona is located) and the United States Department of Interior (USDOI) recognize that it is illegal under the act to intentionally kill, or destroy a migratory bird, or the active nest of a migratory bird without a permit. Activities that

[8] 16 U.S.C. § 668 *et seq*.

result in removal or destruction of an active nest (a nest with eggs or young being attended by one or more adults) would violate the act. Removal of unoccupied nests, or bird mortality resulting indirectly from disturbance activities, is not considered a violation of the MBTA.

EO 13186, Responsibilities of Federal Agencies to Protect Migratory Birds

This EO directs Federal agencies to take action to further implement the MBTA. This would require agencies that take actions that either directly or indirectly affect migratory birds to develop a Memorandum of Understanding (MOU), and to work with the USFWS, and other federal agencies to promote the conservation of migratory bird populations.

Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act, 16 U.S.C. § 668 *et seq*., enacted in 1940, protects bald and golden eagles from the unauthorized capture, purchase, or transportation of the birds, their nests, or their eggs. Therefore, it is illegal to, unless the Secretary of the Interior authorizes such activities under a special permit, take bald eagles, including their parts, nests, or eggs. The act defines *take* as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb" (50 C.F.R. § 22.3). Moreover, *disturb* means, "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior. (50 C.F.R. § 22.3). Activities that result in a taking of bald eagles, including their parts, nests, or eggs, violate the Bald and Golden Eagle Protection Act and are considered illegal.

EO 13112, Invasive Species

This EO 13112 issued in 1999, instructs Federal agencies whose actions may affect the status of invasive species to use relevant programs and authorities, to the extent practicable, to prevent the introduction of invasive species and to provide for the restoration of native species and habitat conditions in ecosystems that have been invaded. The EO defines an invasive species as a plant, animal, or microorganism species not native to the region or area whose introduction causes or is likely to cause harm to the economy or the environment, or harms animal or human health. Agencies are directed not to carry out actions that they believe are likely to cause or promote the introduction or spread of invasive species unless the benefits of such actions clearly outweigh the potential harm, and all feasible and prudent measures to minimize risk of harm are taken.

Memorandum of Understanding (MOU) to Foster the Ecosystem Approach

The MOU to Foster the Ecosystem Approach, established in 1995, provides guidance for the sustaining or restoring of ecological systems and their functions and values. The ecosystem approach emphasizes consideration of all relevant and identifiable ecological and economic consequences, both long-term and short-term; coordination among Federal agencies; partnership; communication with the public; efficient and cost-effective implementation; use of best available science; improved data and information management, and responsiveness to changing circumstances.

Council on Environmental Quality (CEQ) Guidance on Incorporating Biodiversity Considerations into Environmental Impact Analysis under the National Environmental Policy Act

In accordance with 40 C.F.R. §§ 1507.2(e), 1508.8(b), and 1508.27, federal agencies are directed to consider the effects of Federal actions on biodiversity to the extent that is possible to both anticipate and evaluate those effects. The guidance outlines the detailed principles and discusses the importance of context – that is, examining the direct, indirect, and cumulative impacts of a specific project in the regional or ecosystem context.

3.5.1.2 Arizona Regulatory Setting

The State of Arizona has statutes and/or conservation plans in place to protect special-status species. All resident, migratory, native, and introduced wildlife in Arizona, except fish and bullfrogs in private ponds or wildlife and birds held in captivity under permit, are property of the state.

Arizona Revised Statutes Title 17 and the Arizona Administrative Code Title 12, Chapter 4

Under provisions of the Arizona Revised Statutes Title 17 and the Arizona Administrative Code (AAC) Title 12, Chapter 4, the Arizona Game and Fish Department (AGFD) is charged to manage wildlife. The AGFD tracks uncommon animal and native plant species. The AGFD developed Arizona's State Wildlife Action Plan which established a comprehensive wildlife conservation strategy for the state.[9] This strategy included the identification of Arizona's species of greatest conservation need, including wildlife species most in need of conservation actions that depend on Arizona habitats for survival. The plan only includes such species for which the AGFD has statutory responsibility, including nonnative species that the AGFD currently manages. The species of greatest conservation need are listed in the AGFD's Heritage Data Management System. The species of greatest conservation need and State Wildlife Action Plan are used to inform management decisions by land management and non-governmental conservation organizations in planning decisions.

[9] Arizona Game and Fish Department, May 2012, Arizona's State Wildlife Action Plan: 2012-2022. Available on-line: https://www.azgfd.com/PortalImages/files/wildlife/2012-2022_Arizona_State_Wildlife_Action_Plan.pdf. Accessed on September 6, 2017.

Arizona Native Plant Law (Arizona Administrative Code Title 3, Chapter 3, Article 11)

The Arizona Native Plant Law, enacted in 1929, aims to protect the native plants of Arizona. The Arizona Department of Agriculture (AZDA) administers the legislation while the AGFD maintains the database and tracks many of the protected plants. These protected plants may not be removed from any lands without permission of the land owner and a permit from the AZDA. A landowner may destroy a protected native plant on their own property if the landowner receives a permit from the AZDA within 20 to 60 days prior to the destruction of said protected native plant. The legislation defines *destroy* as "cause death of any protected native plant". The protected native plants are listed in the Arizona Administrative Code Title 3, Chapter 3, Appendix A, *Protected Native Plants by Category*.

Additionally, the Arizona Native Plant Law categorizes many native plants as highly safeguarded, salvage restricted, salvage assessed, and harvest restricted. The highly safeguarded category includes native plants in Arizona that are in jeopardy or in danger of extinction. The salvage restricted category is extensive and includes native plants that are not in the highly safeguarded category but are vulnerable to theft or vandalism (this category includes, but is not limited to, all species of the agave, cactus, lily, and orchid families). Salvage assessed plants are not included in the highly safeguarded or salvage restricted categories but have sufficient value to support the cost of salvage. Harvest restricted plants are not included in the highly safeguarded category but are subject to excessive harvest because of their intrinsic value.

3.5.1.3 Pima County Regulatory Setting

Pima County also has the following ordinances and plans in place to protect native plants and special-status species.

Sonoran Desert Conservation Plan, Multiple Species Conservation Plan, and ESA Section 10 Permit

The Sonoran Desert Conservation Plan (SDCP) was established to ensure the long-term survival of the full spectrum of plants and animals that are indigenous to Pima County through maintaining or improving the habitat conditions and ecosystem function necessary for their survival. At its core, the conservation plan is a land use and protection plan that aims to balance the protection of the biological resources and economic vitality of Pima County. The conservation plan identifies 56 priority vulnerable species warranting further analysis, consideration, and conservation in Pima County. Of these, 44 species that occur in Pima County are protected under the conservation plan's Multiple Species Conservation Plan. The implementation of this plan has allowed Pima County a specified level of incidental take permitted under ESA Section 10 in exchange for perpetual protection of sensitive habitat in the Conservation Lands System, implementation of management prescriptions therein, and mitigation measures for habitat modification.

The Pima County Native Plant Preservation Ordinance (PCC Chapter 18.72)

The Pima County Native Plant Preservation Ordinance (PCC 18.72) generally requires that projects that disturb more than 14,000 square feet and contain protected native upland plants prepare a Native Plant Preservation Plan. Pima County's list of protected native plants includes 11 tree/shrub species, seven agaves, four yuccas, 14 cacti, and all threatened and endangered plants in the state. All Native Plant Preservation Plans must use one or a combination of methods to preserve native plants and to salvage and mitigate protected plants that will be impacted by construction, except in areas of regulated riparian habitat.

3.5.2 AFFECTED ENVIRONMENT

The affected environment or action area for biological resources is defined per 50 C.F.R. § 402.02 as "*all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action*."

The USFWS Information, Planning, and Conservation System and the Arizona Game and Fish Department Online Environmental Review Tool were accessed in January 2018 to review the potential for listed species and critical habitat in the General Study Area. The General Study Area covers approximately 12,600 acres and is defined as the area where both direct and indirect impacts may result from the development of the Proposed Action. See **Appendix D**, *Section 7 Consultation* for copies of the USFWS Information, Planning, and Conservation System and the Arizona Game and Fish Department Online Environmental Review Tool results.

In addition, a pedestrian survey was conducted between April 20 and June 24, 2017 to collect site-specific vegetation and wildlife information within the Detailed Study Area . The Detailed Study Area covers approximately 1,500 acres and is defined as the area where actual ground disturbance may occur as a result of the Proposed Action.

3.5.2.1 Vegetation

Vegetation in the Detailed Study Area consists of upland vegetation and bottomland vegetation communities. The Detailed Study Area consists of the following upland vegetation communities:

- Developed Areas
- Creosote – Mesquite and Mixed Scrub
- Creosote –Mixed Scrub
- Foothills Paloverde – Creosote – Mixed Cacti – Mixed Scrub
- Desert broom – Mixed Shrub
- Fountain Grass – Mixed Grasses
- Ornamental landscaping

Developed Areas

Developed areas are disturbed, and many areas are covered with gravel and other road bed material. Small forbs, shrubs and/or mixed grasses are locally dense. The vegetation is mowed in areas near the runways and between taxiways.

Creosote – Mesquite – Mixed Scrub Association

The creosote – mesquite – mixed scrub association is primarily creosote interspersed with scattered mesquites, many of which tend to be stunted and have many small stems. Fishhook barrel cactus (*Ferocactus wislizenii*) and several cholla species (*Opuntia* spp.) are common throughout this community.

Creosote – Mixed Scrub Association

Areas within the creosote – mixed scrub association are chiefly creosote flats with small strands of mesquite and whitethorn and catclaw acacia (*Acacia constricta* and *A. greggii*) occurring along the ephemeral drainages. Fishhook barrel cactus, several cholla species (*Opuntia* spp.), and ocotillo (*Fouquieria splendens*) are locally common.

Foothills Paloverde – Creosote – Mixed Cacti – Mixed Scrub Association

The foothills paloverde – creosote – mixed cacti – mixed scrub association is an open and simple upland desertscrub habitat. Foothills paloverde, mesquite, and whitethorn acacia are scattered throughout the landscape among saguaro (*Carnegiea gigantea*), fishhook barrel cactus, hedgehog cactus (*Echinocereus engelmannii*), and chainfruit, teddybear, cane, and Christmas chollas (*Opuntia fulgida*, *O. bigloveii*, *O. spinosior*, and *O. leptocaulis*). Creosote is common and occurs among triangle-leaf bursage (*Ambrosia deltoidea*) and shrubby coldenia (*Tiquilia canescens*). Pima pineapple cactus mostly (*Coryphantha scheeri* var. *robustispina*) occurs in this vegetation association within the project area.

Desert *Broom – Mixed Shrub Association*

The desert broom – mixed shrub association occurs near drainages or where runoff accumulates. It is dominated by dense patches of desert broom (*Baccharis sarothroides*), and is frequently interspersed with various proportions of other shrubs and forbs.

Fountain Grass – Mixed Grasses Association

The fountain grass – mixed grasses association is dominated by buffelgrass (*Pennisetum ciliare*) and contains various proportions of other grass species. This association forms a monoculture near the center of the study area.

Ornamental Landscaping

Ornamental plants are primarily exotic and occur in landscaped areas around buildings. Most of these areas consist of Chilean mesquite (*Prosopis chilensis*), Mexican paloverde (*Parkinsonia aculeata*), fan palm (*Washingtonia* sp.), and a few native species such as mesquite and foothills paloverde.

The Detailed Study Area also consists of bottomland vegetation communities including:

- Mesquite – Acacia – Desert Broom Xeroriparian Association
- Mixed Exotic – Native Mesoriparian Association

Common riparian scrub species include mesquite, foothill paloverde, blue paloverde (*Parkinsonia florida*), whitethorn and catclaw acacia, desert hackberry, and canyon ragweed (*Ambrosia ambrosioides*).

Mesquite – Acacia – Desert Broom Xeroriparian Association

The mesquite – acacia – desert broom xeroriparian vegetation association occurs along drainages and is primarily mesquite interspersed with whitethorn acacia. Dense patches often occur in a mosaic with patches of desert broom.

Mixed Exotic – Native Mesoriparian Association

The dense mixed exotic – native mesoriparian association is a unique vegetation community that occurs in a manmade canal near the western edge of the study area. It contains many exotic and invasive species including salt cedar (*Tamarix ramosissima*), African sumac (*Rhus lancea)*, fan palm, Mexican paloverde, and natives such as mesquite and western black willow (*Salix gooddingii*).

Native Plants

The AZDA's website was referenced to obtain a list of native plants protected within the State of Arizona. A total of 9 native plant species protected under the AZDA Native Plant Law were observed and documented during the pedestrian survey conducted in the spring and summer of 2017 within the Detailed Study Area as shown in **Table 3-5**.

Table 3-5
AZDA PROTECTED NATIVE PLANTS AND NOXIOUS WEEDS OBSERVED DURING 2017 PEDISTRIAN SURVEY WITHIN THE DETAILED STUDY AREA
Tucson International Airport

COMMON NAME	SCIENTIFIC NAME
AZDA, Native Plant Law[a] – Highly Safeguarded Protected Native Plants	
Saguaro	*Carnegiea gigantean*
AZDA, Native Plant Law – Salvage Restricted Protected Native Plants	
Saguaro	*Carnegiea gigantean*
Chainfruit/jumping cholla	*Cylindropuntia fulgida*
Cane cholla	*Cylindropuntia imbricate*
Christmas cholla	*Cylindropuntia leptocaulis*
Fishhook barrel cactus	*Ferocactus wislizenii*
Ocotillo	*Fouquieria splendens*
Long-spined prickly pear	*Opuntia macrocentra*
AZDA, Native Plant Law – Salvage Assessed Protected Native Plants	
Littleleaf palo verde	*Parkinsonia microphylla*
Velvet mesquite	*Prosopis velutina*
AZDA, Native Plant Law – Harvest Restricted Protected Native Plants	
Velvet mesquite	*Prosopis velutina*
AZDA, Regulated and Restricted Noxious Weeds[b]	
Buffelgrass	*Pennisetum ciliare*

Note: Several of the native plant species are under more than one category in the table.

Source: [a] AZDA Native Plants: Protected Arizona Native Plants. Accessed online at https://agriculture.az.gov/plantsproduce/native-plants, November 2017.
[b] AZDA Noxious Weeds: Regulated and Restricted Noxious Weeds. Accessed online at https://agriculture.az.gov/pests-pest-control/agriculture-pests/noxious-weeds, November 2017.

Native vegetation in the Detailed Study Area includes upland associations in the Arizona Upland subdivision of the Sonoran Desertscrub biotic community, and riparian woodland and scrub communities.[10]

A total of 34 native plant species were observed and documented during the same pedestrian survey conducted in spring and summer of 2017 within the Detailed Study Area as shown on **Table 3-6**.

Non-Native Plants

Three non-native weed species, buffelgrass (*Pennisetum ciliare*), Lehmann's lovegrass (*Eragrostis lehmanniana*), and London rocket (*Sisymbrium irio*) were observed and documented during the pedestrian survey conducted in the spring and summer of 2017 within the Detailed Study Area. Buffelgrass is listed as both a Prohibited and Regulated Noxious Weed by the AZDA.

[10] Brown, David E. (Ed.), 1994, Biotic communities: southwestern United States and northwestern Mexico. University of Utah Press, Salt Lake City.

Table 3-6
LIST OF NATIVE PLANT SPECIES OBSERVED DURING THE PEDESTRIAN SURVEY WITHIN THE DETAILED STUDY AREA
Tucson International Airport

COMMON NAME	SCIENTIFIC NAME
TREES	
White-thorn acacia	*Acacia constricta*
Catclaw acacia	*Acacia greggii*
Littleleaf palo verde	*Parkinsonia microphylla*
Velvet mesquite	*Prosopis velutina*
SHRUBS	
Weakleaf bur ragweed	*Ambrosia confertiflora*
Triangleaf bursage	*Ambrosia deltoidea*
Desert broom	*Baccharis sarothroides*
Brittlebush	*Encelia farinose*
Burrowed	*Isocoma tenuisecta*
Creosote bush	*Larrea tridentate*
Fremont's desert thorn	*Lycium fremontii*
Desert senna	*Senna covesii*
CACTI AND SUCCULENTS	
Saguaro	*Carnegiea gigantean*
Chainfruit/jumping cholla	*Cylindropuntia fulgida*
Cane cholla	*Cylindropuntia imbricate*
Christmas cholla	*Cylindropuntia leptocaulis*
Fishhook barrel cactus	*Ferocactus wislizenii*
Ocotillo	*Fouquieria splendens*
Long-spined prickly pear	*Opuntia macrocentra*
FORBS	
Desert holly, dwarf desertpeony	*Acortia nana*
Weakleaf bur ragweed	*Ambrosia confertiflora*
Devil's spineflower	*Chorizanthe rigida*
Gordon's bladderpod	*Lesquerella gordoni*
Slender goldenweed	*Machaeranthera gracilis*
Seep monkeyflower	*Mimulus guttatus*
Climbing milkweed	*Sarcostemma cynanchoides*
Lyreleaf Jewelflower/Silverbells	*Streptanthus carinatus*
Fiveneedle pricklyleaf	*Thymophylla pentachaeta*
Woody crinklemat	*Tiquilia canescens*
GRASSES	
Purple three-awn	*Aristida purpurea*
Fluffgrass	*Erioneuron pulchellum*
Bush muhly	*Muhlenbergia porter*
Plains bristlegrass	*Setaria leucopila*
Spike dropseed	*Sporobolus contractus*

Source: Harris Environmental Group, Inc., direct observation by Harris Environmental Group staff during pedestrian surveys in Spring and Summer 2017.

3.5.2.2 Wildlife

Birds observed during the first pedestrian survey conducted in the spring and summer of 2017 within the Detailed Study Area, which is where actual ground disturbance could occur from the Proposed Action are shown on **Table 3-7** and included: northern harrier (*Circus cyaneus*), lark bunting (*Calamospiza melanocorys*), white-crowned sparrow (*Zonotrichia leucophrys*), black-throated sparrow (*Amphispiza bilineata*), evidence (burrows with whitewash and bones) of burrowing owl (*Athene cunicularia*), common raven (*Corvus corax*), red-tailed hawk (*Buteo jamaicensis*), green-tailed towhee (*Pipilo chlorurus*), Gila woodpecker (*Melanerpes uropygialis*), loggerhead shrike (*Lanius ludovicianus*), verdin (*Auriparus flaviceps*), mourning dove (*Zenaida macroura*), Gambel's quail (*Callipepla gambelii*), horned lark (*Eremophila alpestris*),vesper sparrow (*Pooecetes gramineus*), and lesser nighthawk (*Chordeiles acutipennis*). One nighthawk nest containing two eggs was also observed. Mammals observed during field studies included black-tailed jackrabbit (*Lepus californicus*), desert cottontail (*Sylvilagus auduboni*), badger (*Taxidea taxus*), coyote (*Canis latrans*), and javelina (*Tayassu tajacu*). Reptiles included coachwhip (*Masticophus flagellum*) and regal horned lizard (*Phrynosoma solare*).

Migratory Birds

There have been few avian studies conducted in the Sonoran Desert. However, previous surveys have revealed totals for bird species ranging from 39 at Casa Grande Ruins National Monument to 112 at Saguaro National Park.[11] In comparison, avian diversity on Davis-Monthan Air Force Base (DMA) totaled 74 species during surveys conducted in 2015 by Scott Blackman currently of Harris Environmental Group, Inc. Monitoring efforts to date have documented eight priority Arizona Partners in Flight species, including: Brewer's sparrow, (*Spizella breweri*), Costa's hummingbird (*Calypte costae*), gilded flicker (*Colaptes chrysoides*), grasshopper sparrow (*Ammodramus savannarum*), Lucy's warbler (*Oreothlypis luciae*), purple martin (*Progne subis*), rufous-winged sparrow (*Peucaea carpalis*), and savannah sparrow (*Passerculus sandwichensis*). Brewer's, savannah, and grasshopper sparrows are wintering species in southern Arizona. Grasshopper sparrows also breed in the southeastern portion of Arizona, and likely occur only during the winter season within the Detailed Study Area. Costa's hummingbird and Lucy's warbler maintain breeding territories in the Detailed Study Area; both species are considered common Sonoran Desert breeders. The gilded flicker, purple martin, and rufous-winged sparrow may breed in the area. Additionally, several grassland species (e.g., Brewer's sparrow, Cassin's sparrow, grasshopper sparrow, savannah sparrow, and western meadowlark) were observed and documented.

[11] Ali, M., K. Beaupré, P. Valentine-Darby, and C. White. 2014. Landbird monitoring in the Sonoran Desert Network: 2013 annual report. Natural Resource Technical Report NPS/SODN/NRTR—2014/888. National Park Service, Fort Collins, Colorado.

Table 3-7
BIRD SPECIES OBSERVED DURING PEDESTRIAN SURVEY
Tucson International Airport

COMMON NAME	SPECIES
American kestrel[1]	*Falco sparverius*
Anna's hummingbird	*Calypte anna*
black-chinned hummingbird[1]	*Archilochus alexandri*
black-headed grosbeak[1]	*Pheucticus melanocephalus*
black-tailed gnatcatcher[1]*	*Polioptila melanura*
Brewer's sparrow*	***Spizella breweri***
broad-billed hummingbird*	*Cynanthus latirostris*
brown-headed Cowbird[1]	*Molothrus ater*
cactus wren	*Campylorhynchus brunneicapillus*
Cassin's sparrow*	*Peucaea cassinii*
chipping sparrow[1]	*Spizella passerine*
cliff swallow	*Petrochelidon pyrrhonota*
Cooper's hawk	*Accipiter cooperii*
Costa's hummingbird*	***Calypte costae***
curve-billed thrasher	*Toxostoma curvirostre*
Eurasion collared-dove	*Streptopelia decaocto*
European starling	*Sturnus vulgaris*
Gila woodpecker	*Melanerpes uropygialis*
grasshopper sparrow[1]*	***Ammodramus savannarum***
great-tailed grackle	*Quiscalus mexicanus*
house finch	*Haemorhous mexicanus*
house sparrow	*Passer domesticus*
lark bunting[1]*	*Calamospiza melanocorys*
lark sparrow	*Chondestes grammacus*
lesser goldfinch	*Carduelis psaltria*
lesser nighthawk[1]*	*Chordeiles acutipennis*
Lincoln's sparrow*	*Melospiza lincolnii*
Lucy's warbler	***Oreothlypis luciae***
mourning dove	*Zenaida macroura*
northern mockingbird	*Mimus polyglottos*
northern rough-winged swallow[1]*	*Stelgidopteryx serripennis*
pyrrhuloxia	*Cardinalis sinuatus*
rock pigeon	*Columba livia*
ruby-crowned kinglet	*Regulus calendula*
savannah sparrow*	***Passerculus sandwichensis***
Say's phoebe	*Sayornis saya*
verdin	*Auriparus flaviceps*
vermillion flycatcher	*Pyrocephalus rubinus*
western kingbird	*Tyrannus verticalis*
western meadowlark	*Sturnella neglecta*
western tanager[1]*	*Piranga ludoviciana*
white-crowned sparrow*	*Zonotrichia leucophrys*
yellow-rumped warbler	*Dendroica coronate*

[1] Indicates species observed incidentally.
* Indicates species not previously documented prior to 2015-2016 monitoring efforts.
Note: Species in **bold** font are classified PIF priorities for conservation[12]
Source: American Ornithology, 2017, American Ornithology Website Database. Accessed online at http://www.americanornithology.org/content/taxonomic-resources, November.

[12] Latta, M. J., Beardmore, C. J. and Corman, T. E. 1999. Arizona partners in flight bird conservation plan. Version 1.0. Nongame and Endangered Wildlife Program Technical Report 142. Arizona Game and Fish Department, Phoenix, Arizona.

3.5.2.3 Special Status Species

The USFWS Information, Planning, and Conservation System was queried to review species and critical habitat occurring within one or more delineated United States Geological Survey 7.5 minute quadrangles intersecting the Detailed Study Area. See **Appendix D**, *Section 7 Consultation*. In addition, the AGFD's Online Environmental Review Tool was also used to determine whether any special status species or special management areas have been documented as occurring within three miles of the Detailed Study Area. See **Appendix D**, *Section 7 Consultation*. The following special status species as shown in **Table 3-8** have been identified within the Detailed Study Area. The following sections provide a brief description of the federally and state-listed species that have been observed or have the potential to occur within the Detailed Study Area.

Lesser Long-Nosed Bat

The lesser long-nosed is a medium-sized, leaf-nosed bat that is yellow-brown to pale gray dorsally and cinnamon ventrally. [13] It is a nectivorous that also consumes pollen and fruit of agaves and columnar cacti.

In Arizona, this bat generally forages from dusk to dawn from April through September. In a single night, lesser long-nosed bats forage up to 30 miles from their daytime roost sites.[14] Pregnant females arrive in Arizona in early April and form large maternity colonies. Males arrive later and form smaller separated colonies. A single offspring per mother is born each year in May and can fly by late June. Maternity colonies dissociate by the end of July. Lesser long-nosed bats range from the southern United States to northern South America in semiarid to arid habitats. Food availability and suitable roosting habitat within commuting distance of food sources are requisite.[15] In Arizona, lesser long-nosed bats roost in caves, mines, and tunnels in desertscrub, grassland, and oak woodlands. This bat does not hibernate and leaves Arizona during the winter migration to the southern portion of its range.

The lesser long-nosed bat is endangered from declines in the size and number of maternity colonies from roost site exclusion and disturbance in Sonora and Arizona. Further causes may be related to large-scale depletions of agaves in Mexico for tequila production.[16]

[13] USFWS, 1995b, Lesser long-nosed bat recovery plan. Region 2, US Fish & Wildlife Service, Albuquerque, New Mexico.
[14] AGFD, 2003, *Leptonycteris curasoae yerbabuenae*. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, Arizona.
[15] Ibid.
[16] Ibid.

Table 3-8
SPECIAL STATUS SPECIES REGULATED OR MONITORED
Tucson International Airport

SPECIES		UNITED STATES FISH AND WILDLIFE SERVICE		STATE OF ARIZONA	PIMA COUNTY	
		ENDANGERED SPECIES ACT	MIGRATORY BIRD TREATY ACT	ARIZONA NATIVE PLANT LAW	PCC 18.72	PCC 16.30
Lesser long-nosed bat	*Leptonycteris curasoae yerbabuenae*	LE			PC	
Pima pineapple cactus	*Coryphantha scheeri var. robustispina*	LE		HS	PC	
Merriam's mouse	*Peromyscus merriami*				PC	PC
Western red bat	*Lasiurus blossevillii*				PC	PC
Western yellow bat	*Lasiurus xanthinus*				PC	PC
Cactus ferruginous pygmy-owl	*Glaucidium brasilianum cactorum*		MBTA		PC	PC
Western burrowing owl	*Athene cunicularia hypugaea*		MBTA		PC	
Rufous-winged sparrow	*Aimophila carpalis*		MBTA		PC	PC
Tucson shovel-nosed snake	*Chionactis occipitalus klauberi*				PC	PC
Tumamoc globeberry	*Tumamoca macdougalii*			SR	PC	PC
	Key: PC = Protected by Pima County Ordinances, MBTA = Migratory Bird Treaty Act, LE = Listed Endangered, HS = Highly Safeguarded under the Arizona Native Plant Law, SR = Salvage Restricted under the Arizona Native Plant Law					

Source: USFWS, 2017, Information, Planning, and Conservation System. Available online at: https://ecos.fws.gov/ipac/ Accessed January 2018; Arizona Game and Fish Department, 2017, Online Environmental Review Tool. Accessed online at https://azhgis2.esri.com/, January 2018; Pima County, 2016, Multi-species Conservation Plan for Pima County, Arizona: Final. Submitted to the Arizona Ecological Services office of the United States Fish and Wildlife Service, Tucson, Arizona.

The Airport is within the 30-mile foraging range of a historic roost site at Colossal Cave and other recently discovered roosts in the Catalina Mountains approximately 15 miles away.[17,] Although the Airport is outside Pima County's Conservation Lands System, a habitat model has identified 100 percent of the Detailed Study Area as medium value habitat. No day-roosting habitat occurs in the Detailed Study Area, and no major maternity roosts have been recently documented within 30 miles of the Detailed Study Area.[18,19] Lesser long-nosed bats may use shelter sites such as buildings as night roosts in the Detailed Study Area as resting areas during foraging activities; individuals may occasionally forage in the project vicinity. The Detailed Study Area does not contain vegetation composition or structure, or geologic features that provide day-roosting or foraging habitat to support a viable lesser long-nosed bat population.

Pima Pineapple Cactus (PPC)

The Pima pineapple cactus (PPC) is a small spheroid, stemmed cactus with radial tubercles.[20] This cactus occurs as both solitary and clumping plants (i.e., in small clusters/groups). Mature plants vary from 2.0 to 8.5 inches in diameter and from 2.0 to 18.0 inches tall. Yellow flowers open after the start of the summer monsoon (in July and August), and fruits develop and mature the following month. The principal pollinators appear to be solitary, ground nesting bees.[21,]

The range of the PPC in Arizona includes eastern Pima County and parts of Santa Cruz County, extending north to the Airport, south to Nogales and Sasabe, east to Vail, and west to Pan Tak and San Pedro.[22,23] These cacti typically grow on flat areas with sandy and silty soils on the lower sections of alluvial fans, and in gravelly to rocky soils on upper bajadas and hillsides. Populations of PPC are declining across its range. Nearly 38 percent of suitable habitat has been developed or adversely modified, and only a small proportion of the range is on federal land that affords PPC any protection. Threats include overgrazing, exotic grass encroachment, catastrophic fire, illegal collecting, and habitat loss and fragmentation from urbanization, development, and mining.[24]

---

17 AGFD, 2003, *Leptonycteris curasoae yerbabuenae*. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, Arizona.

18 AGFD, 2003, *Leptonycteris curasoae yerbabuenae*. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, Arizona.

19 SDCP (Sonoran Desert Conservation Plan), 2001, Priority vulnerable species (draft). Pima County Board of Supervisors, Tucson, Arizona.

20 USFWS, 1993, Endangered and threatened wildlife and plants; determination of endangered status for the plant Pima pineapple cactus (Coryphantha scheeri var. robustispina). Federal Register 58(183):49875-49880.

21 AGFD, 2001d, Coryphantha scheeri var. robuustispina. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, Arizona.

22 Felger, R.S., S. Rutman, and J. Malusa. 2015. Ajo Peak to Tinajas Altas: A flora of southwestern Arizona. Part 12. Eudicots:Campanulaceae to Cucurbitaceae. Phytoneuron 2015-21: 1–39. Published 30 March 2015. ISSN 2153 733X.

23 AGFD, 2001d, Coryphantha scheeri var. robuustispina. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, Arizona.

24 USFWS, 1993, Endangered and threatened wildlife and plants; determination of endangered status for the plant Pima pineapple cactus (Coryphantha scheeri var. robustispina). Federal Register 58(183):49875-49880.

The Airport is at the northern fringe of the PPC range. A pedestrian survey for PPC was conducted throughout this area by qualified biologists in the spring and summer of 2017. See **Appendix D** for additional information. 82 PPC were found in the Detailed Study Area, with most occurring near the southeast end of Runway 11R/29L. The locations of the PPCs in the Detailed Study Area are shown in **Exhibit 3-2**.

In addition to the ESA-listed species the Detailed Study Area contains suitable habitat for other special status species.

Merriam's Mouse

Merriam's mouse is listed as a priority vulnerable species by Pima County. Woodcutting, grazing, and channelization, alteration, and destruction of perennial and intermittent riparian watercourses and adjacent desertscrub vegetation may threaten habitat for Merriam's mouse.[25]

This nocturnal deer mouse ranges from south-central Arizona through Sonora and into Sinaloa, Mexico. It lives in low desert and riparian plant communities that contain mesquite bosques and mesquite woodland with dense under shrubs.

The Detailed Study Area contains low and medium quality modeled habitat. Patches of woodland capable of supporting a small Merriam's mouse population exist within the Detailed Study Area. Although the Merriam's mouse was not observed during the pedestrian survey, the presence of suitable habitat makes it possible that Merriam's mouse occurs in the Detailed Study Area.

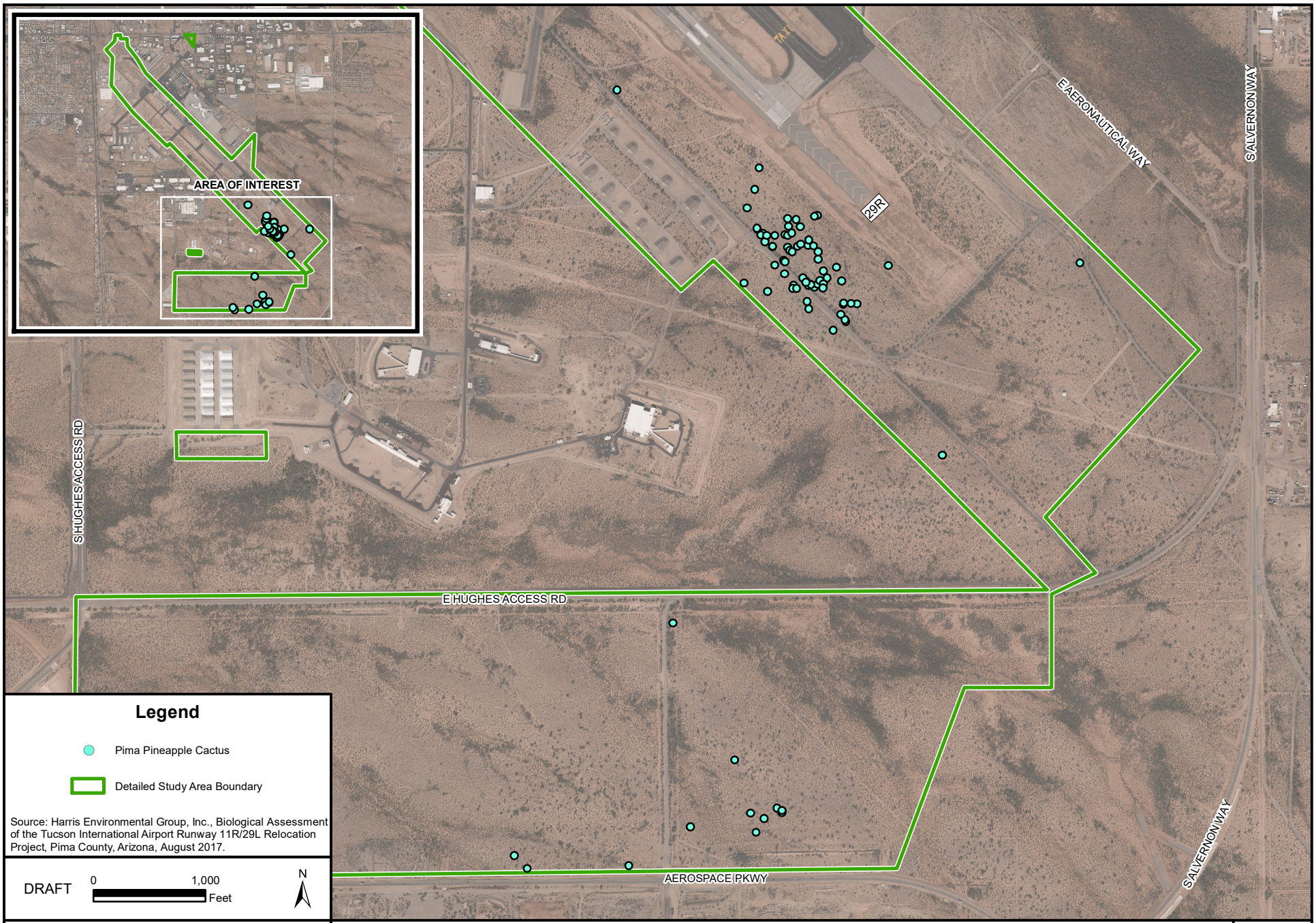
Western Red Bat

The western red bat is listed as wildlife of special concern in the AGFD's Heritage Data Management system and a priority vulnerable species by Pima County.[26] The chief threats to western red bats include loss of broadleaf riparian woodland and forest habitat, and pesticide application in fruit orchards. Documented causes of red bat mortalities include impalement by barbed wire, and collisions with buildings and vehicles.

Western red bats are insectivorous and aggressively take many moths on the wing. Red bats mate between August and October. Habitat for western red bat includes broadleaf riparian woodlands (primarily cottonwood) and other wooded areas such as fruit orchards. The western red bat may roost in saguaro boots and cave-like situations, although dense foliage is typical. Western red bat may use saguaro boots in any of the large saguaros that occur in the Detailed Study Area, but are more likely to occur in the mesoriparian woodland habitat.

[25] AGFD, 2011, Peromyscus merriami. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, Arizona.

[26] AGFD, 2011, Lasiurus blossevillii. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, Arizona.



Environmental Impact Statement
Tucson International Airport

Pima Pineapple Cactus in the Detailed Study Area

EXHIBIT: **3-2**

12/5/2017 Y:\TUS\TUS-EIS\E-L&B Work Product\2-GIS\MXD\DOCUMENT\ 3-2_PPC in the Detailed Study Area.mxd

THIS PAGE INTENTIONALLY LEFT BLANK

The Detailed Study Area includes mostly low quality modeled habitat and contains prey species for western red bats. Roost sites in the Detailed Study Area are limited to four saguaros large enough to form boots, and a few scattered patches of dense xeroriparian foliage. Although the western red bat was not observed during the pedestrian survey, the presence of suitable habitat and prey species makes it possible that western red bat occurs in the Detailed Study Area.

Western Yellow Bat

The western yellow bat is listed as wildlife of special concern in the AGFD's Heritage Data Management system and a priority vulnerable species by Pima County.[27] The chief threats to western yellow bats is the loss of roosting habitat from trimming palm trees and the loss of riparian habitats.

Western yellow bats are insectivorous and feed on a variety of small- to medium-sized nocturnal flying insects. They are believed to be migratory, and produce litters of one or usually two offspring in early June. Roosting habitat for western yellow bat may include Washington fan palm trees, other palms and other dense leafy vegetation such as sycamores, hackberries, and cottonwoods. They are often associated with urban habitats with palm trees, and low- to mid-elevation riparian communities.

The Detailed Study Area includes mostly high and a minor amount of medium quality modeled habitat and contains prey species for western yellow bats and a small number of available roosting sites. Available roost sites in the Detailed Study Area are primarily palm trees used as ornamental vegetation around buildings. Although the western yellow bat was not observed during the pedestrian survey, the presence of suitable habitat and prey species makes it possible that western yellow bat occurs in the Detailed Study Area.

Cactus Ferruginous Pygmy-owl

The cactus ferruginous pygmy-owl (pygmy-owl) is a species of concern protected by the MBTA, listed as wildlife of special concern in the AGFD's Heritage Data Management system, and priority vulnerable species by Pima County.[28] The pygmy-owl is chiefly endangered by fragmentation, modification, and destruction of habitat. Vegetation removal directly and indirectly affects pygmy-owls by creating and/or enlarging open areas that pygmy-owls evidently avoid, presumably to reduce exposure to predation. Such open areas restrict movement because flight distance is rarely more than 100 feet. Wide roadways result in large openings between any remaining tree canopies on either side. Pygmy-owls tend to fly low across wide roads, a behavior that increases the risk of collisions with vehicles.

[27] AGFD, 2011, Lasiurus xanthinus. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, Arizona.

[28] AGFD, 2001, Glaucidium brasilianum cactorum. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, Arizona.

The pygmy-owl is a small, gray-brown or rufous-brown streaked carnivorous owl 6.5 to 7.0 inches long with yellow eyes and black eye patches on the nape. Central Arizona is the northern limit of pygmy-owl, with the majority of recent observations from northwest Tucson and the Altar Valley. Suitable habitat for pygmy-owl, a secondary cavity nester, includes areas with mixed broadleaf deciduous forests and mesquite bosques, Sonoran desertscrub with braided washes and large trees and columnar cacti and semidesert grassland with wooded drainages.

A habitat assessment indicates potential pygmy-owl habitat in the Detailed Study Area, as medium to low value habitat. Large saguaros and mesquites, paloverdes, and ironwoods are primary constituents of suitable nesting, foraging, resting, and dispersal habitat. Four saguaros occur in the Detailed Study Area that are large enough to contain nest cavities. Large mesquites and paloverdes are locally abundant in xeroriparian habitat that may be used by pygmy-owls for dispersal. No recent pygmy-owl records exist from the vicinity of the Detailed Study Area, and no breeding owls occur at the Airport. Although the pygmy-owl was not observed during the pedestrian survey, the presence of suitable habitat makes it possible that pygmy-owl occurs in the Detailed Study Area.

Western Burrowing Owl

The western burrowing owl is protected under the MBTA and is listed as a species of concern by the USFWS and priority vulnerable species by Pima County.[29] Threats to burrowing owls in Pima County include mortality from collisions with vehicles, direct and indirect poisoning from rodenticides, habitat loss through development of agricultural and rural areas, reduction in burrow availability resulting from decreased rodent populations, landscape maintenance, encroachment of open areas by invasive shrubs, and increased predation exposure from feral cats and dogs.

The western burrowing owl is distributed throughout Arizona. Desert habitats in southern Arizona include open creosote-saltbush-bursage and grassland habitats that often have been grazed or are adjacent to agricultural fields. This owl is commonly found around canal banks, while nesting has been documented in culverts.

Suitable habitat exists in the Detailed Study Area for the western burrowing owl. The majority of known burrows in the Tucson area occur in undeveloped sites with sparse vegetation. The Detailed Study Area includes a large area of such habitats. No western burrowing owls were directly observed at the pedestrian survey conducted in the spring and summer of 2017. However, at the request of the USFWS an additional pedestrian survey was conducted in November 2017. At that time one western burrowing owl was observed and documented in the Detailed Study Area. See **Appendix D** for additional information.

[29] AGFD, 2001, Athene cunicularia. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, Arizona.

Rufous-Winged Sparrow

The rufous-winged sparrow is protected under the MBTA and is listed as priority vulnerable species by Pima County. Threats to rufous-winged sparrows include habitat loss from grazing, development, and invasion of non-native plants.[30]

Rufous-winged sparrows chiefly eat invertebrates and plant seeds. Habitat includes mixed grasses with scattered shrubs and scrub in upland and xeroriparian areas within Sonoran Desert and grassland communities from the Rincon, Santa Catalina, Tucson, and Santa Rita mountains around Tucson west across Pima County to Sonoyta, Mexico. Sacaton, mesquite, and/or cholla appear to be important habitat constituents. Rufous-winged sparrow is an uncommon resident that begins nesting in early April.

The Detailed Study Area is comprised of low quality modeled habitat and contains abundant xeroriparian and upland desertscrub habitats that are suitable for rufous-winged sparrow nesting and foraging areas. The pedestrian survey indicated that the Detailed Study Area contains suitable habitat along many of the abundant washes and in desertscrub uplands. Although the rufous-winged sparrow was not observed during the pedestrian survey, the presence of suitable habitat makes it possible that rufous-winged sparrow occurs in the Detailed Study Area.

Tucson Shovel-Nosed Snake

The Tucson shovel-nosed snake is listed as priority vulnerable species by Pima County. Threats to the Tucson shovel-nosed snake include habitat loss from mass grading of high-density development and mortality from collisions with on- and off-road vehicles.[31]

This small, nocturnal snake preys on a variety of invertebrates. This snake has a patchy distribution from west of Tucson north through Avra Valley into southern Pinal County. The snake inhabits sandy desertscrub flats and washes with scattered mesquite and creosote over white bursage, Mormon tea, and mixed grasses. The presence of fine sand on valley floors appears to be an important habitat constituent for the Tucson shovel-nosed snake.[32]

[30] SDCP (Sonoran Desert Conservation Plan), 2001, Priority vulnerable species (draft). Pima County Board of Supervisors, Tucson, Arizona.

[31] SDCP (Sonoran Desert Conservation Plan), 2001, Priority vulnerable species (draft). Pima County Board of Supervisors, Tucson, Arizona.

[32] AGFD, 2007, Chionactis occipitalis klauberi. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, Arizona.

The Tucson shovel-nosed snake generally occurs west of the Detailed Study Area. However, creosote flats on valley floors in the southern portion of the Detailed Study Area, and xeroriparian washes throughout the Detailed Study Area provide suitable habitat for this snake. The Detailed Study Area includes minimal high quality and mostly medium quality modeled habitat. Although the shovel-nosed snake was not observed during the pedestrian field survey, the presence of habitat makes it possible that Tucson shovel-nosed snake could occur in the Detailed Study Area.

Tumamoc Globeberry

The Tumamoc globeberry is an herbaceous, perennial vine that appears annually from a cluster of tuberous roots and climbs on trees and shrubs. Growth coincides with summer rainfall and the above-grade vine is killed by frosts, usually in November or in dry periods. Flowers open fully at night and are pollinated by moths. This plant ranges from Sonora and Sinaloa, Mexico through much of Pima County and into Pinal and Maricopa counties. Tumamoc globeberry grows beneath a variety of nurse plants in xeric situations on alluvial soils within Sonoran Desertscrub habitats. It is usually found along gullies and sandy washes of hills and valleys.[33]

Tumamoc globeberry was listed endangered in 1986 and habitat loss through urban and agricultural development was a perceived threat along with overgrazing, recreation, off-road vehicle use, and foraging javelinas.[34] However, Tumamoc globeberry was delisted by the USFWS in 1993 after new research showed that the species had a larger distribution range than previously documented. Furthermore, habitat is secured for the foreseeable future because the species occurs within a variety of habitat types and vegetation communities, many within remote areas not threatened by development.

The AZDA's Native Plant Law list the Tumamoc globeberry as a salvage restricted protected native plant, which is the same designation as common cactus such as jumping cholla and fishhook barrelcactus. The Detailed Study Area contains mostly low quality and a moderate amount of medium quality habitat as well as numerous washes that could provide habitat for Tumamoc globeberry. No Tumamoc globeberry plants were observed during the pedestrian surveys. It is unlikely that the Tumamoc globeberry plant occurs in the Detailed Study Area.

[33] AGFD, 2004, Tumamoca macdougalii. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, Arizona.

[34] USFWS, 1993, Final rule to delist the plant Tumamoca macdougalii. Federal Register 58(116): 33562-33565.

3.6 CLIMATE

3.6.1 REGULATORY SETTING

Per FAA Order 1050.1F, the discussion of potential climate impacts should be documented in a separate section of the NEPA document, distinct from air quality.[35] Where the proposed action or alternative(s) would result in an increase in greenhouse gases (GHG) emissions, the emissions should be assessed either qualitatively or quantitatively. There are no significance thresholds for aviation GHG emissions, and it is not required for the NEPA analysis to attempt to link specific climate impacts to the proposed action or alternative(s) given the small percentage of emissions that aviation projects contribute.

3.6.2 AFFECTED ENVIRONMENT

GHG are gases that trap heat in the earth's atmosphere. The primary GHGs include water vapor (H_2O) and the following:

- **Carbon dioxide (CO_2)**, which enters the atmosphere through the burning of fossil fuels (oil, natural gas, and coal), agriculture, irrigation, and deforestation, as well as the manufacturing of cement.
- **Methane (CH_4)**, which is emitted through the production and transportation of coal, natural gas, and oil, as well as from livestock. Other agricultural activities influence methane emissions as well as the decay of waste in landfills.
- **Nitrous oxide (N_2O)**, which is released most often during the burning of fuel at high temperatures. This greenhouse gas is caused mostly by motor vehicles, which also include non-road vehicles, such as those used for agriculture.
- **Fluorinated Gases**, which are emitted primarily from industrial sources and generally include hydrofluorocarbons (HFC), perfluorocarbons (PFC), and sulfur hexafluoride (SF_6). Though they are often released in smaller quantities, fluorinated gases have an increased ability to contribute to global warming.

Two key ways in which these GHGs differ from each other are their ability to absorb energy and how long they stay in the atmosphere. The Global Warming Potential (GWP) was developed to allow comparisons of the global warming impacts of different gases by converting each gas amount to a carbon dioxide equivalent (CO_2E).[36] GWPs provide a common unit of measure, which allows for one emissions estimate of these different gases. CO_2 has a GWP of one because it is the gas used as the reference point. Methane does not last as long in the atmosphere as CO_2 however it absorbs much more energy. Therefore, one ton of methane has 28 times more heat capturing potential than one ton of carbon dioxide.

[35] FAA, April 2015, Order 1050.1F Paragraph 4-1. Climate is considered a separate section from Air Quality.

[36] EPA, 2017, Understanding Global Warming Potentials. https://www.epa.gov/ghgemissions/understanding-global-warming-potentials, Accessed August 2017.

The amount of methane emissions would be multiplied by 28 to determine its CO_2E value. Nitrous oxides lasts in the atmosphere far longer than CO_2. The amount of nitrous oxides emissions would be multiplied by 298 to determine its CO_2E value.

This section provides the estimate of the annual rate (metric tons per year) of GHG emissions attributable to airport sources within the GHG study area. The AEDT computer program was used to identify the GHG study area and determine CO_2 from aircraft operating in the landing and take-off cycles (LTOs) below 3,000 feet in altitude. GHG emissions from aircraft operating during cruise operations were not included in this analysis. Due to the nature of the Proposed Action, neither the No Action nor the Proposed Action alternatives would affect ground support equipment, ground access vehicles, or auxiliary power units.

The GHG emissions inventory was prepared using the same sources and methodology as described in Section 3.4 Air Quality. **Table 3-9** provides an estimate of GHG emissions for the Existing (2016) conditions due to aircraft operations. See **Appendix C** for additional information on the methodology and inputs for the GHG inventory. This estimate is provided for information only as no federal standard for the significance of GHG emissions on the environment has been established.

Table 3-9
GHG EMISSIONS INVENTORY SUMMARY – EXISTING (2016)
Tucson International Airport

ANNUAL EMISSIONS SUMMARY	
YEAR	**GREENHOUSE GAS POLLUTANTS** (metric tons per year)
	CO_2E
2016	**54,791.87**

Note: CO_2E: Carbon Dioxide equivalent

Source: Landrum & Brown analysis, 2018.

3.7 DEPARTMENT OF TRANSPORTATION ACT, SECTION 4(f)

3.7.1 REGULATORY SETTING

Section 4(f) of the United States Department of Transportation (USDOT) Act of 1966 (49 U.S.C. § 303) protects publicly owned parks, recreational areas, wildlife and waterfowl refuges of national, state, or local significance, and public and private historic sites of national, state, or local significance. Section 4(f) provides that the Secretary of Transportation may approve a transportation program or project requiring the use of publicly owned land of a public park, recreation area, or wildlife or waterfowl refuge of national, state, or local significance, or land of an historic site of national, state, or local significance, only if there is no feasible and prudent alternative to using that land and the program or project includes all possible planning to minimize harm resulting from the use. Section 4(f) applies only to transportation

modal agencies within the USDOT. If the FAA is engaged with a non-DOT agency on the NEPA review of a proposed project involving Section 4(f), the FAA must take the lead on Section 4(f) compliance.

Section 6(f) of the Land and Water Conservation Fund Act of 1965 (LWCFA), 16 U.S.C. § 4601-8(f), prohibits the conversion of property acquired or developed with LWCFA grants for uses other than public outdoor recreation without the approval of the USDOI's National Park Service (NPS). The USDOI has delegated most review, consultation and assessment of Section 6(f) impacts and conversions to specified state recreation offices. When acquisition is required, Section 6(f) directs the USDOI to assure that replacement lands of at least equal fair market value and of reasonably equivalent usefulness and location are provided as a condition of such conversions. Consequently, where conversions of Section 6(f) lands are proposed for airport projects, replacement lands are required.

3.7.2 AFFECTED ENVIRONMENT

3.7.2.1 Section 4(f) Resources

There are three properties within the General Study Area that are considered Section 4(f) resources, including: a portion of one publicly owned park, the Manuel Herrera Jr. Park[37]; one structure that includes three hangars, referred to as the Triple Hangars, and that was previously recommended highly significant architecturally and historically and eligible for inclusion on the National Register of Historic Places (NRHP)[38]; and one recreation facility, the Sunnyside Pool[39], as shown in **Exhibit 3-3**.

There are no other public parks, recreation facilities, or wildlife or waterfowl refuges public and private historic sites located within the site of the Proposed Action.

Triple Hangars

Three large hangars, referred to as the Triple Hangars, are located in the southeast corner of South Park Avenue and East Teton Road on TUS property. The hangars were built in 1942 and expanded in 1943. They have been previously used for storage and aircraft repair.[40]

[37] Pima County Geographic Information Systems, 2017, Manuel Herrera Jr. Park. Available online: https://pimamaps.pima.gov/Html5Viewer/index.html?configBase=https://pimamaps.pima.gov/Geocortex/Essentials/REST/sites/mainsite/viewers/mainmap/virtualdirectory/Resources/Config/Default. Accessed August 2017.

[38] Harris Environmental Group, Inc., 2007, A Class III Cultural Resources Investigation of 704 Acres at the Tucson International Airport in Support of Proposed Runway 11R/29L Relocation.

[39] City of Tucson, 2017, Parks and Recreation – Sunnyside Pool. Available on-line: https://www.tucsonaz.gov/parks/sunnyside-pool. Accessed August 2017.

[40] Harris Environmental Group, Inc., 2007, A Class III Cultural Resources Investigation of 704 Acres at the Tucson International Airport in Support of Proposed Runway 11R/29L Relocation.

The Triple Hangars remain in sound structural condition and retain their historic integrity with few alterations.[41] These structures were previously recommended as historically significant for architecture and are eligible for listing on the NRHP under Criterion A (Association with Events) and Criterion C (Embodiment of Distinctive Architectural Characteristics). The construction of the hangar complex took place during World War II and during a time of building-materials shortages. The development of the hangars illustrates the partnership between the Federal Government and private enterprise to mobilize and implement wartime industries during the World War II period, which set the stage for postwar expansion of the aviation industry in the Tucson area.

Manuel Herrera Jr. Park

The Manuel Herrera Jr. Park is an approximately 3.5-acres neighborhood park owned and maintained by the City of Tucson.[42] The park is open to the public and is located near 12th Avenue and West Drexel Road. Amenities include a Peace Garden, which consists of a maze, butterfly area, and benches.[43]

Sunnyside Pool

The Sunnyside Pool is owned and maintained by the City of Tucson.[44] The pool is open to the public and located in the southwest corner of South Campbell Avenue and East Bilby Road across from Sunnyside High School. Amenities include a competitive pool and a diving bay.

3.7.2.2 Section 6(f) Resources

The Saguaro National Park, located approximately eight miles northeast of the General Study Area, is the closest LWCF property to TUS.[45] No LWCF lands are located within the General Study Area. Therefore, LWCF Section 6(f) lands are not discussed further in this EIS.

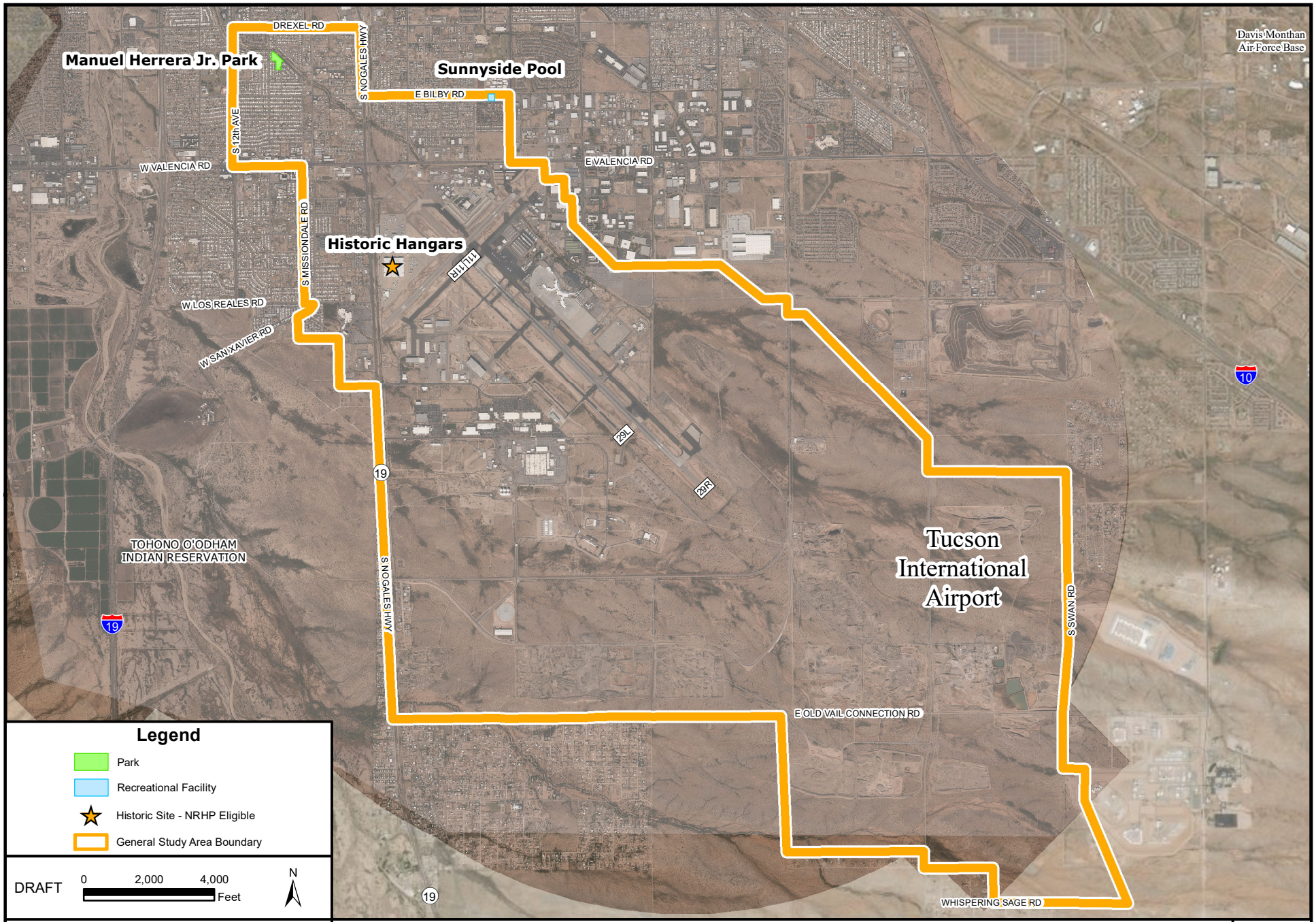
41 Ibid.

42 City of Tucson, October 5, 2016, Parks and Recreation System Master Plan, Final Report. Available online: https://www.tucsonaz.gov/files/parks/masterplan/Tucson_Parks_and_Recreation_System_Master_Plan_10_5_16.PDF. Accessed September 2017.

43 Newell, L. A., February 16, 2008, Their caring efforts grow into Peace Garden, Arizona Daily Star. Available on-line: http://tucson.com/news/local/their-caring-efforts-grow-into-peace-garden/article_595ae86f-2f50-5d89-91d2-dbadaedd743e.html. Accessed September 2017.

44 City of Tucson, 2017, Parks and Recreation – Sunnyside Pool. Available on-line: https://www.tucsonaz.gov/parks/sunnyside-pool. Accessed August 2017.

45 Land and Water Conservation Fund Coalition, 2017, Map of LWCF Funding Through Federal Land Management Agencies and State & Local Assistance Program - Resources. Available on-line: https://www.lwcfcoalition.com/tools/. Accessed September 2017.



Environmental Impact Statement
Tucson International Airport

Potential 4(f) Sites in the General Study Area

EXHIBIT: **3-3**

4/19/2018 Y:\TUS\TUS-EIS\E-L&B Work Product\2-GIS\MXD\DOCUMENT\ 3-3_Potential 4(f) Sites in the General Study Area.mxd

THIS PAGE INTENTIONALLY LEFT BLANK

3.8 HAZARDOUS MATERIALS, SOLID WASTE, AND POLLUTION PREVENTION

3.8.1 REGULATORY SETTING

3.8.1.1 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

The CERCLA of 1980, 42 U.S.C. §§ 9601 – 9675, was amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986 and the Community Environmental Response Facilitation Act (CERFA) of 1992. The purpose of CERCLA is to conduct an increasingly complex series of evaluations of federally-listed suspected hazardous waste sites to determine if those sites pose sufficient threats to human health and the environment to become eligible for federally-funded investigation and clean up under Superfund. This act has four basic elements:

- The establishment of a system for gathering and analyzing information for characterizing contaminated sites. This information is used in the development of the EPA National Priorities List (NPL);
- The establishment of federal authority to respond to hazardous substance emergencies and cleanup leaking sites;
- The creation of a trust fund to pay for removal and remedial actions; and
- Assignment of liability for cleanup and restitution costs to persons who are responsible for hazardous substance releases.

CERFA, PL 102-426, requires that, prior to the termination of federal activities on any real property owned by the Federal Government, agencies must identify real property where no hazardous substance was stored, released, or disposed of. The purpose is to identify property that offers the greatest opportunity for reuse and redevelopment.

3.8.1.2 Resource Conservation and Recovery Act (RCRA)

The RCRA of 1987, 42 U.S.C. §§ 6901 – 6992k, is intended to provide "cradle to grave" management of hazardous and solid wastes and regulation of underground storage tanks (USTs) containing chemical and petroleum products. The RCRA allows the EPA to set standards for entities producing, storing, handling, transporting, and disposing of hazardous waste. The RCRA was amended with the Hazardous and Solid Waste Amendments of 1984 (HSWA) that addressed corrective actions and permitting of hazardous waste issues.

3.8.1.3 Pollution Prevention Act (PPA)

The PPA of 1990, 42 U.S.C. §§ 13101 – 13109, established that it is the national policy of the United States that, whenever feasible:

- pollution should be prevented or reduced at the source;

- pollution that cannot be prevented should be recycled in an environmentally safe manner;
- pollution that cannot be prevented or recycled should be treated in an environmentally-safe manner; and
- disposal or other release into the environment should be employed only as a last resort, and should be conducted in an environmentally-safe manner.

3.8.1.4 Toxic Substances Control Act (TSCA)

The TSCA of 1976, 42 U.S.C. §§ 2601 – 2697, states that it is the policy of the United States that:

- adequate data should be developed with respect to the effect of chemical substances and mixtures on health and the environment, and that the development of such data should be the responsibility of those who manufacture and those who process such chemical substances and mixtures;
- adequate authority should exist to regulate chemical substances and mixtures that create an unreasonable risk of injury to health or the environment, and to take action with respect to chemical substances and mixtures which are imminent hazards; and
- authority over chemical substances and mixtures should be exercised in such a manner as not to impede unduly or create unnecessary economic barriers to technological innovation while fulfilling the primary purpose of the TSCA to assure that such innovation and commerce in such chemical substances and mixtures do not create an unreasonable risk of injury to health or the environment.

3.8.1.5 Oil Pollution Act (OPA)

The OPA of 1990, 33 U.S.C. §§ 2701 - 2762 was established to improve the nation's ability to prevent and respond to oil spills by establishing provisions that expand the Federal government's ability, and provide the money and resources necessary to respond to oil spills. The OPA provided new requirements for contingency planning by both government and industry. The Oil Pollution Prevention Regulation (40 C.F.R. Part 112) was amended to incorporate requirements of the OPA, and now forms the basis of the EPA's Oil Spill Prevention, Control, and Countermeasure (SPCC) program. The SPCC program seeks to prevent oil spills from certain aboveground storage tanks (ASTs) and USTs.

3.8.1.6 EO 12088, Federal Compliance with Pollution Control Standards

EO 12088, as amended, directs federal agencies to comply with "applicable pollution control standards" in the prevention, control, and abatement of environmental pollution; and consult with the EPA, state, interstate, and local agencies concerning the best techniques and methods available for the prevention, control, and abatement of environmental pollution.

3.8.1.7 EO 12580, Superfund Implementation

EO 12580, Superfund Implementation, amended by EOs 13016 and 13308, delegates most response authorities to the EPA and the United States Coast Guard (USCG) for abatement. Federal agencies must participate in response teams with the opportunity for public comment, before removal action is made.

3.8.2 AFFECTED ENVIRONMENT

A Phase I Environmental Due Diligence Audit (EDDA) investigation and report was completed in order to identify recognized environmental conditions (RECs), Historical RECs, and Controlled RECs in the area to be directly and indirectly impacted by the Proposed Action. See **Appendix E**, *Hazardous Materials* for a Summary of the Phase I EDDA. The Phase I EDDA included a regulatory database search, historical records review, and interviews of key personnel with knowledge of existing hazardous and/or contaminated materials sites. In addition, a site visit and pedestrian survey was conducted of the Detailed Study Area during May through July 2017. The Detailed Study Area contains multiple forms and quantities of hazardous materials of which many are routinely monitored and regulated by federal and state agencies. The location of the hazardous materials within the Detailed Study Area is shown in **Exhibit 3-4**. In addition to the Phase I EDDA, a limited Phase II soil sampling and lead-based paint investigation report was completed at the ECMs on AFP 44. See **Appendix E**, *Hazardous Materials* for a Summary of the Phase II investigation.

3.8.2.1 National Priorities List Sites

In 1981, volatile organic compounds (VOCs), which had been used as solvents by industries near the Airport, were detected in the City of Tucson drinking water wells in the TUS area.[46] In September 1983, EPA established the Tucson International Airport Area (TIAA) Superfund Site and placed them on the NPL. For the purpose of investigating and remediating groundwater contamination, EPA divided the Site into two geographic areas—Superfund Site Area A and Superfund Site Area B. Superfund Site Area A comprises the main groundwater contamination plume located to the west of the Airport, and is divided into the Tucson Airport Remediation Project (TARP), Airport Property Project, and AFP 44. The City of Tucson is responsible for the TARP. Settling defendants for the Airport Property Project are General Dynamics Corporation, McDonnell Douglas Corporation, the City of Tucson, and the TAA. The USAF is responsible for the AFP 44 project area. Superfund Site Area B includes the West Plume B, Arizona Air National Guard, Texas Instruments and former West-Cap project areas, located to the north and west of the airport. The West Plume B and West-Cap project areas are funded by the EPA. These areas are depicted on **Exhibit 3-5**.

[46] EPA, 2017, Tucson International Airport Area, Superfund Site Area A North of Los Reales Road, Tucson Arizona, https://yosemite.epa.gov/r9/sfund/r9sfdocw.nsf/vwsoalphabetic/Tucson+International+Airpo,rt+Area accessed in September 2017.

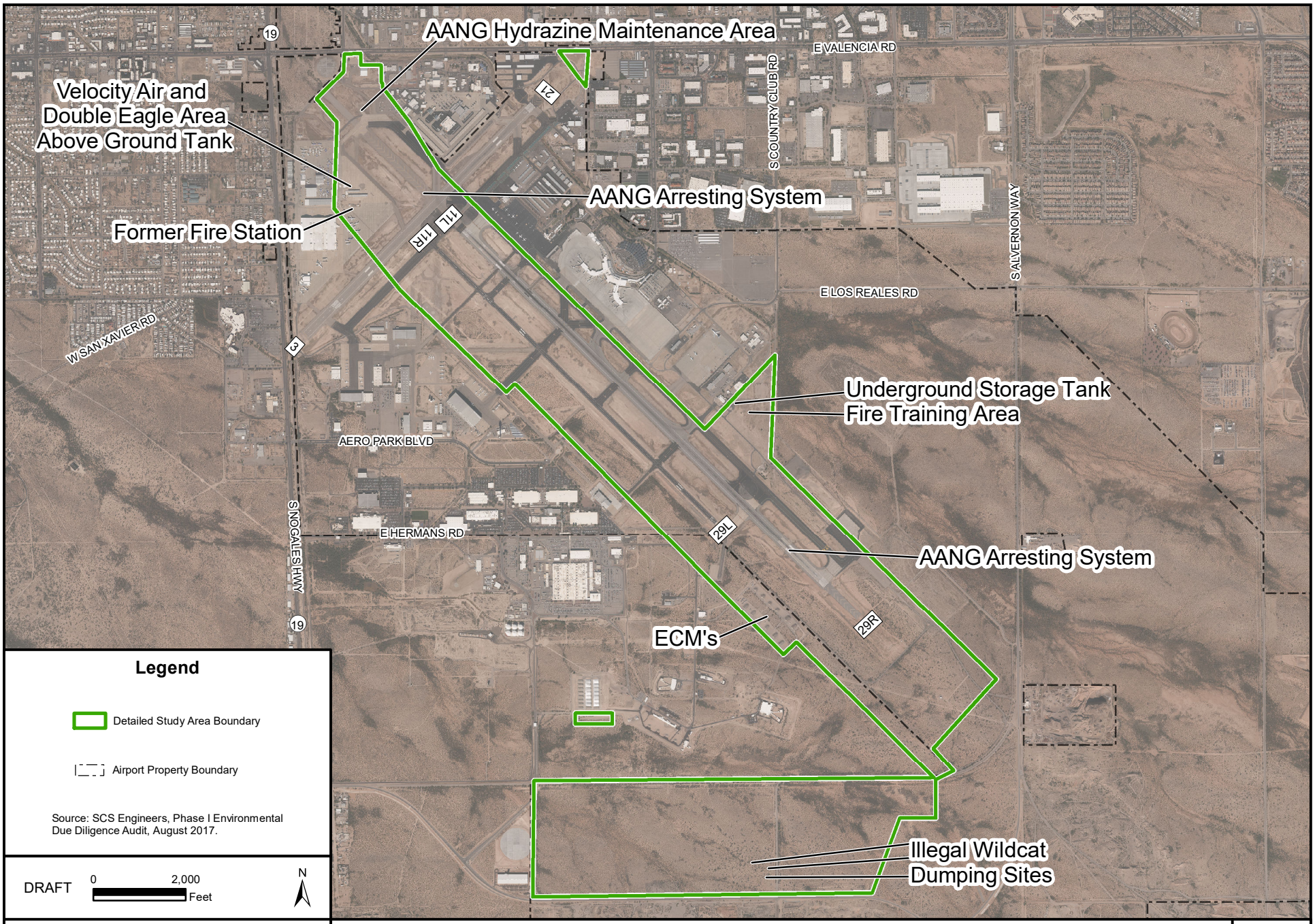
In 1985, the USAF adopted a remedy to address the groundwater contamination associated with AFP 44 in Superfund Site Area A.[47] Three years later, in August 1988, EPA signed a Record of Decision (ROD) identifying groundwater extraction and treatment as the remedy to address the groundwater contamination at the remaining areas.[48] The main remedies of the EPA 1988 ROD include the following:

- Control groundwater contamination through extraction wells
- Treat contaminated groundwater using packed column aeration
- Treat generated off-gas
- Provide treated groundwater to the City of Tucson for use as drinking water
- Monitor groundwater in the area

Remediation activities for groundwater and soil cleanup were then initiated at the various areas in Superfund Site Area A and Superfund Site Area B. The EPA 1988 ROD was updated in September 2004 to modify the previously selected remedy for groundwater contamination at the West Cap and the West Plume B Project Areas, located within Superfund Site Area B. [49] This ROD Amendment adopts the same general process as the original ROD, but incorporates and relies upon new information obtained since the signing of the original ROD in 1988. The ROD was again updated in 2012 to modify the original remedy in TIAA Superfund Site Area B (groundwater extraction and treatment) with in-situ chemical oxidation at the West-Cap Site, Texas Instruments Site, and the AANG Site.[50] In addition, Monitored Natural Attenuation was implemented at the West Plume B site and groundwater monitoring and institutional controls were implemented in the rest of TIAA Superfund Site Area B.

In March 1990, a Consent Decree was signed between the EPA and Burr-Brown Corporation requiring Burr-Brown to clean up the eastern-most part of Area B.[51] In June 1991, a Consent Decree was approved for the cleanup of the Superfund Site Area A plume by the potentially responsible parties. The EPA and the National Guard Bureau (NGB) signed a Federal Facilities Agreement in 1993. In 1994, a groundwater remediation system (known as the TARP) was constructed by the City of Tucson Water Department (Tucson Water) to treat groundwater before it was delivered to the Tucson Water's potable water-distribution system. In February 2000, a Consent Decree was signed between EPA and the potentially responsible parties for the cleanup of the Airport property. EPA, Arizona Department of Environmental Quality (ADEQ), and the USAF signed a Federal Facilities Agreement in November 2011 for AFP 44. The Airport continues to monitor soil, water, and air quality.

47 Ibid.
48 EPA Region IX, 1988, Tucson International Airport Area Record of Decision for Groundwater Remediation North of Los Reales Road, August.
49 EPA Region IX, 2004, TIAA Superfund Site, Area A & B Groundwater OU – Record of Decision Amendment.
50 EPA Region IX, April 2012, Tucson International Airport Area Superfund Site Area B Record of Decision Amendment.
51 EPA Region IX, March 2017, Tucson International Airport Area Superfund Site Overview.



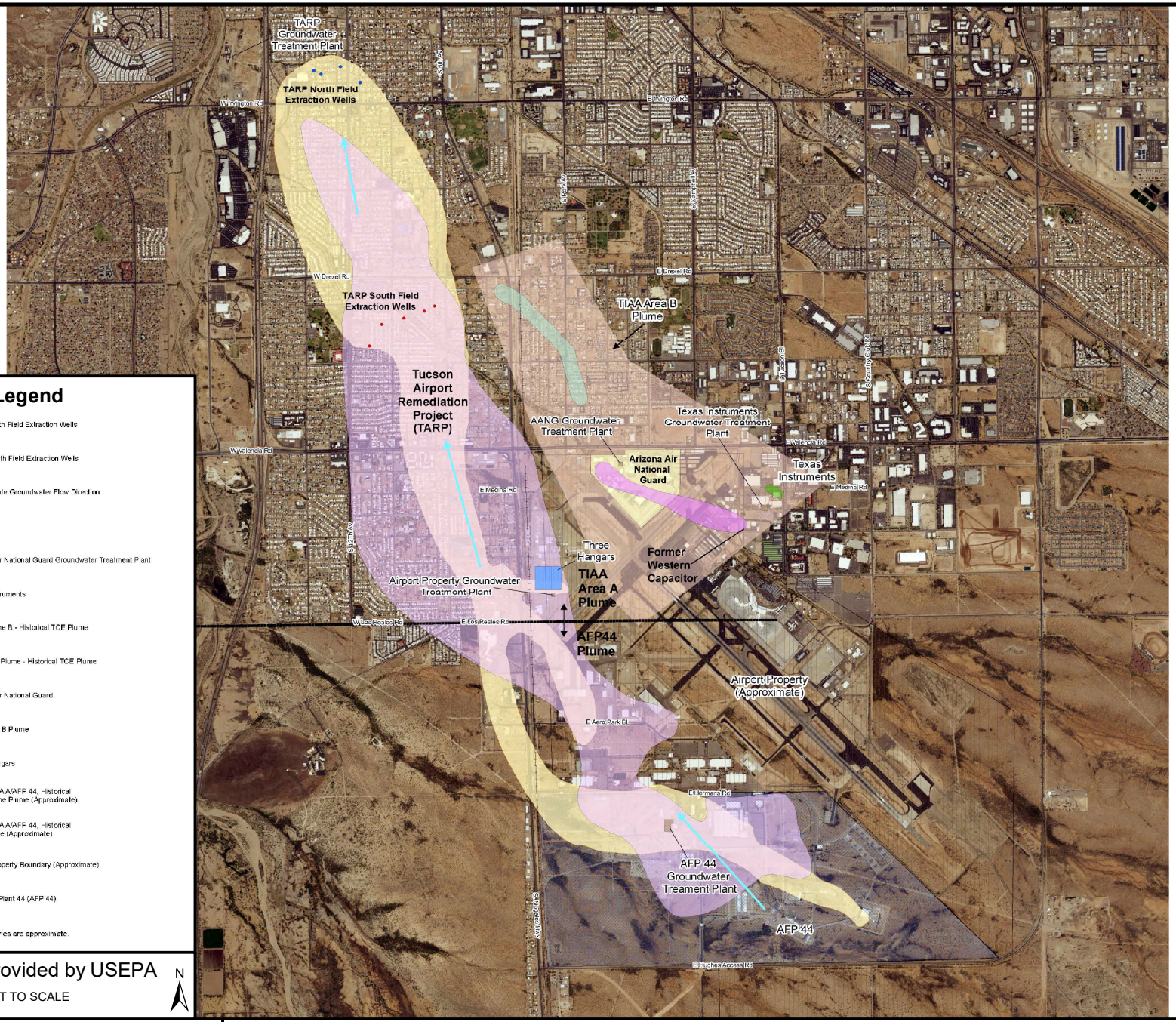
Environmental Impact Statement
Tucson International Airport

Existing Hazardous Material Areas

EXHIBIT: **3-4**

3/27/2018 Y:\TUS\TUS-EIS\E-L&B Work Product\2-GIS\MXD\DOCUMENT\ 3-4_Existing Hazardous Material Areas.mxd

THIS PAGE INTENTIONALLY LEFT BLANK



Legend

- TARP North Field Extraction Wells
- TARP South Field Extraction Wells
- Approximate Groundwater Flow Direction
- Railroad
- Arizona Air National Guard Groundwater Treatment Plant
- Texas Instruments
- West Plume B - Historical TCE Plume
- West Cap Plume - Historical TCE Plume
- Arizona Air National Guard
- TIAA Area B Plume
- Three Hangars
- TIAA AREA A/AFP 44, Historical 1,4-Dioxane Plume (Approximate)
- TIAA AREA A/AFP 44, Historical TCE Plume (Approximate)
- Airport Property Boundary (Approximate)
- Air Force Plant 44 (AFP 44)

Note: Location and boundaries are approximate.

NOTE: Map provided by USEPA

DRAFT NOT TO SCALE

N

Environmental Impact Statement

Tucson International Airport

Superfund Site Area A and B

EXHIBIT: **3-5**

12/5/2017 Y:\TUS\TUS-EIS\E-L&B Work Product\2-GIS\MXD\DOCUMENT\ 3-5_Superfund Site Area A and B.mxd

THIS PAGE INTENTIONALLY LEFT BLANK

According to the EPA, significant progress has been made in identifying and cleaning up soil and groundwater contamination.[52] A total of more than 40 billion gallons of groundwater has been treated and more than 130,000 pounds of VOCs removed from soils and groundwater throughout the site. Groundwater cleanup actions continue in all areas with additional cleanup systems scheduled for the future. In addition, 100,000 tons of metals, 10,000 tons of PCB-contaminated soils, and 2,000 tons of PCB/VOC contaminated sludges have been removed. In 1994, EPA and Pima County officials completed a study that concluded that no known private well users on the south side of Tucson are currently drinking contaminated groundwater and that the public is not being exposed to the Superfund site contaminants.

Wells

A total of 22 wells are located within the Detailed Study Area that are registered with the Arizona Department of Water Resources (ADWR).[53] Of these, five are listed as and/or are assumed to be abandoned and five are listed as capped. Many of the wells are groundwater monitoring wells associated with the NPL Site investigations. If any wells would need to be abandoned due to the Proposed Action, the TAA would need to follow ADWR requirements and a Notice of Intent (NOI) must be approved by ADWR. The well owner must approve any well abandonments. The wells shown on **Exhibit 3-6** are described below. The common name of each well used with the ADWR number is available in **Appendix E, *Hazardous Materials, Solid Waste, and Pollution Prevention***.

- Five of the well listings (ADWR #55-214445, 55-214446, 55-214447, 55-214448, and 55-218146) are owned by the AANG and are located at 1000 and 1070 East Valencia Road. These wells are for groundwater monitoring and are associated with the AANG Superfund Site. *To date, all of these wells are capped.*
- Five of the well listings (ADWR #55-540974, 55-619931, 55-209879, 55-524217, and 55-512173) are located within the runway and taxiway areas. *However, ADWR files reported that well listing ADWR #55-619931 could not be located and was assumed to be abandoned beneath asphalt.*
- Two of the well listings (ADWR #55-524218 and 55-525522) are located at the former fire training facility that is east of the current fire station and south of the contractors' yard. These wells are for groundwater monitoring.
- Five of the well listings (ADWR #55-204855, 55-204856, 55-204865, 55-204866, and 55-204867) are located at the AANG Test Stand (a.k.a. Test Cell or Test Pad), which is the pavement area located north of the runway area, south of the former fire training facility. These wells are for groundwater monitoring.
- Three of the well listings (ADWR #55-513727, 55-809549, and 55-482463) are located in the A-Magazine area at AFP-44. *Two of the wells were listed as abandoned.*

[52] EPA, 2017, Tucson International Airport Area Cleanup Sites to Date.
[53] Arizona Department of Water Resources, 2017, Interactive Online Well Registry Map http://gisweb2.azwater.gov/WellReg Accessed September 2017.

- Two of the well listings (ADWR #55-545386 and 55-556448) are located in the north portion of Section 32 on the southern site parcels, south of Hughes Access Road. These wells were associated with the investigations at AFP-44. *Both wells are listed as abandoned.*

Above Ground Storage Tanks, Underground Storage Tanks, Leaking Underground Storage Tanks, and Hazardous Material Storage Areas

In the northwest portion of the Detailed Study Area, near the Triple hangars, is an area currently operated by Velocity Air and Double Eagle. This area has a series of hangars used for storage, office space, and maintenance areas. A used oil above ground storage tank in a concrete containment is located outside the shop hangar to the south. A pipe extending to a 55-gallon drum outside the shop hangar to the west contains used sandblasting material.

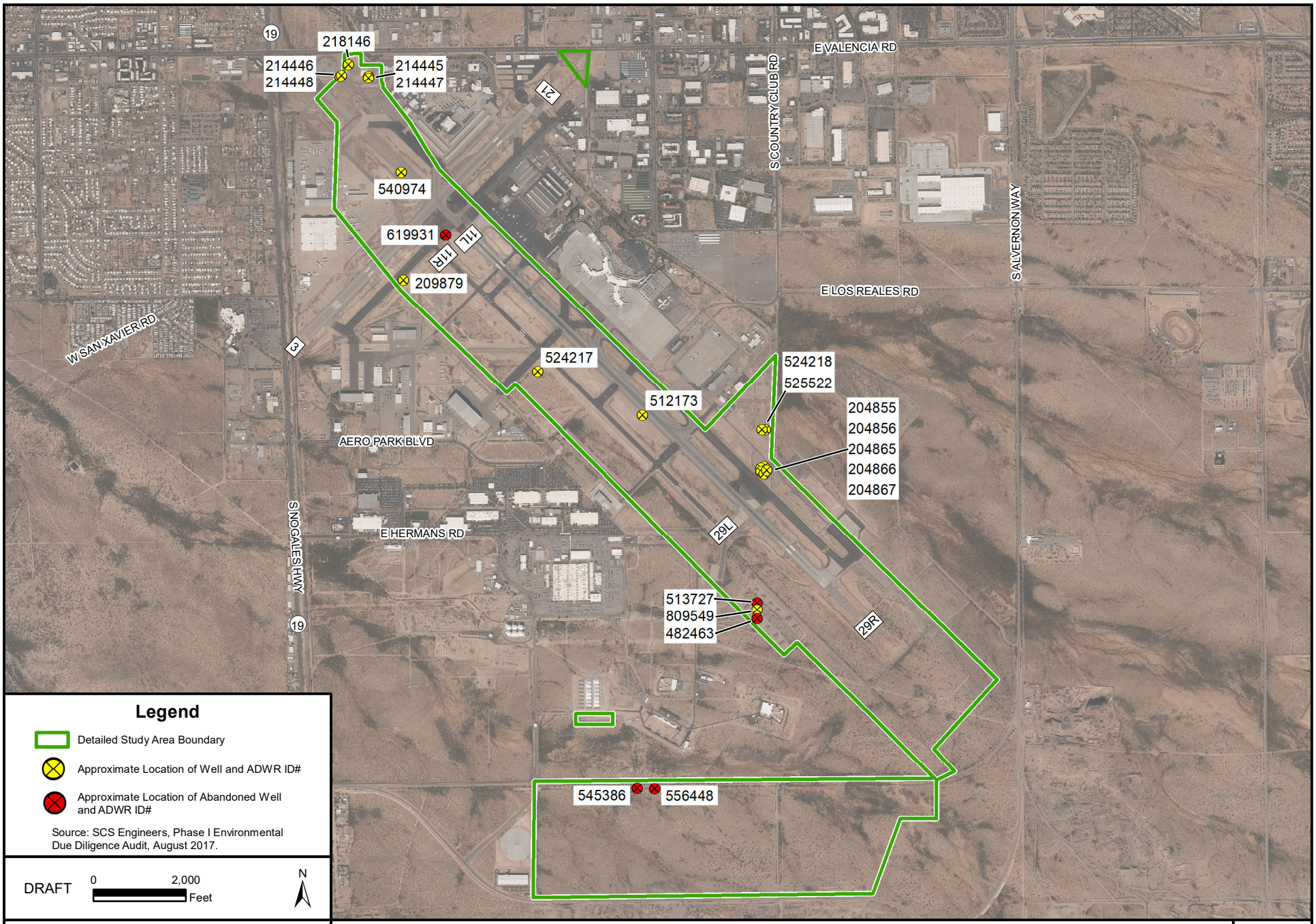
Just south of the Velocity Air and Double Eagle hangars is a vacant area that previously housed a former fire station where structures and old water reservoirs have since been removed and filled in. Two subgrade vaults and a wash pad with a drain to an oil-water separator and a manhole remain in the western portion of this area. A fenced hazardous material storage area on a curbed concrete pad and covered by a canopy was also located in the area; material stored here is typically from maintenance activities, such as paints, motor and engine oil, solvent, film forming foam for firefighting, and related materials. According to TAA, this area is checked by TAA personnel on a weekly basis. [54]

Located on the runway ends for 11L/29R are AANG military aircraft arresting systems that can be deployed in order to stop AANG aircraft. A deployed arrestor system is located at the Runway 29R end and an abandoned arrestor system is located at the Runway 11L end. According to TAA personnel, these AANG arresting systems include gas powered engines and small fuel tanks in subgrade concrete vaults with a pit in the bottom. [55]

Additionally, a hazardous material storage area is located in the northwest portion of the site off of Taxiway A1. This area is an AANG hydrazine maintenance area and consists of a concrete pad with a drain leading to a holding tank. Hydrazine is used in F-16 fighter jets to fuel their emergency power units.

There are underground storage tanks at a fueling area and an old airplane body used for fire training on the eastern portion of the Detailed Study Area just south of the Fire Station. The Airport also currently has a Contractors Yard in this area, which is used for construction staging activities.

[54] Eric Roudebush, TAA, July 31, 2017, Verbal comment during site visit.
[55] Charlie Reeves and Rich Marqueson, TAA, May 8, 2016, Verbal comment during site visit.



Environmental Impact Statement
Tucson International Airport

Wells in the Detailed Study Area

EXHIBIT: **3-6**

12/5/2017 Y:\TUS\TUS-EIS\E-L&B Work Product\2-GIS\MXD\DOCUMENT\ 3-6_Wells in the Detailed Study Area.mxd

THIS PAGE INTENTIONALLY LEFT BLANK

Earth Covered Magazines (ECMs)

Twelve ECMs used for storage of explosives and other materials are located within the Detailed Study Area at AFP 44. The bunkers are arranged in two rows of six and are known as the A-Magazines. The structures were built in 1954 and are located south of the southernmost portion of Runway 11L/29R. The bunkers consist of concrete structures overlain by soil and capped by asphalt that has degraded over time. Drain trenches along the sides of the floor divert water that leaks into the structures into pipes leading through the walls to the west exterior of the structures.

A Phase II investigation including soil sampling was conducted at the exteriors of the ECMs to evaluate whether soils on the top of the ECMs and around the base of the ECMs have been impacted by materials stored in the ECMs or by pesticides, herbicides, or asphalt leaching. See Appendix E, Hazardous Materials, for a summary of the report. Soil samples were collected from the sides of the ECMs and from the ground surface adjoining the ECMs. The locations of the soil sampling sites, all within the AFP-44 area surrounding the ECMs proposed for demolition, are provided in **Appendix E**.

Organochlorine pesticides were detected in six soil samples and polynuclear aromatic hydrocarbons (PAHs), which may have leached into the soil from asphalt leaching, were detected in 17 of the samples. No organochlorine herbicides or organophosphorous pesticides were detected in any of the samples. The concentrations of organochlorine pesticides and PAHs were compared to the Arizona residential and non-residential soil remediation levels (RSRLs and NRSRLs, respectively). None of the concentrations of organochlorine pesticides and PAHs exceeded the RSRLs or NRSRLs.

Metals were detected in all the soil samples. The metals arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, and zinc were detected in the analyzed samples. None of the concentrations exceeded the RSRLs or NRSRLs, except for arsenic in four of the samples. Arsenic in these samples exceeded the RSRL/NRSRL concentration of 10 milligrams per kilogram; however, the concentrations of arsenic detected in the samples are relatively low and are within the range of typical background levels in soil in Arizona.

A lead-based paint survey was also conducted at the exteriors of the ECMs using a portable hand-held X-Ray Fluorescence analyzer. This survey method tested the lead content of painted surfaces directly without the need to collect samples, therefore, causing no damage to the ECMs. Two general areas of exterior painted surfaces were tested. The front area of the ECMs contained painted surfaces on the concrete wall, concrete pad, and concrete ramp adjoining the wall, and on the metal doors, pipes, trim strip on the concrete pad, electrical panels and boxes, and vents. The second area tested was the vent on the top rear of the ECMs. Painted surfaces in the vent area included the concrete base for the vent and the metal vent, flag, flag arm, and vent door. Painted plastic vault covers adjacent to the ECMs were also tested. The results for the tested painted surfaces ranged up to 2.78 milligrams per square centimeter. A reading of 1.0 milligrams per square centimeter or greater is considered to be lead-based paint.

Solid Waste

Solid waste in the Detailed Study Area is generated by various activities associated with the operations of the Airport. The Airport collects this solid waste and evaluates it to determine where it is to be disposed. Solid and semi-solid waste, such as garbage and other rubbish, is sent to Los Reales Landfill, which is located approximately three miles to the east of the Airport. Los Reales is a regional landfill and serves the residents and businesses of Tucson and Pima County. Waste that cannot go to the landfill, such as waste oil, is disposed of at Arizona Waste Oils Services in Tucson.[56]

A site reconnaissance was conducted of the entire Detailed Study Area during May through July 2017. Improper and illegal dumping, referred to as wildcat dumping of solid waste, was observed in the areas known as Parcel G and Parcel H off dirt trails on Airport property. These dump sites are south of the Old Hughes Access Road and north of Aerospace Parkway. Materials observed appeared to be primarily household and construction debris, including the following: PVC pipe, glass and plastic bottles, plastic buckets, plant containers, food cans, aerosol cans, shoes, clothing, carpet, window screens, wood, tires, car parts, mattress springs, plastic, pieces of concrete, cut vegetation, scrap metal, filters, cardboard, hose, paper, rope, foam cups, furniture, cooler, fluorescent bulbs, bricks, doors, concrete blocks, paint cans, tarps, carpet pads, broken window glass, roofing felt, and broken concrete (other such materials may also be present).

Recycling

In 1990, the Airport initiated an airport-wide recycling program to divert materials that could be reused out of the landfill.[57] Over the years, the Airport recycling program has expanded to include not only cardboard and aluminum but landscape waste material, which is shredded and composed while concrete and asphalt, are recycled as possible to use on Airport construction projects. **Exhibit 3-7** shows an example of the recycling container currently used inside the Passenger Terminal Building at TUS. Copper is recycled at Desert Metal Recycling, metal at SA Recycling, and paper waste is recycled by Republic Services at Re-Community Recycling in Tucson. [58]

[56] Eric Roudebush, TAA, August 24, 2017, RE: TUS EIS solid waste.
[57] Tucson Airport Authority, September 2017, Environmental Program - Recycling. Available on-line: https://www.flytucson.com/taa/about/environmental-programs/. Accessed on September 1, 2017.
[58] Eric Roudebush, TAA, August 24, 2017, RE: TUS EIS solid waste.

Source: Photo courtesy of TAA and FAA, 2017.

DRAFT

Environmental Impact Statement
Tucson International Airport

Existing Recycling in the Terminal Building

EXHIBIT: **3-7**

11/27/2017 Y:\TUS\TUS-EIS\E-L&B Work Product\2-GIS\MXD\DOCUMENT\ 3-7_Existing Recycling in the Terminal Building.mxd

THIS PAGE INTENTIONALLY LEFT BLANK

3.9 HISTORIC, ARCHITECTURAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

3.9.1 REGULATORY SETTING

The National Historic Preservation Act of 1966 (NHPA) (54 U.S.C. § 300101 *et seq*.) Section 106, *Protection of Historic Properties* requires federal agencies to take into account the effects of their undertakings on properties that are listed on or determined eligible for inclusion in the National Register of Historic Places (NRHP), and requires federal agencies to consult with the State Historic Preservation Officer (SHPO), Tribal Historic Preservation Officers (THPO), and other parties to develop and evaluate alternatives or modifications to the undertaking that could avoid, minimize, or mitigate adverse effects on historic properties. The independent federal agency overseeing federal historic preservation and tribal programs, the Advisory Council on Historic Preservation (ACHP), is afforded a reasonable opportunity to comment on such undertakings subject to Section 106. The ACHP typically reserves its comments either for complex consultations in which it has had previous involvement or for consultations wherein a federal agency seeks ACHP comment on unresolved consultation issues. Section 106 of NHPA is the principal statute concerning such resources. It requires consideration of direct and indirect impacts from federal actions on historic, architectural, archaeological, and other cultural resources.

This project also falls under the purview of the Arizona Historic Preservation Act of 1982 (A.R.S. § 41-861 et seq.). This Act directs the Arizona SHPO to assist government agencies with the identification and nomination of eligible properties to the Arizona Register of Historic Places as they are identified.

3.9.2 AFFECTED ENVIRONMENT

3.9.2.1 Area of Potential Effects (APE)

The Area of Potential Effects (APE) is "the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties" (36 C.F.R. § 800.16(d)). For purposes of Section 106, the term "historic properties" can include architectural, archeological, or cultural resources. The determination of the APE considers the character of a project area and the potential for resources to be found.

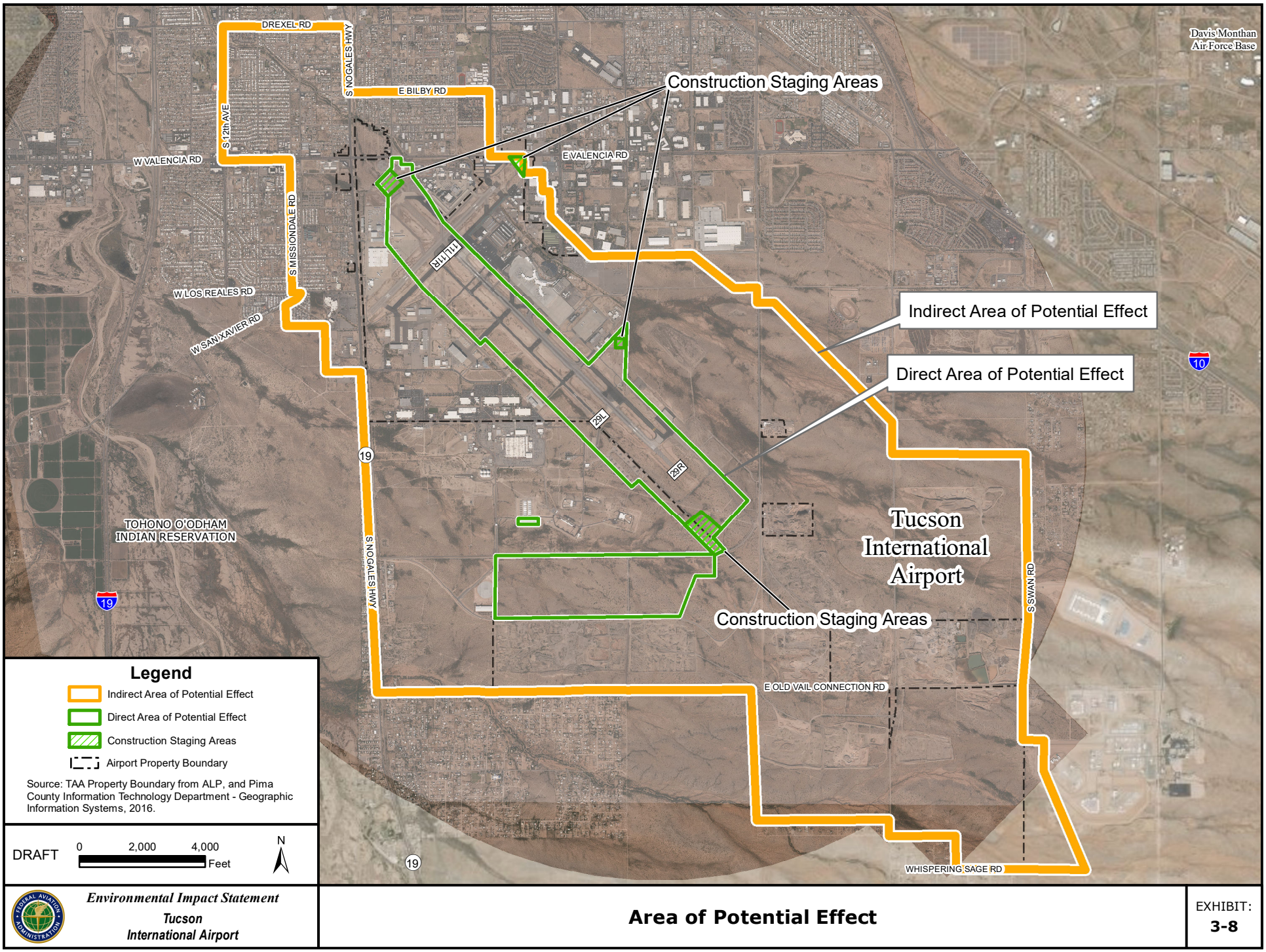
The APE is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking (36 C.F.R. § 800.16(d)). The APE must include all direct and reasonably foreseeable indirect effects. Although the NHPA regulations do not define the term "indirect effect," the criteria of adverse effects cover reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance, or be cumulative (36 C.F.R. § 800.5(a)(1)).

For this undertaking, future development, runway construction, or other construction activities, including impacts to historic resources associated with noise, visual impacts, or changes in setting, could cause direct and indirect effects. As a result of this effort the FAA defined two APEs - a Direct APE and an Indirect APE as shown on **Exhibit 3-8**.

The Indirect APE covers approximately 12,600 acres and is defined as the area where both direct and indirect impacts may result from the development of the Proposed Action or any of its alternatives. The Indirect APE boundary was developed using a composite of airport noise contours, including the Future (2028) No Action and Future (2028) Proposed Action noise contours (out to the 65 DNL). Furthermore, a buffer area was added to square off the boundary to follow roadways where available.

The Direct APE covers approximately 1,500 acres and is defined as the area where direct impacts may result from the Proposed Action and its alternatives. The Direct APE boundary was developed using the area of physical disturbance of the alternatives because physical disturbance is contemporaneous, closer in distance, and individual in nature.

The Arizona SHPO concurred with FAA delineation of the APE via letter on June 19, 2017 (see **Appendix F**).



Environmental Impact Statement
Tucson International Airport

Area of Potential Effect

EXHIBIT: **3-8**

4/19/2018 Y:\TUS\TUS-EIS\E-L&B Work Product\2-GIS\MXD\DOCUMENT\ 3-8_Area of Potential Effect.mxd

THIS PAGE INTENTIONALLY LEFT BLANK

3.9.2.2 Indirect APE

Research indicated that 48 prior surveys have been conducted in the area of the Airport. These projects were prompted by transmission and utility line installations, airport improvements, road construction and maintenance, materials pit purchase (for the extraction of aggregate), quarry construction, residential and commercial development, landfill construction, detention basin construction, airport expansion, park construction, land acquisition, cell tower construction, raceway construction, and archaeological research. A total of 76 previously recorded archaeological sites were identified.

In addition to the archaeological sites, other resources identified principally date to the WWII and post-WWII era. The identification of historic resources in the Indirect APE was based on known inventoried properties that are listed or eligible for the National or State Register of Historic Places, as well as database research from the Pima County GIS website. Three large hangars, referred to as the Triple Hangars, are located in the southeast corner of South Park Avenue and East Teton Road on TUS property. The hangars were built in 1942 and expanded in 1943. [59] They have been previously used for storage and aircraft repair. The Triple Hangars remain in sound structural condition and retain their historic integrity with few alterations. Based on the architectural characteristics and historical association with WWII and the postwar expansion of the aviation industry in the Tucson area, Statistical Research, Inc. recommended that the Triple Hangars be eligible for inclusion in the NRHP under Criterion A (Association with Events) and Criterion C (Embodiment of Distinctive Architectural Characteristics).[60]

The San Xavier del Bac National Historic Landmark (Pima County, Arizona) lies outside of the Indirect APE. The Juan Bautista de Anza National Historic Trail lies approximately 4.5 miles west of the Airport. The FAA coordinated with the NPS as part of the EIS scoping process. By email dated October 17, 2016 the NPS stated they had no concerns from the Anza Trail for this project (see **Appendix F**).

3.9.2.3 Direct APE

A Class III Cultural Resources Investigation was conducted for the proposed undertaking in compliance with Section 106 of the NHPA and guidelines set forth by the Arizona State Museum (ASM) and the Arizona SHPO. The survey is available in **Appendix F**. The purpose of the investigation was to identify any historic properties located within the Direct APE that are listed or eligible for listing in the NRHP. Historic properties may include buildings or structures, sites, objects, and even districts of importance in prehistory or history.

[59] Harris Environmental Group, Inc., March 2007, A Class III Cultural Resources Investigation of 704 Acres at the Tucson International Airport in Support of Proposed Runway 11R/29L Relocation.

[60] Majewski, Teresita, Statistical Research, Inc., 1995, Section 106 Assessment of Buildings D-1-1, D-2-2, D-3-3, D-66-13, D-67-14, D-68-15, D-69-16, D-70-17, and D-71-18, Tucson International Airport.

The cultural resources investigation consisted of a records search and literature review, as well as an archaeological pedestrian survey of the Direct APE. The background research included a review of the ASM archaeological records office, the Arizona Site File database, the Cultural Resource Inventory (ASM's cultural resources electronic database), General Land Office maps, and historic United States Geological Survey (USGS) maps.

As part of the Class III Cultural Resource Investigation, qualified archeologists conducted a pedestrian survey on August 16-18 and 23-25, 2017. See **Appendix F**, *Section 106 Consultation*. As described in the FAA Order 1050.1F Desk Reference, the steps taken to identify archeological sites must be identified.[61] The pedestrian survey was conducted in accordance to ASM pedestrian survey standards which allow a person to achieve 100 percent coverage of a corridor 20 meters (66 feet) wide in a single pass. One hundred (100) percent coverage of the project area was achieved by conducting multiple transects at 15 meter intervals across the Direct APE.

During the pedestrian survey, the archaeologists carefully examined all surface and soil exposures. Any artifacts or features that appeared older than 50 years were evaluated to determine if they constituted an archaeological site or a cultural resource eligible for inclusion in the NRHP. According to the criteria established by the ASM, a site can be of virtually any size and exhibit a variety of artifacts and features to be eligible for inclusion in the NRHP. However, sites must contain at least one of the following:

- 30 or more artifacts of a single artifact class within an area 15 meters (49 feet) in diameter, except when all pieces appear to originate from a single source (e.g., one ceramic vessel, one core, or one glass bottle, etc.).
- 20 or more artifacts that include at least two artifact classes (e.g., sherds, lithics, or historic artifacts, etc.), within an area 15 meters (49 feet) in diameter.
- One or more archaeological features in association with any number of artifacts.
- Two or more temporally associated archaeological features without artifacts.

Artifacts and features that do not qualify as sites are typically recorded as isolated occurrences. These consist of a single artifact, an individual feature, or a widely-dispersed artifact scatter of extremely low density. An isolated feature is defined as a non-portable object that has no other features or artifacts within a 100-meter (328 feet) diameter of its location. See **Appendix F**, *Section 106 Consultation*.

[61] FAA, 2015, *1050.1F Desk Reference*.

3.9.2.4 Archaeological Sites

Twenty-one (21) archaeological sites have been identified within the Direct APE. Nineteen (19) of these sites previously were not recommended for listing in or eligible for inclusion in the NRHP. Two of these sites which were included in a previous survey were not evaluated for listing in or eligible for inclusion in the NRHP because they would not be disturbed as part of the Proposed Action. **Table 3-10** provides the archaeological sites within the Direct APE.

Table 3-10
ARCHAEOLOGICAL SITES WITHIN THE DIRECT APE
Tucson International Airport

ASM SITE NUMBER	CULTURAL/ TEMPORAL AFFILIATION	DESCRIPTION	RECORDER	NRHP STATUS RECOMMEN-DATION	NRHP STATUS OPINION
AZ BB:13:773	Historic European-American	Historic Debris Scatter/ Waste Pile, Rock Features	Twilling et al. 2007	Determined Ineligible	SHPO (2007)
AZ BB:13:774	Historic European-American	Historic Debris Scatter/ Waste Pile	Twilling et al. 2007	Determined Ineligible	SHPO (2007)
AZ BB:13:775	Historic European-American	Historic Debris Scatter/ Waste Pile; Rock Feature	Twilling et al. 2007	Determined Ineligible	SHPO (2007)
AZ BB:13:779	Historic European-American	Historic Rock Features	Twilling et al. 2007	Determined Ineligible	SHPO (2007)
AZ BB:13:836	Historic European-American	Historic Debris Scatter/ Waste Pile	Remington 2013	Recommended Ineligible	Recorder
AZ BB:13:972	Historic European-American	Historic Debris Scatter/ Waste Pile	Harris 2017	Recommended Ineligible	Recorder
AZ BB:13:973	Historic European-American	Historic Debris Scatter/ Waste Pile	Harris 2017	Recommended Ineligible	Recorder
AZ BB:13:974	Historic European-American	Historic Debris Scatter/ Waste Pile	Harris 2017	Recommended Ineligible	Recorder
AZ BB:13:975	Historic European-American	Historic Debris Scatter/ Waste Pile	Harris 2017	Recommended Ineligible	Recorder
AZ BB:13:976	Historic European-American	Historic Debris Scatter/ Waste Pile	Harris 2017	Recommended Ineligible	Recorder

Table 3-10, *Continued*
ARCHAEOLOGICAL SITES WITHIN THE DIRECT APE
Tucson International Airport

ASM SITE NUMBER	CULTURAL/ TEMPORAL AFFILIATION	DESCRIPTION	RECORDER	NRHP STATUS RECOMMEN-DATION	NRHP STATUS OPINION
AZ BB:13:977	Historic European-American	Historic Debris Scatter/ Waste Pile	Harris 2017	Recommended Ineligible	Recorder
AZ BB:13:449	Historic European-American	Historic Debris Scatter	Knoblock 1994	Determined Ineligible	SHPO (2000)
AZ BB:13:631	Prehistoric	Prehistoric Lithic Scatter; Rock Features	Dutt 1999	Determined Ineligible	SHPO (2000)
AZ BB:13:632	Prehistoric	Prehistoric Lithic Scatter; Rock Feature	Dutt 1999	Determined Ineligible	SHPO (2000)
AZ BB:13:633	Prehistoric	Prehistoric Lithic Scatter; Rock Features	Dutt 1999	Determined Ineligible	SHPO (2000)
AZ BB:13:634	Prehistoric Hohokam	Prehistoric Lithic and Ceramic Scatter; Rock Features	Dutt 1999	Determined Ineligible	SHPO (2000)
AZ BB:13:635	Prehistoric	Prehistoric Lithic Scatter, Rock Features	Dutt 1999	Determined Ineligible	SHPO (2000)
AZ BB:13:636	Prehistoric	Prehistoric Lithic Scatter; Rock Feature	Dutt 1999	Determined Ineligible	SHPO (2000)
AZ BB:13:637	Prehistoric	Prehistoric Lithic Scatter; Rock Features	Dutt 1999	Determined Ineligible	SHPO (2000)
AZ BB:13:839	Prehistoric Hohokam	Prehistoric Lithic Artifact and Ceramic Artifact; Rock Features	Will be avoided and therefore not evaluated		
AZ BB:13:851	Prehistoric	Prehistoric Lithic Artifact; Rock Features	Will be avoided and therefore not evaluated		

Sources: Harris Environmental Group, Inc., 2018, Class III Cultural Resources Investigation for the Proposed Airfield Safety Enhancement Project, Tucson International Airport, Pima County, Arizona; Knoblock, Keith B., Statistical Research, Inc., 1994, A Class III Archaeological Survey of the Western Santa Rita Lower Bajada; Remington, Richard, Logan Simpson Design, 2013, Access Road Cultural and Biological Survey Summary; Harris Environmental Group, Inc., 2007, A Class III Cultural Resources Investigation of 704 Acres at Tucson International Airport in Support of Proposed Runway 11R/29L Relocation.

3.9.2.5 Structures

Seventeen (17) structures have been identified within the Direct APE including 12 ECMs used for storage of explosives and other materials are located at AFP-44. The bunkers are arranged in two rows of six. The ECMs consist of 12, buildings 871 through 882, constructed in 1955. The structures are situated in two rows facing southwest. Originally owned by Hughes Missile Systems Company, a subsidiary of Hughes Aircraft Company, AFP 44 was the site of the Falcon missile plant built by Phoenix-based Del E. Webb Construction Company in 1951. The USAF acquired the complex in 1952, with Hughes retaining the contract to run the plant. For storage of explosive materials, ECMs were built on site.

ECMs were the primary type of ammunition storage building constructed during and after World War II. The 12 buildings are all typical ECM design that vary in their lengths with headwalls measuring 19 feet high from grade and 85 feet wide. A typical ECM structure is a reinforced concrete barrel arch, designed to direct the force of any explosion up instead of out, preventing a chain reaction in adjacent structures. The headwall extends approximately two and a half feet above the top of the roof, with the wingwalls sloping to the ground, to withstand blast pressures and retain the earth fill covering the structure. Swinging steel doors are centered on the headwall, and the floor and rear blast wall are also reinforced concrete. ECMs are not associated with a significant event, the product of any master designer or builder, or in any way a distinctive example of this type of utilitarian structure. A buildings and structures inventory and evaluation of AFP 44 including the 12 ECMs was completed in 1996 by Earth Tech. The 12 ECMs were recommended as ineligible for inclusion in the National Register and the Arizona SHPO concurred. The FAA reviewed the previous determination and is providing a current determination. Documentation about any specific site that is more than five years old must be reviewed and updated, as appropriate. The FAA's "fresh look" confirms the previous determination made in 1996 that these ECMs are determined ineligible for listing on the NRHP, neither as separate structures, nor as a contributor to a potential historic district.

In addition to the ECMs, there are five structures used for storage, office space, and maintenance areas in the northwest portion of the Direct APE near the Triple hangars. Several of these hangars are currently operated by Velocity Air and Double Eagle. These five remaining structures within the APE were previously determined not eligible for listing in the NRHP. **Table 3-11** provides the structures within the Direct APE.

There are no historic, architectural, archaeological, and other cultural resources located within the Direct APE that are listed or eligible for listing on the NRHP or state register of historic places. Two archaeological sites which were included in a previous survey[62] were not evaluated for eligibility for the NRHP, but would not be disturbed by the Proposed Action. See **Appendix F**, *Section 106 Consultation*.

[62] SWCA Environmental Consultants, May 2014, Cultural Resources Inventory for the Hughes Access Road Relocation Project, Pima County, Arizona.

Table 3-11
STRUCTURES WITHIN THE DIRECT APE
Tucson International Airport

STRUCTURE	DESCRIPTION/ FUNCTION	YEAR CONSTRUCTED	HISTORIC INTEGRITY/ ARCHITECTURAL SIGNIFICANCE	NRHP STATUS
AFP 44 Building 871	Earth-covered magazine (ECM)-ammunitions storage	1955	No Change / Low	Determined Ineligible (1996)
AFP 44 Building 872	Earth-covered magazine (ECM)-ammunitions storage	1955	No Change / Low	Determined Ineligible (1996)
AFP 44 Building 873	Earth-covered magazine (ECM)-ammunitions storage	1955	No Change / Low	Determined Ineligible (1996)
AFP 44 Building 874	Earth-covered magazine (ECM)-ammunitions storage	1955	No Change / Low	Determined Ineligible (1996)
AFP 44 Building 875	Earth-covered magazine (ECM)-ammunitions storage	1955	No Change / Low	Determined Ineligible (1996)
AFP 44 Building 876	Earth-covered magazine (ECM)-ammunitions storage	1955	No Change / Low	Determined Ineligible (1996)
AFP 44 Building 877	Earth-covered magazine (ECM)-ammunitions storage	1955	No Change / Low	Determined Ineligible (1996)
AFP 44 Building 878	Earth-covered magazine (ECM)-ammunitions storage	1955	No Change / Low	Determined Ineligible (1996)
AFP 44 Building 879	Earth-covered magazine (ECM)-ammunitions storage	1955	No Change / Low	Determined Ineligible (1996)
AFP 44 Building 880	Earth-covered magazine (ECM)-ammunitions storage	1955	No Change / Low	Determined Ineligible (1996)

Table 3-11, *Continued*
STRUCTURES WITHIN THE DIRECT APE
Tucson International Airport

STRUCTURE	DESCRIPTION/ FUNCTION	YEAR CONSTRUCTED	HISTORIC INTEGRITY/ ARCHITECTURAL SIGNIFICANCE	NRHP STATUS
AFP 44 Building 881	Earth-covered magazine (ECM)-ammunitions storage	1955	No Change / Low	Determined Ineligible (1996)
AFP 44 Building 882	Earth-covered magazine (ECM)-ammunitions storage	1955	No Change / Low	Determined Ineligible (1996)
TUS Structures D-111 and D-101-9/10	Maintenance Shop/Old Fire Station and Car Rental	1944/1953	No Change / Low	Determined Ineligible (2007)
TUS Structure D-4	Metal aircraft storage structure	1951	No Change / Low	Determined Ineligible (2007)
TUS Structure D-5	Metal aircraft storage structure	1951	No Change / Low	Determined Ineligible (2007)
TUS Structure D-6	Metal aircraft storage structure	1951	No Change / Low	Determined Ineligible (2007)
TUS Structure D-7	Wood Hangar	1951	No Change / Low	Determined Ineligible (2007)

Source: Harris Environmental Group, Inc., 2018, Class III Cultural Resources Investigation for the Proposed Airfield Safety Enhancement Project, Tucson International Airport, Pima County, Arizona; Harris Environmental Group, Inc., 2007, A Class III Cultural Resources Investigation of 704 Acres at the Tucson International Airport in Support of Proposed Runway 11R/29L Relocation.

3.10 LAND USE

3.10.1 REGULATORY SETTING

Special guidance relevant to land use is given in the NEPA implementing regulations, which require consideration of "[p]ossible conflicts between the proposed action and the objectives of Federal, regional, State, and local (and in the case of a reservation, Indian tribe) land use plans, policies and controls for the area concerned." The impacts on land use may include indirect impacts such as the disruption of communities, relocation, induced socioeconomic impacts, and impacts to land uses protected under USDOT Act Section 4(f). The regulations recognize that certain inconsistencies may exist between the proposed federal action and any approved state or local plan or law. Where an inconsistency exists, the EIS should describe the extent to which the agency would reconcile its action with the plan or law. (See 40 C.F.R. § 1506.2(d).)

3.10.2 AFFECTED ENVIRONMENT

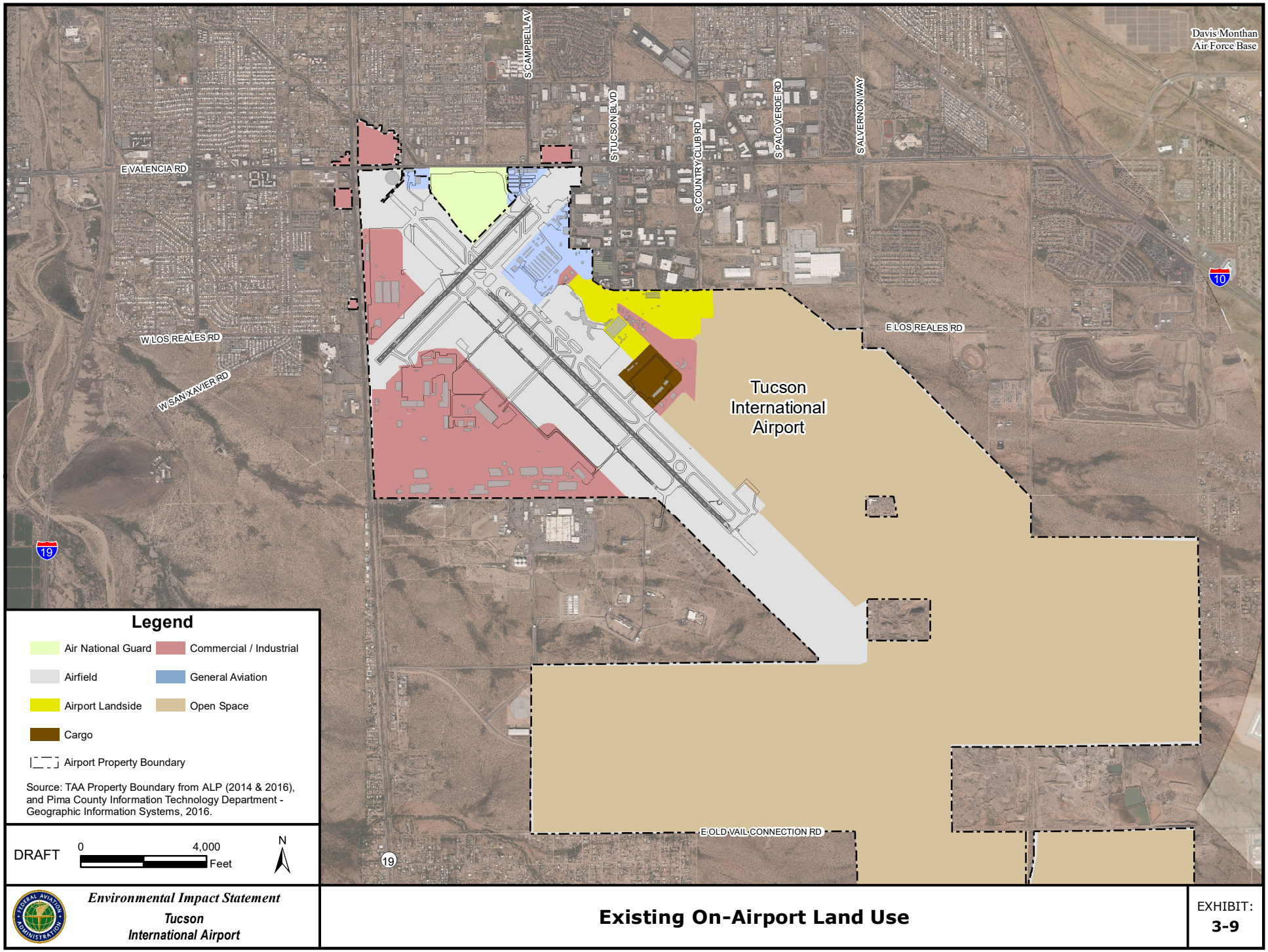
This section discusses existing and future planned federal, regional, state and local land use plans, policies, and controls within the General Study Area.

3.10.2.1 Existing Land Use

The Airport is located on 8,343 acres in Tucson, Arizona in Pima County south of the City of Tucson central business district. The Airport is near both Interstate 10 and Interstate 19. USAF owned land known as AFP 44, is located along the southwest border of the Airport. Existing Land use on Airport property is shown on **Exhibit 3-9**.

Existing Land use in the General Study Area consists of the Airport property, residential uses, commercial and industrial land uses, and open desert land, as shown on **Exhibit 3-10**. The Airport is largely surrounded by aviation land uses to the south and east, including industrial and commercial land uses occupied by large structures that are separated by open land. AFP 44 is considered commercial/industrial. Residential developments consisting of single-family, multi-family, and manufactured housing residences are located to the north and northwest of the Airport. The nearest residential land uses to the Airport property boundary are located approximately 700 feet to the north. Other nearby residential areas are located approximately 1,500 feet to the west on South Nogales Highway. Therefore, the population density of the airport setting is much higher north and northwest where the residential areas are located and much lower south and east where larger industrial and commercial buildings are located.

The area south of the Airport is primarily vacant land. The San Xavier District of the Tohono O'odham Nation, is located southwest of the Airport. The Los Reales Landfill is located approximately three miles to the east of the Airport.



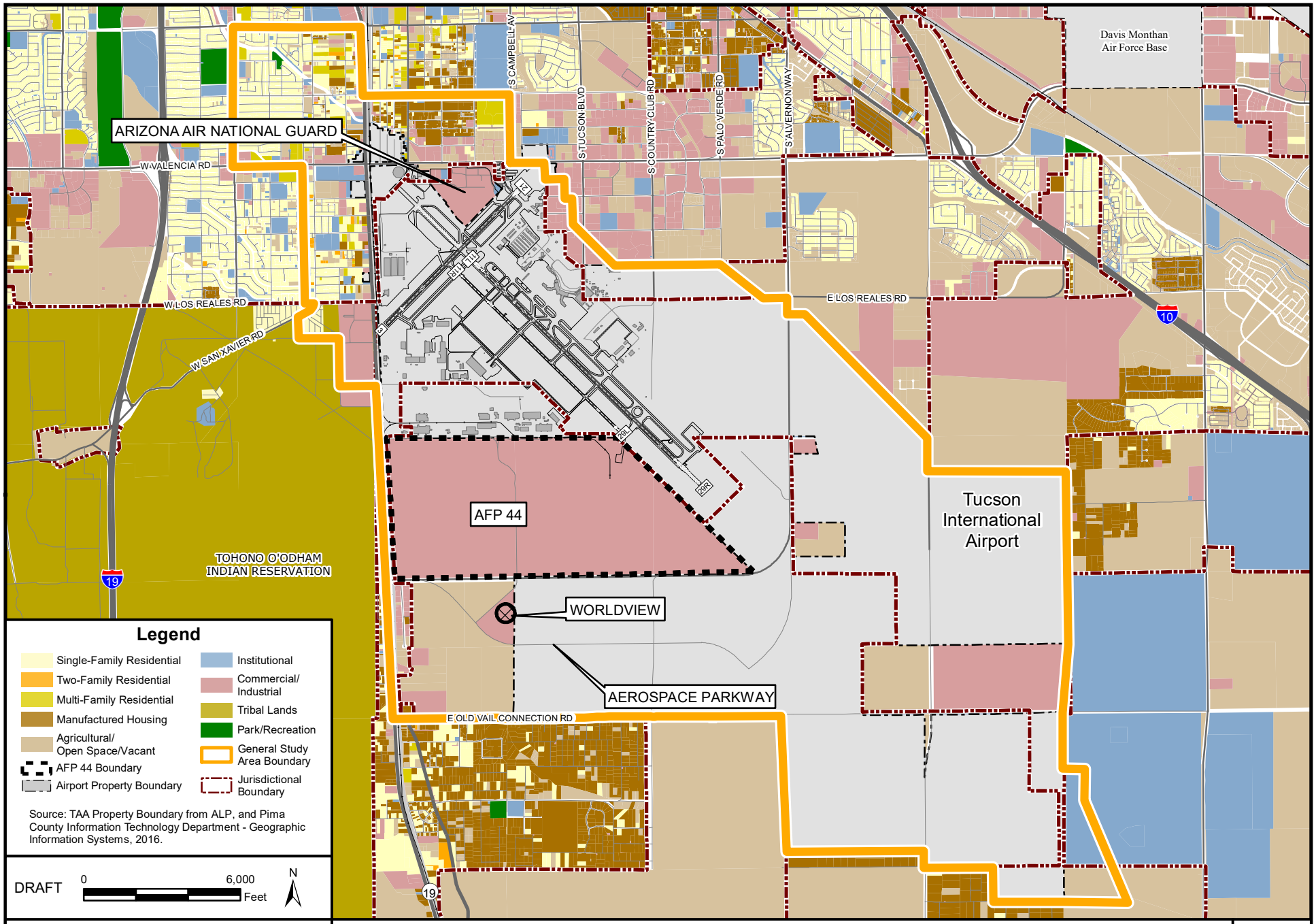
Environmental Impact Statement
Tucson International Airport

Existing On-Airport Land Use

EXHIBIT: **3-9**

12/5/2017 Y:\TUS\TUS-EIS\E-L&B Work Product\2-GIS\MXD\DOCUMENT\ 3-9_Existing On-Airport Land Use.mxd

THIS PAGE INTENTIONALLY LEFT BLANK



Environmental Impact Statement
Tucson
International Airport

Existing Land Use

EXHIBIT:
3-10

4/19/2018 Y:\TUS\TUS-EIS\E-L&B Work Product\2-GIS\MXD\DOCUMENT\ 3-10_Existing Land Use.mxd

THIS PAGE INTENTIONALLY LEFT BLANK

3.10.2.2 Planned and Future Land Use

Pima County's long range county plan known as the *Pima Prospers Comprehensive Plan* and TUS's 2014 TUS Airport Master Plan each describe planning goals for the area surrounding TUS that is included in the General Study Area. These planning goals are aimed to support the successful implementation of the Pima County Aerospace, Defense & Technology Research and Business Park, an approximately 500 acre industrial park which would "address the increasing need for supply chain locations for the aerospace industry and other key sector industries as well as imports/exports with Mexico".[63]

The *Pima Prospers Comprehensive Plan*[64] lists the following planning goal for the land around TUS:

- Designate Land Use south of TUS. Pima County shall provide a mix of land uses along Aerospace Parkway in order to "protect, connect, and grow the regional employment base" of the Aerospace Parkway Industrial Park. Lands owned by Pima County, the TAA, and Arizona State Land Department will be designated for land uses that would promote economic and industrial development and be related or compatible with the Airport.

The TUS Airport Master Plan[65] lists the following planning goal for the land around TUS:

- Designate Land Use north and west of TUS. Lands northwest of TUS along South Nogales Highway and East Valencia Road are expected to remain residential, commercial/industrial, and Airport-related land uses.

The City of Tucson's General and Sustainability Plan known as *Plan Tucson*[66] states that the planning goal for the TUS-area is to conserve neighborhood centers and promote development of Airport-related commercial/industrial activities north and south of the Airport.

---

63 Pima County, 2017, Pima County Aerospace, Defense & Technology Research and Business Park. Available on-line at: https://webcms.pima.gov/UserFiles/Servers/Server_6/File/Government/Economic%20Development/Sonoran%20Corridor/875%20-%20Business%20Park%20flyer%20update%20proof3.pdf Accessed June 20, 2017.

64 Pima County Planning and Zoning Commission, 2015, Comprehensive Plan Update – Pima Prospers, Goal 6, Policy 2. Available on-line at: http://webcms.pima.gov/UserFiles/Servers/Server_6/File/Government/Pima%20Prospers/Policies%20public%20hearing/1.%20Policy%20Document.pdf Accessed May 24, 2017.

65 Tucson Airport Authority, 2014, 2014 Master Plan Update, June.

66 City of Tucson Planning & Development Services, 2013, Plan Tucson – The Built Environment. Available on-line at: https://www.tucsonaz.gov/files/integrated-planning/Chapter3-The_Built_Environment_11-13-13.pdf Accessed May 24, 2017.

3.11 NATURAL RESOURCES AND ENERGY SUPPLY

3.11.1 REGULATORY SETTING

As an impact category, natural resources and energy supply provides an evaluation of a project's consumption of natural resources and use of energy supplies. As set forth in 40 C.F.R. §§1502.14 and 1502.16(e)-(f), CEQ Regulations require that, when evaluating the environmental consequences of a proposed action and its alternatives in an EIS, a federal agency's environmental consequences analysis must include, among other things, energy requirements and the conservation potential of various alternatives and mitigation measures, and natural or depletable resource requirements and the conservation potential of various alternatives and mitigation measures. The following section describes the existing conditions for natural resources and energy supply at TUS.

3.11.2 AFFECTED ENVIRONMENT

The Tucson area is a well-developed urban area with adequate access to natural resources for stationary facility operation, aircraft operations, and construction projects. The Airport has access to utilities and fuel and these energy sources are not in short supply in the Tucson area.

Stationary facilities require electricity and natural gas for lighting, cooling, and heating. Electricity provides cooling and lighting for buildings, lighting for aircraft and vehicle parking areas, and lighting systems for the airfield (runway, taxiways, and aircraft aprons). The Tucson Electric Power Company, a subsidiary of the Fortis holding company, provides electricity to TUS. The Tucson Electric Power Company provides electricity to more than 417,000 residential, commercial, and industrial customers in the Tucson metropolitan area.[67] The Airport also generates electrical power from a solar canopy that feeds into the terminal complex central plant electrical system.

Natural gas provides heat and hot water for airport buildings. Aircraft operations consume fuel energy (Jet A fuel for jets and turboprops and 100 octane low lead aviation fuel for piston aircraft). GSE require unleaded gasoline and diesel fuel. Natural gas is provided to TUS by Southwest Gas Corporation, a subsidiary of Southwest Gas Holdings Inc.[68] Southwest Gas serves more than 1.9 million customers in Arizona, Nevada, and portions of California.

Construction projects may require natural resources such as dirt for fill material, asphalt, water, wood, or gravel. The Airport has a stockpile of dirt for fill material southeast of the terminal area on Airport property. Asphalt, sand, and gravel can be found six miles east of the Airport at the Swann Road Plant and at other vendor locations in Pima County.

---

[67] Tucson Electric Power, 2017, About Us, Available on-line at: https://www.tep.com/about/ Accessed May 25, 2017.

[68] Southwest Gas Corporation, 2017, About Us, Available on-line at: https://www.swgas.com/en/about-us/ Accessed May 25, 2017.

3.12 NOISE AND NOISE-COMPATIBLE LAND USE

3.12.1 REGULATORY SETTING

For aviation noise analyses, the FAA has determined that the cumulative noise energy exposure of individuals to noise resulting from aviation activities must be established in terms of Yearly Day-Night Average Sound Level (DNL), the FAA's primary noise metric. To evaluate aircraft noise, the FAA has a required computer model, the Aviation Environmental Design Tool (AEDT) that simulates aircraft activity at an airport. AEDT replaced the Integrated Noise Model, and the Emissions and Dispersion Modeling System as the required tool for environmental modeling of FAA actions to determine if significant noise impacts would result. AEDT 2d is the latest version.[69]

The FAA uses the 14 C.F.R. Part 150, *Airport Noise Compatibility Planning*, land use compatibility guidelines to determine compatibility with most land uses. These guidelines are consistent with land use compatibility guidelines developed by other federal agencies such as United States EPA and the United States Department of Housing and Urban Development.[70],[71] The DNL 65 decibels (dB) is the noise level where noise-sensitive land uses (residences, churches, schools, libraries, and nursing homes) become significantly impacted. Below 65 DNL, all land uses are determined to be compatible with airport noise. Special consideration is given to noise sensitive areas within Section 4(f) properties (including, but not limited to, noise sensitive areas within national parks, national wildlife and waterfowl refuges and historic sites, including traditional cultural properties) where the land use compatibility guidelines in 14 C.F.R. Part 150 are not relevant to the value, significance, and enjoyment of the area in question.

An explanation of the DNL metric, along with a review of the physics of noise, noise impacts on humans, and social impacts of noise is provided in **Appendix G.**

3.12.2 AFFECTED ENVIRONMENT

3.12.2.1 Noise Model

The noise pattern calculated by the AEDT for an airport is a function of several factors, including: the number of aircraft operations during the period evaluated, the types of aircraft flown, the time of day when they are flown, the way they are flown, how frequently each runway is used for landing and takeoff, and the routes of flight used to and from the runways. Substantial variations in any one of these factors may, when extended over a long period of time, cause marked changes to the noise pattern.

---

69 FAA, 2017, Aviation Environmental Design Tool, Version 2d. Available on-line at: https://aedt.faa.gov/2d_information.aspx Accessed 2017.

70 Federal Interagency Committee on Urban Noise (FICUN), 1980, *Guidelines for Considering Noise in Land Use Planning and Control*.

71 Federal Interagency Committee on Noise (FICON), 1992, *Federal Agency Review of Selected Airport Noise Analysis Issues,* August.

3.12.2.2 Aircraft Activity Levels and Fleet Mix

In order to calculate DNL noise exposure levels for the Airport, the average number of daily arrivals and departures by specific aircraft types was prepared for input into the AEDT. Information concerning aircraft operations was collected from TAA data, FAA Airport Traffic Control Tower (ATCT) counts, Official Airline Guide schedules, and other operational records maintained by TUS for calendar year 2016. During the existing conditions period 140,271 annual operations occurred at TUS.

The average daily number of aircraft arrivals and departures for the Existing (2016) Noise Contour are calculated by determining the total annual operations and dividing by 365 (days in a year). **Table 3-12** provides the number of average daily operations for the four categories of users operating at the Airport. **Table 3-13** shows the total number of operations by detailed aircraft type and by time of day (daytime or nighttime). The 2016 annual average day included 384.3 total operations, 7.6 percent of which occurred during the nighttime hours of 10:00 p.m. to 6:59 a.m.

Tucson Air National Guard Base, which hosts the AANG, has trained tactical military fighter pilots since 1958. Today, the facility is used to train F-16 Fighting Falcon pilots. The use of F-16s for military operations is a major contributor to aircraft noise levels at TUS. The military aircraft type for this EIS included the F-16 Fighting Falcon and the A-10A Thunderbolt II with 27,413 and 277 annual operations, respectively.

Table 3-12
SUMMARY OF AVERAGE DAILY OPERATIONS BY AIRCRAFT CATEGORY – EXISTING (2016)
Tucson International Airport

TYPE OF OPERATIONS	AIR CARRIER/ CARGO	COMMUTER/ AIR TAXI	GENERAL AVIATION	MILITARY	TOTAL
NUMBER OF OPERATIONS	90.10	72.74	145.59	75.87	384.30

Source: FAA, 2017, Airport Traffic Control Tower (ATCT) counts; Landrum & Brown, 2017.

Table 3-13
AVERAGE DAILY OPERATIONS BY AIRCRAFT TYPE – EXISTING (2016)
Tucson International Airport

AIRCRAFT TYPE	ARRIVALS		DEPARTURES		TOTAL OPERATIONS
	DAYTIME	NIGHTTIME	DAYTIME	NIGHTTIME	
Air Carrier / Cargo					
Airbus A300B4-600 Series	0.07	0.00	0.07	0.00	0.14
Airbus A319-100 Series	0.48	0.00	0.46	0.02	0.96
Airbus A320-200 Series	0.11	0.00	0.09	0.02	0.22
Boeing 737-200 Series	1.27	0.00	0.78	0.49	2.54
Boeing 737-300 Series	2.16	0.08	2.13	0.10	4.47
Boeing 737-700 Series	6.54	2.64	6.87	2.31	18.36
Boeing 737-800 with winglets	1.92	0.28	1.88	0.32	4.40
Boeing 737-900 Series	0.89	0.02	0.87	0.04	1.82
Boeing 757-200 Series	0.18	0.00	0.10	0.08	0.36
Boeing 767-300 ER Freighter	0.57	0.70	0.88	0.39	2.53
Boeing MD-11 Freighter	0.00	0.00	0.00	0.00	0.00
Boeing MD-88	6.62	0.99	6.12	1.49	15.22
Boeing MD-90	2.08	0.02	1.48	0.62	4.21
Bombardier CRJ-700-ER	5.51	0.00	4.41	1.10	11.02
Bombardier CRJ-900-ER	4.85	3.03	6.56	1.31	15.75
Embraer ERJ175-LR	3.89	0.17	3.89	0.16	8.10
Subtotal	*37.12*	*7.93*	*36.58*	*8.47*	*90.10*
Air Taxi / Commuter					
Bombardier Challenger 600	7.09	0.99	6.82	1.26	16.16
Bombardier CRJ-200-ER	5.92	3.95	9.86	0.00	19.73
Embraer EMB120 Brasilia	0.75	0.00	0.45	0.30	1.51
Embraer ERJ145-LR	0.64	0.03	0.64	0.03	1.34
Fairchild SA-227-AC Metro III	0.05	0.00	0.04	0.01	0.10
Pilatus PC-12	1.96	0.20	1.91	0.24	4.30
Raytheon Beech 1900-C	0.08	0.00	0.08	0.00	0.17
Raytheon Super King Air 200	14.24	0.47	13.71	1.01	29.43
Subtotal	*30.74*	*5.63*	*33.52*	*2.85*	*72.74*

Table 3-13, *(continued)*
AVERAGE DAILY OPERATIONS BY AIRCRAFT TYPE – EXISTING (2016)
Tucson International Airport

AIRCRAFT TYPE	ARRIVALS		DEPARTURES		TOTAL OPERATIONS
	DAYTIME	NIGHTTIME	DAYTIME	NIGHTTIME	
General Aviation					
Cessna 172 Skyhawk	50.23	1.33	50.17	1.39	103.11
Cessna 525 CitationJet	15.70	0.88	16.09	0.49	33.16
Piper PA-31 Navajo	0.64	0.04	0.60	0.08	1.37
Bell 206 JetRanger Helicopter	3.97	0.00	3.97	0.00	7.95
Subtotal	*70.55*	*2.25*	*70.83*	*1.96*	*145.59*
Military					
Fairchild A-10A Thunderbolt II	0.38	0.00	0.38	0.00	0.76
Lockheed Martin F-16 Fighting Falcon	28.22	0.00	28.22	0.00	56.44
Military Closed Patter					
Lockheed Martin F-16 Fighting Falcon	9.33	0.00	9.33	0.00	18.67*
Subtotal	*37.93*	*0.00*	*37.93*	*0.00*	*75.87*
Total	**176.34**	**15.81**	**178.86**	**13.29**	**384.30**

* Includes touch-and-go/closed patterns operations which are counted as one arrival and one departure.

Notes: Daytime = 7:00 am – 9:59 pm, Nighttime = 10:00 pm – 6:59 am.

Source: FAA, 2017, Airport Traffic Control Tower (ATCT) counts; Landrum & Brown, 2017.

3.12.2.3 Runway Definition

TUS has three runways as shown on Exhibit 1-4, *Existing Airfield*. There are two northwest/southeast parallel runways (11L/29R and 11R/29L) spaced 706 feet from runway centerline to runway centerline. Runway 3/21, a northeast/southwest crosswind runway, is located northwest of Runways 11L/29R and 11R/29L and is located within the approach for Runways 11L and 11R. Runway 11L/29R is the longest runway on the airfield at 10,996 feet. The following provides the length and width of the current runways at TUS used in AEDT:

Runway	Length (feet)	Width (feet)
3/21	7,000	150
11L/29R	10,996	150
11R/29L	8,408	75

3.12.2.4 Runway End Utilization

Runway end utilization refers to the percent of time that a particular runway end is used for departures or arrivals. It is a principal element in the definition of the noise exposure pattern. Proportional use of a runway is based largely on conditions of wind direction and velocity and the length of the runway. In addition, runway use is based on preferential runway use policy at TUS, which includes the following:

- To minimize the impact of noise for residents nearest the airport, the FAA airport traffic control tower at TUS follows a preferential runway use policy that keeps the bulk of aircraft noise over the less-populated southeast desert area.
- During daylight hours, and contingent upon weather conditions, pilots are asked to land from the northwest and takeoff to the southeast when using the main runway 11L/29R.
- During nighttime hours (10:00 p.m. to 6:59 a.m.), preference is given to conducting arrivals from and departures to the southeast when wind, weather and level of traffic permit.

Based on data collected for the existing conditions, the Airport is operated in one of two operating configurations -- southeast flow (74 percent of the time) or northwest flow (26 percent of the time). The primary flow during existing conditions was southeast flow due to the prevailing southeast winds. When the airport operated in this configuration, aircraft arrived from the northwest to Runways 11L, 11R, and 21 and departures to the southeast from Runways 11L, 11R, and 21. During northwest flow, aircraft arrived from the southeast to Runways 29R, 29L, and 3 and departures to the northwest from Runways 29R, 29L, and 3.

The preferred operating configuration during the nighttime calls for an informal preferential reverse flow in which aircraft arrive from the southeast (on Runways 29L and 29R) and depart to the southeast (on Runways 11L and 11R). Weather and/or traffic conditions limit the amount of time operations can use this configuration.

Runway 11R/29L is limited to aircraft with approach speeds less than 166 knots due to the physical limitations of the runway. Runway 3/21 is generally used only when winds require it, when one of the other runways is unavailable, or when the level of demand warrants its use. Due to these limitations, Runway 11L/29R is the most heavily used runway. Runway use percentages modeled for the Existing (2016) Noise Contour are shown in **Table 3-14**.

Military Operations

Military aircraft only use Runway 11L/29R at TUS in one of two operating configurations -- southeast flow (74 percent of the time) and northwest flow (26 percent of the time).

Helicopter Operations

A small number of civil helicopter operations occur at TUS. These operations typically land and take-off at the helipad located to the east of Runway 21.

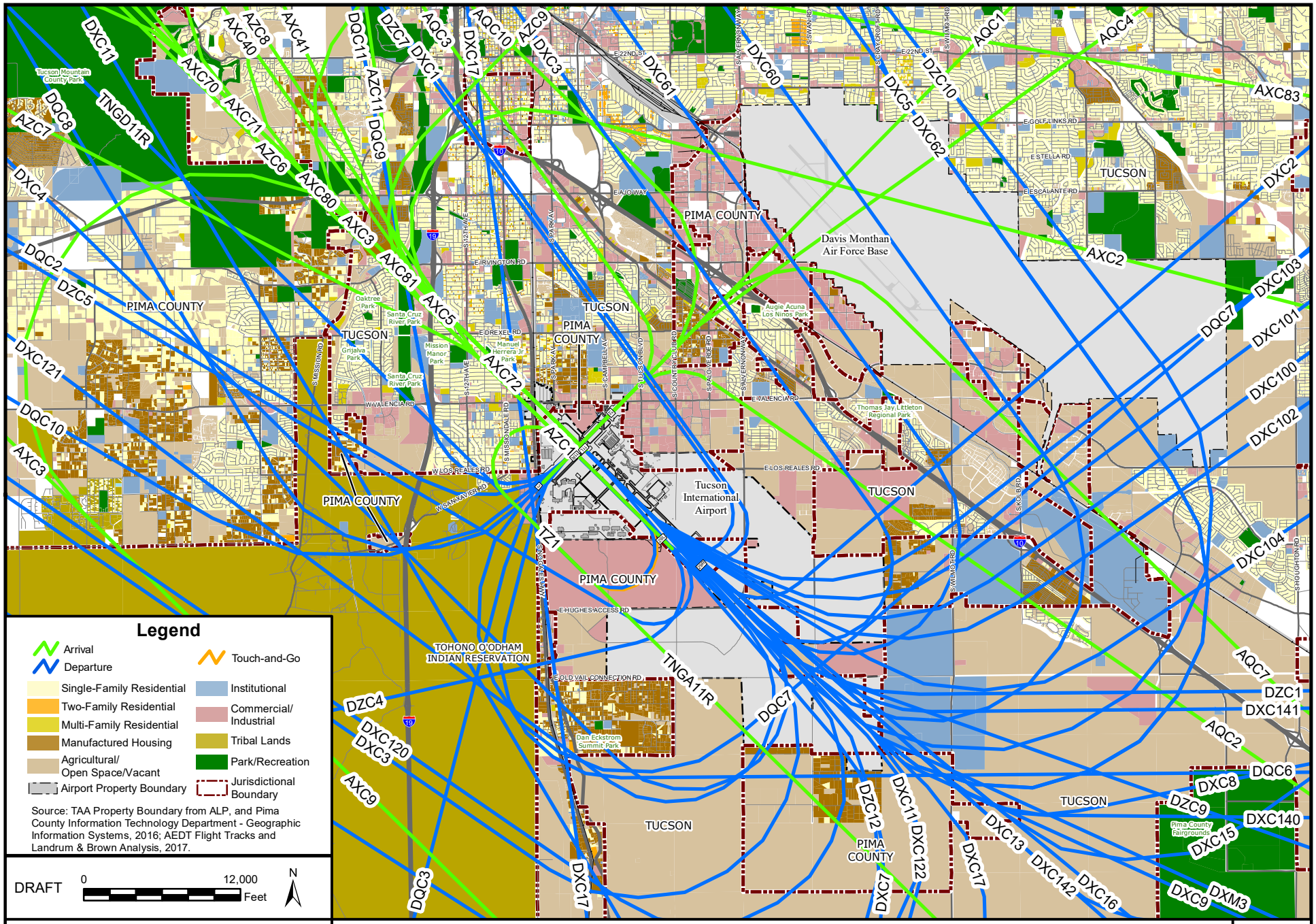
Table 3-14
RUNWAY UTILIZATION – EXISTING (2016)
Tucson International Airport

AIRCRAFT CATEGORY	RUNWAY END						
	3	21	11L	11R	29L	29R	Total
Daytime Arrivals							
Air Carrier / Cargo	0.1%	0.4%	73.2%	0.0%	0.0%	26.4%	100.0%
Air Taxi / Commuter	6.6%	2.8%	59.8%	0.8%	0.4%	29.7%	100.0%
General Aviation	2.2%	4.6%	64.4%	12.1%	3.7%	13.0%	100.0%
Military	0.0%	0.0%	76.0%	0.0%	0.0%	24.0%	100.0%
Total	2.1%	2.1%	68.6%	3.9%	1.2%	22.0%	100.0%
Nighttime Arrivals							
Air Carrier / Cargo	0.0%	0.0%	97.0%	0.0%	0.0%	2.9%	100.0%
Air Taxi / Commuter	0.1%	1.1%	93.3%	0.0%	0.0%	5.6%	100.0%
General Aviation	0.0%	13.3%	61.8%	9.2%	2.5%	13.1%	100.0%
Military	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Total	0.0%	1.9%	91.9%	1.0%	0.3%	5.0%	100.0%
Daytime Departures							
Air Carrier / Cargo	0.2%	0.1%	77.4%	0.3%	0.2%	21.8%	100.0%
Air Taxi / Commuter	0.4%	13.2%	65.2%	2.8%	1.0%	17.4%	100.0%
General Aviation	1.0%	7.9%	64.6%	15.0%	4.3%	7.2%	100.0%
Military	0.0%	0.0%	76.0%	0.0%	0.0%	24.0%	100.0%
Total	0.4%	5.5%	69.0%	5.3%	1.6%	18.2%	100.0%
Nighttime Departures							
Air Carrier / Cargo	0.1%	0.2%	80.4%	0.1%	0.0%	19.2%	100.0%
Air Taxi / Commuter	0.0%	10.0%	89.4%	0.0%	0.0%	0.7%	100.0%
General Aviation	3.3%	2.0%	79.7%	12.3%	2.7%	0.0%	100.0%
Military	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Total	0.4%	2.6%	82.4%	1.4%	0.3%	13.0%	100.0%

Source: FAA, 2017, Radar Data; Landrum & Brown, 2017.

3.12.2.5 Flight Tracks

A flight track is the path over the ground as aircraft fly to or from the airport. For this EIS, the existing flight tracks were evaluated to ensure that the flight tracks used in the modeling of aircraft noise are representative of where aircraft fly at TUS. Radar data gathered for sample periods in 2016 was analyzed to verify the location, density, and width of existing flight corridors. Departure corridors are defined by a series of individual flight tracks located across the width of the corridor. Generally, aircraft on approach to a runway end are located within a smaller corridor due to the use of navigational instruments. In order to model the flight corridors in AEDT, consolidated flight tracks were developed from the radar data and given a track ID. Flight tracks modeled for the existing conditions are shown in **Exhibit 3-11** through **Exhibit 3-14**. The percent utilization modeled for each track is provided in **Table 3-15** through **Table 3-17**.



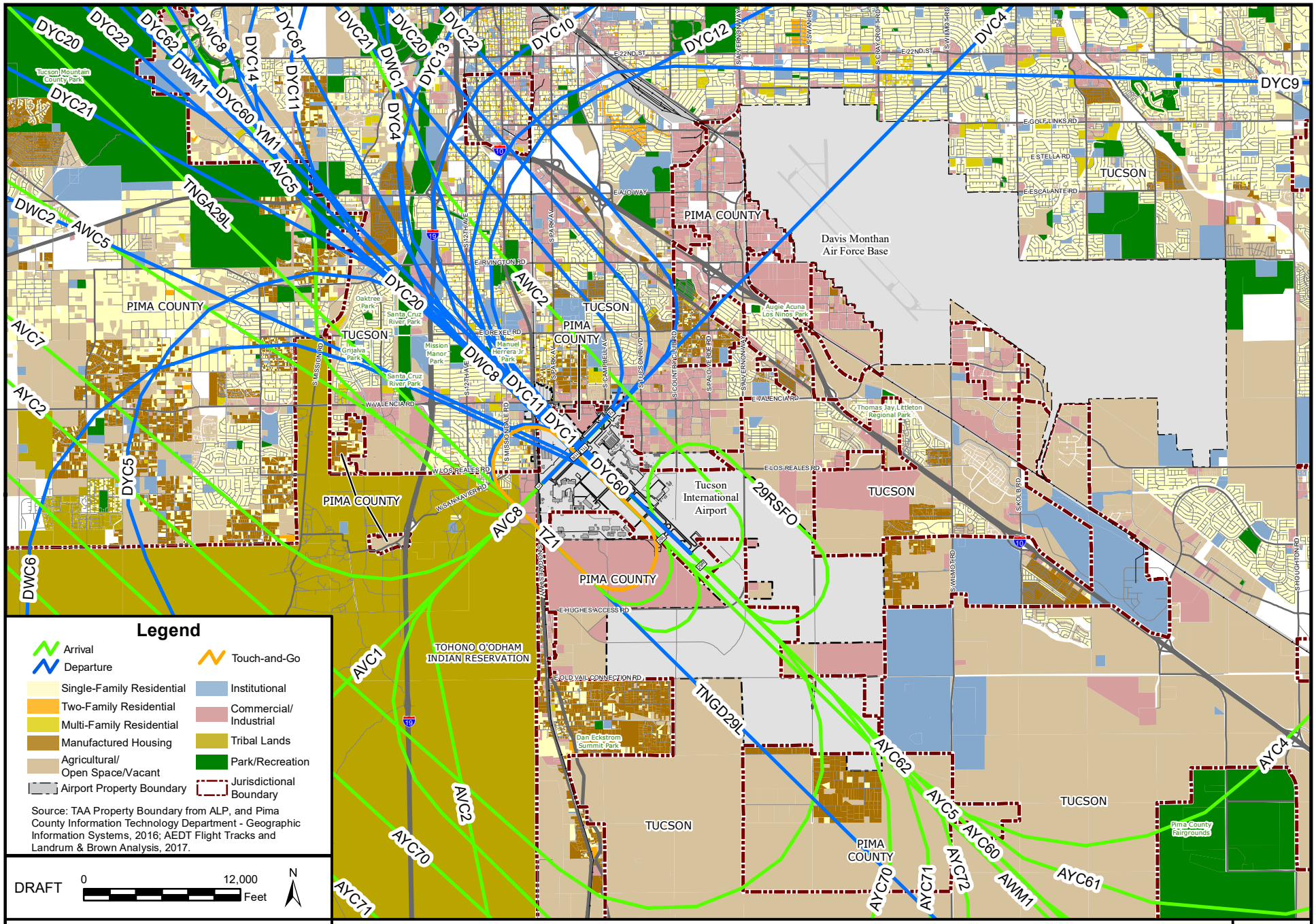
Environmental Impact Statement
Tucson International Airport

Southeast Flow Civil AEDT Flight Tracks - Existing (2016)

EXHIBIT: **3-11**

12/7/2017 Y:\TUS\TUS-EIS\E-L&B Work Product\2-GIS\MXD\DOCUMENT\ 3-11_Southeast Flow Civil AEDT Flight Tracks-Existing 2016.mxd

THIS PAGE INTENTIONALLY LEFT BLANK



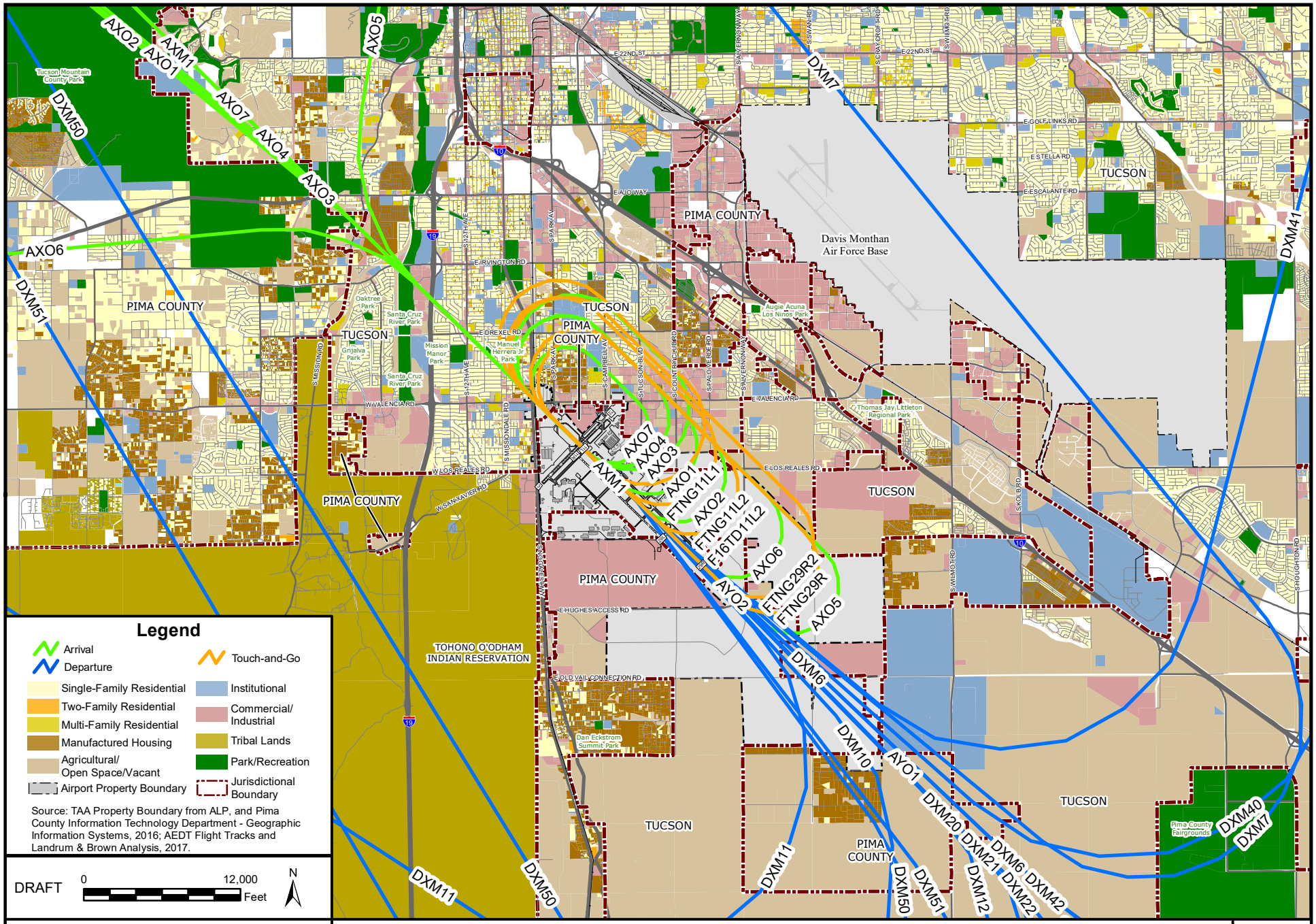
Environmental Impact Statement
Tucson International Airport

Northwest Flow Civil AEDT Flight Tracks - Existing (2016)

EXHIBIT: **3-12**

12/7/2017 Y:\TUS\TUS-EIS\E-L&B Work Product\2-GIS\MXD\DOCUMENT\ 3-12_Northwest Flow Civil AEDT Flight Tracks - Existing 2016.mxd

THIS PAGE INTENTIONALLY LEFT BLANK



Environmental Impact Statement

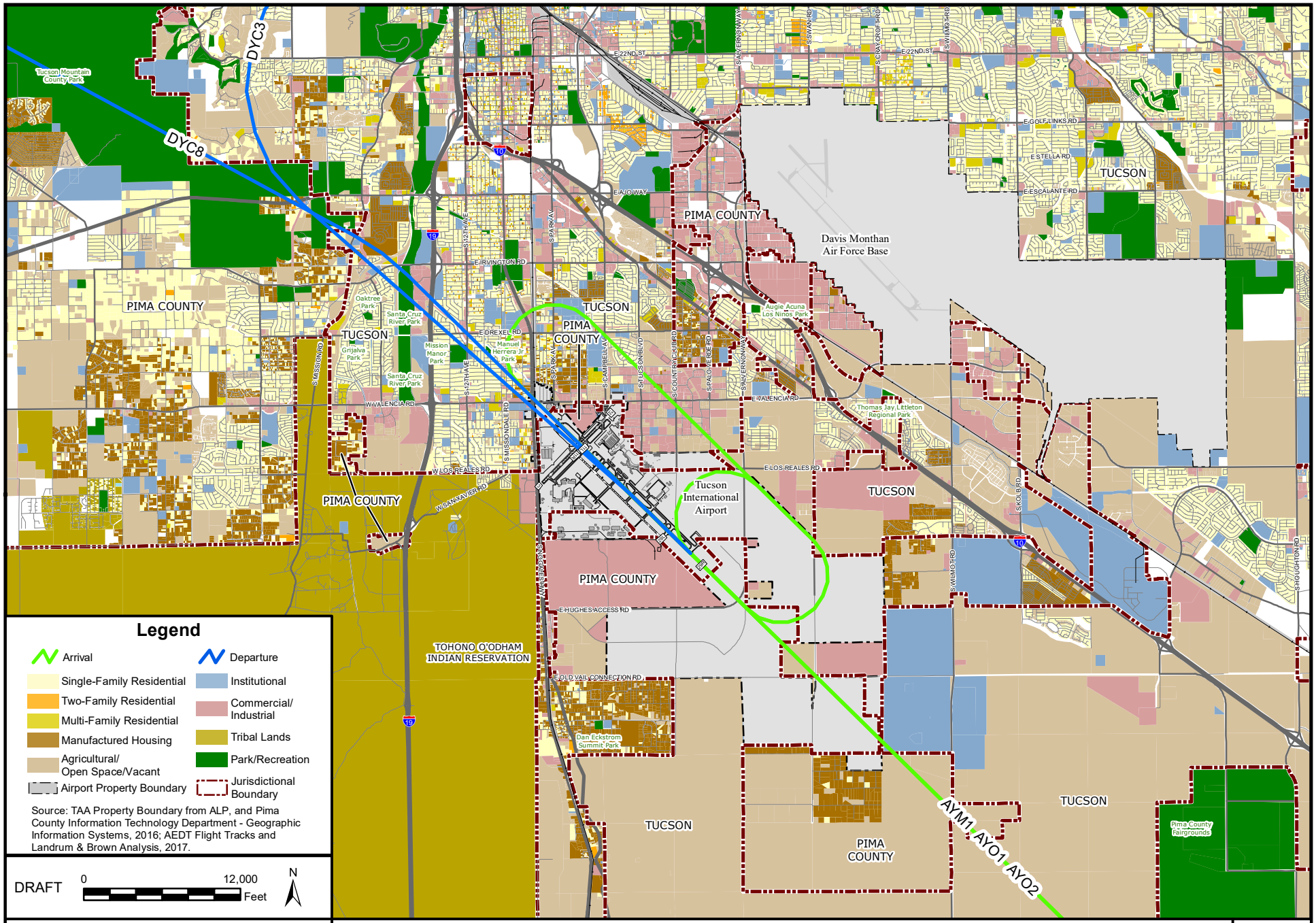
Tucson International Airport

Southeast Flow Military AEDT Flight Tracks - Existing (2016)

EXHIBIT: **3-13**

4/23/2018 Y:\TUS\TUS-EIS\E-L&B Work Product\2-GIS\MXD\DOCUMENT\ 3-13_Southeast Flow Military AEDT Flight Tracks - Existing 2016.mxd

THIS PAGE INTENTIONALLY LEFT BLANK



Environmental Impact Statement
Tucson International Airport

Northwest Flow Military AEDT Flight Tracks - Existing (2016)

EXHIBIT: **3-14**

4/23/2018 Y:\TUS\TUS-EIS\E-L&B Work Product\2-GIS\MXD\DOCUMENT\ 3-14_Northwest Flow Military AEDT Flight Tracks - Existing 2016.mxd

THIS PAGE INTENTIONALLY LEFT BLANK

Table 3-15
ARRIVAL FLIGHT TRACK UTILIZATION – EXISTING (2016)
Tucson International Airport

RUNWAY	TRACK ID	AIR CARRIER/ CARGO	COMMUTER/ AIR TAXI	GENERAL AVIATION	MILITARY
11L	11LSFO	0.00%	0.00%	0.00%	6.76%
	AXC2	0.31%	0.14%	0.10%	0.00%
	AXC3	0.77%	0.36%	0.26%	0.00%
	AXC40	0.77%	7.35%	8.21%	0.00%
	AXC41	0.31%	4.51%	5.07%	0.00%
	AXC5	0.70%	0.90%	0.90%	0.00%
	AXC70	15.47%	12.12%	10.85%	0.00%
	AXC71	23.60%	18.79%	16.90%	0.00%
	AXC72	7.74%	7.37%	6.92%	0.00%
	AXC80	10.68%	4.95%	3.60%	0.00%
	AXC81	7.20%	3.33%	2.43%	0.00%
	AXC82	7.20%	3.33%	2.43%	0.00%
	AXC83	1.62%	1.34%	1.21%	0.00%
	AXC9	1.01%	0.47%	0.34%	0.00%
	AXM1	0.00%	0.00%	0.00%	34.03%
	AXO1	0.00%	0.00%	0.00%	4.18%
	AXO3	0.00%	0.00%	0.00%	4.18%
	AXO4	0.00%	0.00%	0.00%	9.55%
	AXO5	0.00%	0.00%	0.00%	3.88%
	AXO6	0.00%	0.00%	0.00%	3.88%
	AXO7	0.00%	0.00%	0.00%	9.55%
11R	AZC1	0.00%	0.03%	0.10%	0.00%
	AZC11	0.00%	0.06%	0.20%	0.00%
	AZC6	0.00%	0.16%	0.62%	0.00%
	AZC7	0.00%	0.25%	0.81%	0.00%
	AZC8	0.00%	0.13%	0.40%	0.00%
	AZC9	0.00%	0.01%	0.24%	0.00%
	TNGA11R	0.00%	0.00%	8.65%	0.00%
29L	AWC2	0.00%	0.09%	0.18%	0.00%
	AWC5	0.00%	0.24%	0.48%	0.00%
	AWM1	0.00%	0.01%	0.00%	0.00%
	TNGA29L	0.00%	0.00%	2.73%	0.00%

Table 3-15, *Continued*
ARRIVAL FLIGHT TRACK UTILIZATION – EXISTING (2016)
Tucson International Airport

RUNWAY	TRACK ID	AIR CARRIER/ CARGO	COMMUTER/ AIR TAXI	GENERAL AVIATION	MILITARY
29R	29RSFO	0.00%	0.00%	0.00%	2.13%
	AYC15	1.00%	0.77%	0.24%	0.00%
	AYC2	2.23%	6.16%	3.89%	0.00%
	AYC4	0.33%	0.25%	0.08%	0.00%
	AYC5	1.18%	0.90%	0.28%	0.00%
	AYC60	3.52%	4.92%	2.52%	0.00%
	AYC61	2.23%	1.70%	0.53%	0.00%
	AYC62	1.38%	1.05%	0.33%	0.00%
	AYC70	3.90%	5.21%	2.61%	0.00%
	AYC71	4.05%	3.10%	0.96%	0.00%
	AYC72	2.45%	1.87%	0.58%	0.00%
	AYM1	0.00%	0.00%	0.00%	10.71%
	AYO1	0.00%	0.00%	0.00%	6.03%
	AYO2	0.00%	0.00%	0.00%	5.09%
3	AVC1	0.02%	1.42%	0.51%	0.00%
	AVC2	0.00%	1.34%	0.39%	0.00%
	AVC5	0.00%	1.34%	0.39%	0.00%
	AVC7	0.02%	1.41%	0.51%	0.00%
	AVC8	0.02%	0.07%	0.12%	0.00%
21	AQC1	0.15%	0.27%	0.53%	0.00%
	AQC10	0.00%	0.44%	0.76%	0.00%
	AQC2	0.00%	0.22%	0.38%	0.00%
	AQC3	0.00%	1.12%	1.94%	0.00%
	AQC4	0.00%	0.22%	0.38%	0.00%
	AQC7	0.15%	0.27%	0.53%	0.00%
AH1	0.00%	0.00%	7.94%	0.00%	AH1
Total		**100.0%**	**100.0%**	**100.0%**	**100.0%**

Source: FAA, 2017, Radar Data; Landrum & Brown analysis.

* Helicopter operations

Table 3-16
DEPARTURE FLIGHT TRACK UTILIZATION – EXISTING (2016)
Tucson International Airport

RUNWAY	TRACK ID	AIR CARRIER/ CARGO	COMMUTER/ AIR TAXI	GENERAL AVIATION	MILITARY
11L	DXC1	0.00%	10.34%	13.33%	0.0%
	DXC100	0.08%	0.04%	0.03%	0.0%
	DXC101	0.08%	0.04%	0.03%	0.0%
	DXC102	0.39%	0.21%	0.13%	0.0%
	DXC103	0.08%	0.40%	0.49%	0.0%
	DXC104	1.09%	0.58%	0.37%	0.0%
	DXC11	4.29%	6.45%	6.86%	0.0%
	DXC120	11.50%	9.39%	8.19%	0.0%
	DXC121	2.34%	3.07%	3.16%	0.0%
	DXC122	6.63%	5.34%	4.63%	0.0%
	DXC13	1.56%	1.19%	1.00%	0.0%
	DXC140	7.41%	4.28%	2.99%	0.0%
	DXC141	6.24%	3.66%	2.59%	0.0%
	DXC142	5.46%	2.88%	1.86%	0.0%
	DXC15	2.14%	1.13%	0.73%	0.0%
	DXC16	2.73%	1.80%	1.40%	0.0%
	DXC17	2.53%	1.34%	0.86%	0.0%
	DXC2	0.23%	0.85%	1.01%	0.0%
	DXC3	0.08%	0.04%	0.03%	0.0%
	DXC4	0.08%	0.40%	0.49%	0.0%
	DXC5	5.77%	3.05%	1.97%	0.0%
	DXC60	5.46%	2.88%	1.86%	0.0%
	DXC61	2.88%	1.89%	1.45%	0.0%
	DXC62	3.90%	2.78%	2.26%	0.0%
	DXC7	0.62%	0.33%	0.21%	0.0%
	DXC8	2.18%	1.15%	0.74%	0.0%
	DXC9	1.40%	1.10%	0.95%	0.0%
	DXM10	0.00%	0.00%	0.00%	10.1%
	DXM11	0.00%	0.00%	0.00%	5.0%
	DXM12	0.00%	0.00%	0.00%	5.0%
	DXM20	0.00%	0.00%	0.00%	10.7%
	DXM21	0.00%	0.00%	0.00%	5.0%
	DXM22	0.00%	0.00%	0.00%	5.0%
	DXM3	0.23%	0.12%	0.08%	0.0%
	DXM40	0.00%	0.00%	0.00%	6.9%
	DXM41	0.00%	0.00%	0.00%	5.0%
	DXM42	0.00%	0.00%	0.00%	6.9%

Table 3-16, *Continued*
DEPARTURE FLIGHT TRACK UTILIZATION – EXISTING (2016)
Tucson International Airport

RUNWAY	TRACK ID	AIR CARRIER/ CARGO	COMMUTER/ AIR TAXI	GENERAL AVIATION	MILITARY
11L	DXM50	0.00%	0.00%	0.00%	0.6%
	DXM51	0.00%	0.00%	0.00%	0.6%
	DXM6	0.51%	0.27%	0.17%	0.6%
	DXM7	0.08%	0.04%	0.03%	1.3%
29R	DYC1	0.32%	0.18%	0.03%	0.00%
	DYC10	0.85%	0.48%	0.09%	0.00%
	DYC11	1.28%	0.72%	0.14%	0.00%
	DYC12	1.70%	0.95%	0.18%	0.00%
	DYC13	0.43%	0.68%	0.48%	0.00%
	DYC14	2.88%	1.61%	0.31%	0.00%
	DYC20	0.64%	0.57%	0.28%	0.00%
	DYC21	1.70%	1.16%	0.39%	0.00%
	DYC22	0.64%	0.57%	0.28%	0.00%
	DYC3	1.81%	1.01%	0.20%	7.94%
	DYC4	0.96%	1.25%	0.81%	0.00%
	DYC5	0.43%	0.68%	0.48%	0.00%
	DYC60	1.70%	1.16%	0.39%	0.00%
	DYC61	1.17%	1.53%	0.99%	0.00%
	DYC62	1.70%	1.83%	1.05%	0.00%
	DYC8	1.81%	1.01%	0.20%	7.94%
	DYC9	1.28%	0.72%	0.14%	0.00%
	YM1	0.00%	0.00%	0.00%	8.21%
11R	DZC1	0.07%	0.23%	0.57%	0.00%
	DZC10	0.14%	0.06%	0.49%	0.00%
	DZC12	0.00%	0.20%	0.33%	0.00%
	DZC3	0.07%	0.13%	0.41%	0.00%
	DZC4	0.00%	0.30%	0.49%	0.00%
	DZC5	0.00%	0.70%	1.15%	0.00%
	DZC7	0.00%	0.90%	1.47%	0.00%
	DZC9	0.00%	0.10%	0.16%	0.00%
	TNGD11R	0.00%	0.00%	8.65%	0.00%
11L	DWC1	0.00%	0.35%	0.58%	0.00%
	DWC2	0.00%	0.23%	0.38%	0.00%
	DWC6	0.06%	0.07%	0.00%	0.00%
	DWC8	0.11%	0.14%	0.00%	0.00%
	DWM1	0.00%	0.12%	0.20%	0.00%
	TNGD29L	0.00%	0.00%	2.73%	0.00%

Table 3-16, *Continued*
DEPARTURE FLIGHT TRACK UTILIZATION – EXISTING (2016)
Tucson International Airport

RUNWAY	TRACK ID	AIR CARRIER/ CARGO	COMMUTER/ AIR TAXI	GENERAL AVIATION	MILITARY
3	DVC20	0.00%	0.15%	0.50%	0.00%
	DVC21	0.00%	0.08%	0.25%	0.00%
	DVC22	0.00%	0.08%	0.25%	0.00%
	DVC4	0.14%	0.02%	0.00%	0.00%
21	DQC10	0.00%	1.56%	1.05%	0.00%
	DQC11	0.00%	3.23%	1.55%	0.00%
	DQC2	0.00%	4.25%	1.46%	0.00%
	DQC3	0.00%	0.03%	0.75%	0.00%
	DQC6	0.07%	0.01%	0.00%	0.00%
	DQC7	0.00%	2.58%	1.16%	0.00%
	DQC8	0.07%	0.04%	0.75%	0.00%
	DQC9	0.00%	1.28%	0.38%	0.00%
H1*	DH1	0.00%	0.00%	7.94%	0.00%
Total		**100.0%**	**100.0%**	**100.0%**	**100.0%**

Source: FAA, 2017, Radar Data; Landrum & Brown analysis.

* Helicopter operations

Source: FAA, 2017, Radar Data; Landrum & Brown analysis.

Table 3-17
TOUCH-AND-GO FLIGHT TRACK UTILIZATION – EXISTING (2016)
Tucson International Airport

RUNWAY	TRACK ID	GENERAL AVIATION	MILITARY
11L	FTNG11L1	0.0%	30.4%
	FTNG11L2	0.0%	22.8%
	FTNG11L3	0.0%	22.8%
29R	FTNG29R	0.0%	12.0%
	FTNG29R2	0.0%	12.0%
11R	TZ1	76.0%	0.0%
29L	TW1	24.0%	0.0%
Total		100.0%	100.0%

Source: FAA, 2017, Radar Data; Landrum & Brown analysis.

3.12.2.6 Aircraft Trip Length and Operational Profiles

Aircraft weight during departure is a factor in the dispersion of noise because it impacts the rate at which an aircraft is able to climb. Generally, the heavier an aircraft is, the slower the rate of climb and the wider the dispersion of noise along its route of flight. Where specific aircraft weights are unknown, the AEDT uses the distance flown to the first stop as a surrogate for the weight, by assuming that the weight has a direct relationship with the fuel load necessary to reach the first destination. The AEDT groups trip lengths into nine categories; these categories are:

Category	Stage Length[72]
1	0-500 nautical miles
2	500-1000 nautical miles
3	1000-1500 nautical miles
4	1500-2500 nautical miles
5	2500-3500 nautical miles
6	3500-4500 nautical miles
7	4500-5500 nautical miles
8	5500-6500 nautical miles
9	6500+ nautical miles

The trip lengths flown from TUS are based on scheduled operations. **Table 3-18** indicates the proportion of the operations that fell within each of the nine trip length categories for the existing conditions.

Table 3-18
DEPARTURE TRIP LENGTH DISTRIBUTION – EXISTING (2016)
Tucson International Airport

STAGE LENGTH	AIR CARRIER/ CARGO	COMMUTER/ AIR TAXI	GENERAL AVIATION	MILITARY
1	49.2%	84.5%	100%	100%
2	31.4%	15.5%	-	-
3	19.1%	0.0%	-	-
4	0.2%	0.0%	-	-
5	-	-	-	-
6	-	-	-	-
7	-	-	-	-
8	-	-	-	-
9	-	-	-	-

Source: Official Airline Guide; FAA, 2017, Radar Data; Landrum & Brown, 2017.

[72] Stage length is defined as the distance an aircraft travels from takeoff to landing.

The AEDT includes standard flight procedure data for each aircraft that represents each phase of flight to or from the airport. Information related to aircraft speed, altitude, thrust settings, flap settings, and distance are available and used by AEDT to calculate noise levels on the ground.

Standard aircraft departure profiles are supplied from the runway (field elevation) up to 10,000 feet above field elevation (AFE). Aircraft arrival profiles are supplied from 6,000 feet AFE down to the runway including the application of reverse thrust and rollout. The FAA requires that these standard arrival and departure profiles be used unless there is evidence that they are not applicable. Analysis prepared for this EIS using TAA and FAA data and field measurements conducted in the communities surrounding the airport in July 2017, indicated that there is no significant difference between the AEDT standard profiles and the current flight procedures at TUS for air carrier/cargo, commuter/air taxi, and general aviation operations.

3.12.2.7 Military Operations

Table 3-19 provides the number of operations for the F-16 departure and arrival profiles used in this study.

Table 3-19
F-16 OPERATIONAL PROFILES – EXISTING (2016)
Tucson International Airport

TYPE OF PROFILE	NUMBER OF DEPARTURES	NUMBER OF ARRIVALS	TOTAL
Military Power	5,500		5,500
Afterburner Power	4,788		4,788
Afterburner Power – Flight Check	12		12
Instrument Procedure		4,523	4,523
Initial 1*		2,624	2,624
Initial 2*		1,149	1,149
Initial 3*		1,067	1,067
Simulated Flame Out		928	928
Closed Pattern**	3,407	3,407	6,814
Total	**13,353**	**13,353**	**27,414**

* The INITIAL Profile varied in length to simulate the different turning points on arrival.

** 50% of Closed Patterns fly over runway as a low pass and 50% land and roll on the runway.

Source: Landrum & Brown, 2018.

Military Power Departure Profile

The F-16 Military Power Departure profiles are based on the AANG's Military Power departures where 91.5% Revolutions Per Minute (RPM) thrust is applied from zero to 4,500 feet of departure tracks distance, then 91% RPM thrust is applied from 4,500 feet of departure track distance to 41,000 feet of departure track distance, 350 knots of speed, and 3,000 feet of AFE for Runway 29R departures.

Runway 11L Military Power Departure profile begins at 91.5% RPM thrust from zero to 4,500 feet of departure track distance, then 91% RPM thrust is applied until reaching 42,000 feet of departure track distance, 350 knots of speed, and 2,000 feet AFE.

Afterburner Departure Profile

The F-16 Afterburner Departure Profile is based on the AANG's afterburner operations where 92% RPM and afterburner thrust is applied from zero to 12,000 feet of departure track distance, 300 knots of speed, and 750 feet AFE, then cut afterburner thrust and continue with 88 % RPM until reaching 30,000 feet of track distance, 350 knots of speed, and 2,250 AFE for Runway 29R departures,

Runway 11L Afterburner Departure Profile begins at 92% RPM and afterburner thrust zero to 12,000 feet of departure track distance, 300 knots of speed, and 100 feet AFE, then cut afterburner thrust and continue with 88% RPM is applied until reaching 30,000 feet of track distance, 350 knots, and 1,200 feet AFE

Instrument Procedure Arrival Profile

This profile represents the F-16's mission to practice instrument patterns and landings. The profile starts 10 miles from the runway, at 3,500 feet AFE. At 10 miles the F-16 is at approximately 80% RPM and 280 knots and then configures/drops the landing gear and starts to slow to approximately 150 knots at 80% RPM until over the runway. The power is at midrange (80% RPM throughout the pattern) until just above the runway.

Initial Arrival Profile

This profile represents the F-16's mission to practice patterns and landings. The profile starts with the F-16 at 10 miles from the runway, 3,500 feet AFE, arriving at 300 knots with 80% RPM over the runway.

Simulated Flame Out Pattern Arrival Profile

This profile represents the F-16's mission to practice a flameout pattern. The profile starts with the F-16 at 9,000 feet AFE, and at 300 knots with 80% RPM thrust over the runway. The thrust remains at 70% RPM throughout the pattern. The pattern continues to reduce altitude until final approach at 6,000 feet from the runway, 170 knots, and 300 AFE.

Closed Pattern Profile

This profile represents the F-16's mission to practice low passes over the runway and touch and go operations. The Closed Pattern begins on final approach at 6,000 feet from the runway, 80% RPM, 150 knots, and 300 feet AFE. Fifty percent of the Closed Pattern operations perform a low pass over the runway at 80% RPM, 50 feet AFE, and 150 knots of speed. The remaining 50% of Closed Pattern operations land and roll on the runway for 7,500 feet where aircraft rotation takes place to continue to pattern altitude.

Ninety-one percent RPM is applied during the low pass or touch and go to gain speed and altitude until reaching pattern altitude of 1,500 feet AFE, 225 knots, and 88% RPM thrust. From pattern altitude, the aircraft returns to the final approach described above and proceeds to land.

3.12.2.8 Existing (2016) Noise Exposure Contour

Exhibit 3-15 reflects the average-annual noise exposure pattern at TUS during 2016. Noise contours are presented for the 65, 70, and 75 DNL. DNL contours are a graphic representation of how the noise from TUS's annual average daily aircraft operations is distributed over the surrounding area.

Table 3-20 summarizes the land areas within each noise contour level for the existing (2016) noise exposure contour. DNL represents an average sound level over the course of an average annual day. Noise contour patterns extend from the Airport along each extended runway centerline, reflective of the flight tracks used by all aircraft. The relative distance of a contour from the Airport along each route is a function of the frequency of use of each runway end for total aircraft arrivals and departures, and the type of aircraft assigned to it.

Table 3-20
ESTIMATED LAND AREA WITHIN EXISTING (2016) NOISE EXPOSURE CONTOUR
Tucson International Airport

CONTOUR RANGE	AIRPORT PROPERTY ESTIMATED LAND AREA (IN SQUARE MILES)	NON-AIRPORT PROPERTY ESTIMATED LAND AREA (IN SQUARE MILES)	TOTAL ESTIMATED LAND AREA (IN SQUARE MILES)
DNL 65-70 dB	4.15	1.67	5.82
DNL 70-75 dB	1.77	0.60	2.37
DNL 75+ dB	2.13	0.12	2.25
TOTAL	**8.05**	**2.39**	**10.44**

Source: Landrum & Brown, 2017.

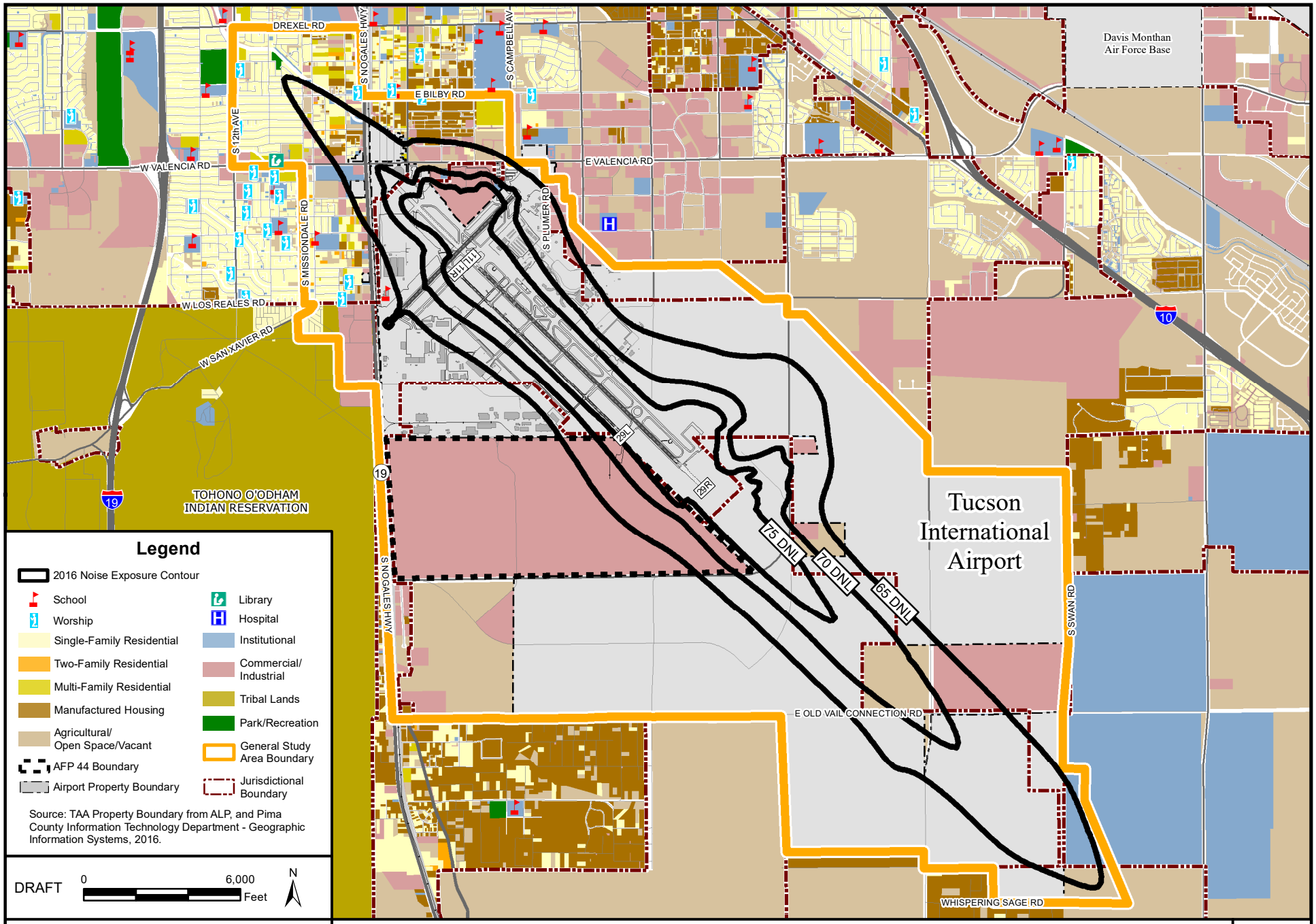
The size and shape of the noise exposure contours are reflective of the ratio of southeast to northwest flow. The noise exposure contours are longer and wider to the southeast of TUS, which is indicative of the greater number of departures to the southeast. The noise exposure contours are shorter and thinner to the northwest of TUS, which is indicative of the greater number of arrivals from the northwest. In addition, the noise exposure contour has a bump out to the northeast. This bump out is primarily due to aircraft including F-16s turning immediately after departures.

The DNL 65 dB Existing (2016) noise contour extends approximately 4.3 miles to the southeast beyond Runway 29R end and extends approximately 4.7 miles to the southeast beyond Runway 29L end. This area is mostly vacant/undeveloped land with some commercial/industrial uses located within Pima County.

To the northwest of the Airport, the noise contour primarily reflects usage by aircraft arriving from the northwest and to a lesser degree aircraft departing to the northwest. The DNL 65 dB noise contour extends approximately 1.9 miles to the northwest from Runway 11L end and extends approximately 1.6 miles to the northwest beyond Runway 11R. The area northwest of TUS within the DNL 65 dB contour is comprised of residential and commercial land uses within the City of Tucson.

The DNL 70 dB Existing (2016) noise contour is located on airport property or other compatible land use. A small area to the southwest of TUS comprised of commercial/industrial land is located within the DNL 70 dB contour. The DNL 75+ dB noise contour located entirely over airport property or other compatible land use.

Runway 11L/29R is the most heavily used runway at TUS because it is the longest runway on the airfield. For this reason, the Existing (2016) noise exposure contour is primarily determined by aircraft operations on this runway. Due to the minimal spacing between the two parallel runways, the noise exposure pattern appears as one contiguous shape around both runways rather than two distinct shapes, as would be the case if the runways had significantly greater separation –such as 4,300 feet for simultaneous instrument approaches. Runway 3/21 is used for less than three percent of all operations and is primarily used by propeller aircraft. Due to the limited use of Runway 3/21, the noise exposure contour remains small around this runway.



Environmental Impact Statement
Tucson
International Airport

Existing (2016) Noise Exposure Contour

EXHIBIT:
3-15

4/24/2018 Y:\TUS\TUS-EIS\E-L&B Work Product\2-GIS\MXD\DOCUMENT\ 3-15_Existing (2016) Noise Exposure Contour.mxd Noise Contour: TUS_2016_Existing_Rev4_32

THIS PAGE INTENTIONALLY LEFT BLANK

3.12.2.9 Noise-Compatible Land Use

The FAA has created guidelines regarding the compatibility of land uses with various aircraft noise levels measured using the DNL metric. These guidelines are defined in Appendix A to 14 C.F.R. Part 150. The land use compatibility table is reproduced in **Table 3-21**. These guidelines show the compatibility parameters for residential, public (schools, churches, nursing homes, hospitals, and libraries), commercial, institutional, and recreational land uses. All land uses exposed to noise levels below the DNL 65 dB noise contour are generally considered compatible with airport operations.

Table 3-21
LAND USE COMPATIBILITY GUIDELINES – 14 C.F.R. PART 150
Tucson International Airport

	YEARLY DAY-NIGHT AVERAGE SOUND LEVEL (DNL) IN DECIBELS					
LAND USE	**BELOW 65**	**65-70**	**70-75**	**75-80**	**80-85**	**OVER 85**
RESIDENTIAL						
Residential, other than mobile homes and transient lodgings	Y	N(1)	N(1)	N	N	N
Mobile home parks	Y	N	N	N	N	N
Transient lodgings	Y	N(1)	N(1)	N(1)	N	N
PUBLIC USE						
Schools	Y	N(1)	N(1)	N	N	N
Hospitals and nursing homes	Y	25	30	N	N	N
Churches, auditoriums, and concert halls	Y	25	30	N	N	N
Governmental services	Y	Y	25	30	N	N
Transportation	Y	Y	Y(2)	Y(3)	Y(4)	Y(4)
Parking	Y	Y	Y(2)	Y(3)	Y(4)	N
COMMERCIAL USE						
Offices, business and professional	Y	Y	25	30	N	N
Wholesale and retail—building materials, hardware and farm equipment	Y	Y	Y(2)	Y(3)	Y(4)	N
Retail trade—general	Y	Y	25	30	N	N
Utilities	Y	Y	Y(2)	Y(3)	Y(4)	N
Communication	Y	Y	25	30	N	N
MANUFACTURING AND PRODUCTION						
Manufacturing, general	Y	Y	Y(2)	Y(3)	Y(4)	N
Photographic and optical	Y	Y	25	30	N	N
Agriculture (except livestock) and forestry	Y	Y(6)	Y(7)	Y(8)	Y(8)	Y(8)
Livestock farming and breeding	Y	Y(6)	Y(7)	N	N	N
Mining and fishing, resource production and extraction	Y	Y	Y	Y	Y	Y
RECREATIONAL						
Outdoor sports arenas and spectator sports	Y	Y(5)	Y(5)	N	N	N
Outdoor music shells, amphitheaters	Y	N	N	N	N	N
Nature exhibits and zoos	Y	Y	N	N	N	N
Amusements, parks, resorts and camps	Y	Y	Y	N	N	N
Golf courses, riding stables and water recreation	Y	Y	25	30	N	N

Table 3-21, *Continued*
LAND USE COMPATIBILITY GUIDELINES - 14 C.F.R. PART 150
Tucson International Airport

(1) Where the community determines that residential or school uses must be allowed, measures to achieve outdoor to indoor Noise Level Reduction (NLR) of at least 25 dB and 30 dB should be incorporated into building codes and be considered in individual approvals. Normal residential construction can be expected to provide a NLR of 20 dB, thus, the reduction requirements are often stated as 5, 10 or 15 dB over standard construction and normally assume mechanical ventilation and closed windows year round. However, the use of NLR criteria will not eliminate outdoor noise problems.
(2) Measures to achieve NLR 25 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.
(3) Measures to achieve NLR of 30 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.
(4) Measures to achieve NLR 35 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal level is low.
(5) Land use compatible provided special sound reinforcement systems are installed.
(6) Residential buildings require an NLR of 25.
(7) Residential buildings require an NLR of 30.
(8) Residential buildings not permitted.

Notes:
1. The designations contained in this table do not constitute a Federal determination that any use of land covered by the program is acceptable under Federal, State, or local law. The responsibility for determining the acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with the local authorities. FAA determinations under Part 150 are not intended to substitute federally determined land uses for those determined to be appropriate by local authorities in response to locally determined needs and values in achieving noise compatible land uses.
2. SLUCM=Standard Land Use Coding Manual.
3. Y (Yes)=Land Use and related structures compatible without restrictions.
4. N (No)=Land Use and related structures are not compatible and should be prohibited.
5. NLR=Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.
6. 25, 30, or 35=Land use and related structures generally compatible; measures to achieve NLR of 25, 30, or 35 dB must be incorporated into design and construction of structure.

Source: 14 C.F.R. § 150 *Airport Noise Compatibility Planning*, Appendix A, Table 1.

There are no public schools, churches, nursing homes, hospitals, or libraries within any of the contours.

Summaries of the residential population and housing units affected by noise levels exceeding DNL 65 dB for the Existing (2016) noise exposure contours are provided in **Table 3-22**.

Table 3-22
NON-COMPATIBLE LAND USE HOUSING AND POPULATION FOR EXISTING (2016) NOISE CONTOURS
Tucson International Airport

	DNL 65-70 dB	DNL 70-75 dB	DNL 75+ dB	DNL 65+ dB
Housing Units				
Single-Family Residential	236	0	0	236
Multi-Family Residential	26	0	0	26
Manufactured Housing	162	0	0	162
Total Housing Units	**424**	**0**	**0**	**424**
Population				
Single-Family Residential	800	0	0	800
Multi-Family Residential	90	0	0	90
Manufactured Housing	561	0	0	561
Total Population	**1,451**	**0**	**0**	**1,451**

Notes: Population numbers are estimates based on the 2000 United States Census average household size per number of housing units.

Source: Landrum & Brown, 2016.

3.13 SOCIOECONOMICS, ENVIRONMENTAL JUSTICE, AND CHILDREN'S HEALTH AND SAFETY RISKS

3.13.1 SOCIOECONOMICS

Socioeconomics is an umbrella term used to describe aspects of a project that are either social or economic in nature. A socioeconomic analysis evaluates how elements of the human environment such as population, employment, housing, and public services might be affected by the Proposed Action and alternatives.

3.13.1.1 Regulatory Setting

Section 1508.14 of the CEQ Regulations requires all federal agencies to conduct a socioeconomic analysis in the event that economic or social and natural environmental effects are interrelated as a result of the proposed action and alternative(s). This would include an evaluation of how elements of the human environment such as population, employment, housing, and public services might be affected by the proposed action and alternative(s).

The Uniform Relocation Assistance and Real Property Acquisitions Policy Act of 1970, 42 U.S.C. § 61 *et seq*., and implementing regulations found at 49 C.F.R. Part 24, provides standards if acquisition of real property or displacement of people would occur as a result of implementing the proposed action.

3.13.1.2 Affected Environment

3.13.1.3 Economic Activity and Income

Tucson is the county seat of Pima County and, according to the United States Census Bureau (USCB), the Tucson Metropolitan Statistical Area (TMSA) is comprised entirely of Pima County. From 2007 to 2015, the TMSA's gross regional product (GRP) decreased at a Compound Annual Growth Rate (CAGR) of 0.3 percent, while the State of Arizona's annual GRP increased at a CAGR of 0.1 percent.[73] From 2016 to 2027, however, TMSA's GRP is forecast to increase at a CAGR of 2.4 percent, which is above the national average of 2.2 percent but below the 2.9 percent expected for the State of Arizona for the same time period. **Table 3-23** provides the historical and forecast growth in GRP for the TMSA.

[73] Woods & Poole Economics, Inc., 2016, Regional Indicators.

Table 3-23
HISTORICAL AND FORECAST GROSS REGIONAL PRODUCT
(In Billions of 2017 U.S. Dollars)
Tucson International Airport

CALENDAR YEAR	TMSA/ PIMA COUNTY, AZ
Historical	
2007	40,890.8
2008	39,886.6
2009	38,351.4
2010	38,593.8
2011	38,037.2
2012	38,516.1
2013	38,600.3
2014	39,170.6
2015	40,123.7
Estimate*	
2016	41,176.7
Forecast	
2022	47,669.6
2027	53,453.1
Compound Annual Growth Rate	
2007-15	-0.2%
2015-22	2.5%
2022-27	2.3%

* At the time of publishing the Draft EIS, 2015 was the last year of GRP data available.

Source: Woods & Poole Economics, Inc., 2016, Regional Indicators.

Note: Reported in 2009 United States Dollars and converted to 2017 United States Dollars with a price index of 112.12.

The largest employers within TMSA are in the manufacturing, government, and education industries. Combined, these industries accounted for 32.3 percent of the employment in the TMSA in 2015.

In 2016, the University of Arizona was the largest employer in the area with 11,251 employees.[74] Raytheon Missile Systems, headquartered in Tucson, has historically been the largest employer in the region. However, the number of employees at Raytheon has decreased from 12,140 in 2010 to 9,600 in 2016 making it the second largest employer in the region. Local government (Pima County and the City of Tucson) had a combined 11,655 employees in 2016. The military also has a significant presence in the region. The USAF's DMA employs 8,406 people and the United States Army's Fort Huachuca employs 5,477 people. Other notable employers represent the health care, retail, mining, manufacturing, and education industries.

[74] Arizona Daily Star, 2017, Star 200 Trend Tracker – Employers Data. Available on-line: http://dynamic.azstarnet.com/star200/ Accessed May 2017.

3.13.1.4 Employment

From 2007 to 2015, employment in the TMSA decreased at a CAGR of 0.3 percent, while the State of Arizona's annual employment increased at a CAGR of 1.8 percent.[75] From 2016 to 2027, however, employment in the TMSA is forecast to grow at a CAGR of 1.5 percent, which is above the national average of 1.3 percent but below the 1.8 percent expected for the State of Arizona. **Table 3-24** provides the historical and forecast growth of the employment of the TMSA.

Table 3-24
HISTORICAL AND FORECAST EMPLOYMENT
(In Thousands)
Tucson International Airport

CALENDAR YEAR	TMSA/ PIMA COUNTY, AZ
Historical	
2007	523.8
2008	510.8
2009	491.4
2010	484.0
2011	485.1
2012	491.5
2013	496.3
2014	500.6
2015	509.9
Estimate*	
2016	519.0
Forecast	
2022	572.8
2027	617.7
Compound Annual Growth Rate	
2007-15	-0.3%
2015-22	1.7%
2022-27	1.5%

* At the time of publishing the Draft EIS, 2015 was the last year of employment data available.

Source: Woods & Poole Economics, Inc., 2016, Regional Indicators.

[75] Woods & Poole Economics, Inc., 2016, Regional Indicators.

3.13.1.5 Population and Housing

From 2007 to 2015, the population in the TMSA increased at a CAGR of 0.8 percent.[76] Over the next 11 years, the population in the TMSA is forecast to increase at a CAGR of 1.2 percent, which is above the national average of 0.9 percent but below the 1.6 percent expected for the State of Arizona. **Table 3-25** provides the historical and forecast growth of the population of the TMSA.

Table 3-25
HISTORICAL AND FORECAST POPULATION
(In Thousands)
Tucson International Airport

CALENDAR YEAR	TMSA/ PIMA COUNTY, AZ
Historical	
2007	955.9
2008	967.8
2009	975.6
2010	981.9
2011	988.1
2012	993.1
2013	998.1
2014	1,004.5
2015	1,016.4
Estimate*	
2016	1,029.1
Forecast	
2022	1,109.0
2027	1,179.2
Compound Annual Growth Rate	
2007-15	0.8%
2015-22	1.3%
2022-27	1.2%

* At the time of publishing the Draft EIS, 2015 was the last year of population data available.

Source: Woods & Poole Economics, Inc., 2016, Regional Indicators.

[76] Woods & Poole Economics, Inc., 2016, Regional Indicators.

Based on the American Community Survey 2010-2014 5-Year Estimate by the USCB,[77] 993,144 people reside within the TMSA. Housing units total 444,564. The racial makeup is roughly 78.8 percent White, 3.6 percent Black or African American, 3.2 percent Native American, 2.7 percent Asian, 8.2 percent from other races, and 3.5 percent from two or more races. Residents of any race who identified their ethnicity as Hispanic or Latino account for 35.4 percent of the population.

The average household size is 2.5 and the median age 37.9 years. The majority of the population is 18 years and older (77.6 percent) with persons aged 65 and older making up 16.6 percent of the population and those aged 5 and under making up 6.1 percent of the population. The median household income is $46,233 and the median family income is $58,113. The per capita income for the city is $25,524. Approximately 13.2 percent of families and 19.0 percent of individuals are living below the poverty line.

3.13.1.6 Public Services and Social Conditions Within the General Study Area

While data from the TMSA was used to generally characterize the economic activity, population, and employment in Pima County, more specific information is also being used to define the affected environment of the General Study Area. Residents of communities in the General Study Area have available a wide range of public services. Public services include such facilities as educational institutions, medical services, emergency response services, and parks and recreational areas.

- Educational Institutions: The Sunny Side Unified District encompasses the General Study Area, with Challenger Middle School located within the General Study Area.
- Medical Services: Pima County has a total of seven hospitals located near the Airport but not within the General Study Area. However, Raytheon Medical Center is located within the General Study Area.
- Emergency Response Services: There are a total of 82 fire departments and 38 police departments in Pima County. The Pima County Rural/Metro Fire Station 81 is located within the General Study Area. In addition, the Airport operates its own fire station and the AANG operates its own fire station. The Airport also operates its own police department. The AANG operates its own security personnel and AFP 44 and Raytheon Missile Systems have their own security personnel.

[77] United States Census Bureau, 2016, American Community Survey 2010-2014 5-Year Estimate. Available on-line: https://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml Accessed August 2017.

Facilities that can determine the state of social conditions include parks and recreational areas and religious/cultural centers.

- Parks and Recreational Areas: The Manuel Herrera Jr. Park is located in the northern segment of the General Study Area.
- Religious/Cultural Centers: Seven religious and cultural centers are located within the General Study Area.

3.13.2 ENVIRONMENTAL JUSTICE

Environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. *Fair treatment* means that no group of people should bear a disproportionate share of the negative environmental consequences resulting from industrial, governmental, and commercial operations or policies. *Meaningful Involvement* means that:

- People have an opportunity to participate in decisions about activities that may affect their environment and/or health;
- The public's contribution can influence the regulatory agency's decision;
- Their concerns will be considered in the decision making process; and,
- The decision makers seek out and facilitate the involvement of those potentially affected.

3.13.2.1 Regulatory Setting

Title VI of the Civil Rights Act of 1964 as amended, 42 U.S.C. §§ 2000d – 2000d-7, states that, "No person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance." Title VI expressly prohibits any discrimination in federally funded programs and projects, including those sponsored by the FAA.

EO 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations,* requires all Federal agencies to address disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations.

USDOT Order 5610.2(a) defines a minority population as any readily identifiable group of minority persons living in geographic proximity to a proposed DOT program, policy or activity including, if circumstances warrant, geographically dispersed or transient persons (such as migrant workers or Native Americans) who will be similarly affected by the proposed program, policy, or activity.

USDOT Order 5610.2(a) defines Low-Income as a median household income at or below the Department of Health and Human Services (HHS) poverty guidelines. USDOT Order 5610.2(a) defines a Low-Income Population as any readily identifiable group of low-income persons who live in geographic proximity including, if circumstances warrant, geographically dispersed or transient persons who will be similarly affected by the proposed program, policy or activity.

Requirements for meaningful public involvement by minority and low-income populations are addressed in Paragraph 2-5.2.b of FAA Order 1050.1F. As stated in the Order, the FAA must provide for meaningful public involvement by minority and low-income populations. In accordance with DOT Order 5610.2(a), this public involvement must provide an opportunity for minority and low income populations to provide input on the analysis, including demographic analysis that identifies and addresses potential impacts on these populations that may be disproportionately high and adverse. The public involvement process can also provide information on subsistence patterns of consumption of fish, vegetation, or wildlife. This information should be disclosed to potentially affected populations for proposed actions and alternative(s) that are likely to have a substantial effect and for Comprehensive Environmental Response, Compensation, and Liability Act sites.

3.13.2.2 Affected Environment

The USCB's American Community Survey 2010-2014 5-Year Estimate was used to identify environmental justice populations within the project's General Study Area. The environmental justice populations include minority and/or low-income populations. Minority population refers to any readily identifiable group of minority persons (Black, Hispanic or Latino, Asian American, American Indian, Alaskan Native, Native Hawaiian, other Pacific Islander, or other non-White populations). Low income is defined as a person whose median household income is at or below the Department of Health and Human Services poverty guidelines.

The AEDT Version 2d[78] was used to identify census block groups within the General Study Area. Then, AEDT determined which census block groups are composed of 50 percent or more minority populations (composed primarily of Hispanic or Latino population and American Indian populations) and/or 50 percent or more low income populations. The General Study Area contains or is adjacent to the following census block groups:

- Census tract 3702
  - block group 1
  - block group 2
  - block group 3
  - block group 4

[78] FAA, 2016, Guidance on Using the Aviation Environmental Design Tool (AEDT) to Screen for Potential Environmental Justice Populations. Available on-line at: https://www.faa.gov/about/office_org/headquarters_offices/apl/research/models/aedt/ Accessed August 2017.

- Census tract 3704
  - block group 1
  - block group 2
- Census tract 3705
  - block group 1
  - block group 2
  - block group 3
- census tract 4114
  - block group 1
  - block group 2
- census tract 4121
  - block group 1
- census tract 4122
  - block group 1
- census tract 0900
  - block group 1

This analysis identified environmental justice populations located in the Sunnyside and Elvira neighborhoods as well as the northeastern portion of the San Zavier District of the Tohono O'odham Nation. Within the General Study Area, census tract 4121 block group 1, which includes the Airport, has 87 percent minority population. All census block groups within the General Study Area have minority populations that exceeded the 50 percent threshold.

The HHS poverty guideline level for a family of four was $24,250 in 2015. Census tract 4121 block group 1, which includes the Airport, has a median income of $59,890. This is the highest median income level of any census tract in the General Study Area.

Census tract 3702 block groups 2 and 4 and census tract 4114 block group 2 have low-income populations that exceed the 50 percent threshold. All the other census block groups within the General Study Area did not exceed the income level threshold. Therefore, low-income populations occur within the General Study Area.

3.13.3 CHILDREN'S ENVIRONMENTAL HEALTH AND SAFETY RISKS

3.13.3.1 REGULATORY SETTING

Pursuant to EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks,* federal agencies are directed to make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children. Environmental health risks and safety risks include risks to health or to safety that are attributable to products or substances that a child is likely to come in contact with or ingest, such as air, food, drinking water, recreational waters, soil, or products they might use or be exposed to.

3.13.3.2 AFFECTED ENVIRONMENT

Schools and day care centers are locations where the potential for a child to be exposed to environmental health risks is increased because a higher concentration of children are located in one place during the day. Currently only the Challenger Middle School is within the General Study Area. There are a number of schools located to the north and northwest of the Airport just outside of the General Study Area including the Santa Clara Elementary, San Miguel High School, Drexel Elementary, Elvira Elementary, Liberty Elementary, Apollo Middle, and Sunnyside High School. However as stated in Section 3.12, *Noise and Noise-Compatible Land Use*, there are no public schools, within any of the noise contours.

3.14 VISUAL EFFECTS

3.14.1 REGULATORY SETTING

FAA Order 1050.1F states that the Visual Effects environmental impacts category deals with the extent to which the proposed action would have the potential to either 1) produce light emissions that create annoyance or interfere with normal activities; or 2) affect the nature of the visual resources or visual character of the area, including the importance, uniqueness and aesthetic value of the affected visual resources, including by contrasting with, or detracting from, the visual resources and/or the visual character of the existing environment or blocking or obstructing the views of visual resources, including whether those resources would still be viewable from other locations.[79] Although there are no federal special purpose laws or requirements specific to light emissions and visual effects, there are special purpose laws and requirements that may be relevant. In addition to NEPA, laws protecting resources that may be affected by visual effects include sensitive wildlife species, Section 106 of the NHPA, Section 4(f) of the DOT Act, and Section 6(f) of the Land and Water Conservation Fund Act.

3.14.2 AFFECTED ENVIRONMENT

For clarity and uniformity, the affected environment section of visual effects are broken into the two categories set forth in FAA Order 1050.1F: 1) light emissions; and 2) visual resources and visual character.

3.14.2.1 Light Emissions

Airports are illuminated by various types of lighting. Some of those lights are critical to safe airport operation, while others provide light for nighttime use of the airport facilities. The existing runway and approach lighting at the Airport as shown on **Exhibit 3-16** consists of the following sources of light emissions:.

- Precision Approach Path Indicators (PAPIs) – Visual glideslope indicators are a system of lights that are arranged to provide visual descent guidance information during an aircraft's approach to the runway. There are two types of visual glideslope indicators, PAPIs and Visual Approach Slope Indicators (VASI). PAPIs (but not VASIs) are used at the Airport. PAPIs consist of a single row of either two or four lights, normally installed on the left side of the runway. PAPIs have an effective visual range of about five miles during the day and up to 20 miles at night. PAPIs radiate a directional pattern of high intensity red and white focused light beams which indicate that the pilot is "on path" if the pilot sees an equal number of white lights and red lights, with white to the left of the red; "above path" if the pilot sees more white than red lights; and "below path" if the pilot sees more red than white lights. PAPIs are located on a line perpendicular to the runway centerline, at a distance from the

[79] FAA, 2015, Order 1050.1F, *Environmental Impacts: Policies and Procedures*, Exhibit 4-1, page 4-10.

threshold chosen to provide the proper threshold crossing height and obstacle clearance.

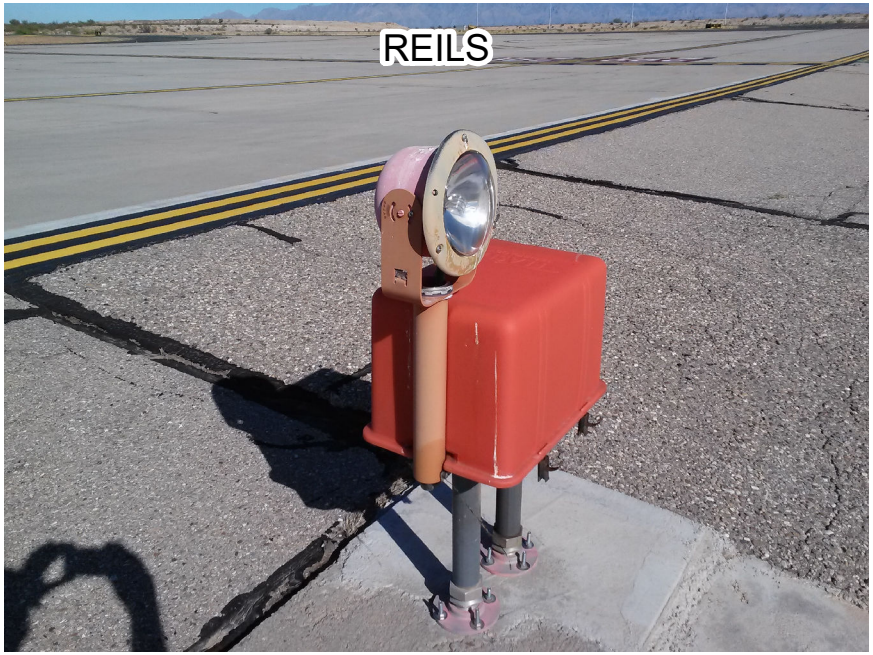
- Runway End Identified Lights (REILs) – Two synchronized flashing lights, one on each side of the runway threshold, which identify the approach end of the runway.
- Medium Intensity Approach Lights with Runway Alignment Indicator Lights (MALSR) – A lighting system installed in airport runway approach zones along the extended centerline of the runway. The MALSR, consisting of a combination of threshold lamps and steady burning light bars and flashers, provides visual information to pilots on runway alignment, height perception, roll guidance, and horizontal references for CAT I precision approaches.
- Airport Rotating Beacon –Airport rotating beacons indicate the location of an airport by projecting beams of light (one green and one white) spaced 180 degrees apart.

In addition to the various light emissions sources described above, the Airport also has terminal area and landside lighting fixtures, taxiway and ramp lighting, runway/taxiway signage, and obstruction lighting. Building and apron security lighting consists of roof perimeter lights and lighting from the interior of the structures, including hangars. Most light fixtures are shielded to direct light within the designated area on airport property. Roadway lighting and parking lot lights consist of lower intensity white light. Such lighting, similar to building light, is directed downward and does not typically spill more than 30 to 50 feet away from the light source.

3.14.2.2 Visual Resources and Visual Character

The existing visual character of the General Study Area would be considered an airport setting. The Airport is largely surrounded by aviation land uses to the south and east, including industrial and commercial land uses occupied by large structures that are separated by open land. The daytime visual character of the area is shown on **Exhibit 3-17.** The night time visual character of the area is shown on **Exhibit 3-18.**

The Airport is adjacent to residential and commercial land uses to the north and northwest of the Airport which include smaller, more densely located residential structures and commercial buildings. The nearest residential land uses to the Airport property boundary are located approximately 700 feet to the north. Other nearby residential areas are located approximately 1,500 feet to the west on South Nogales Highway. Therefore, the population density of the airport setting is much higher north and northwest where the residential areas are located and much lower south and east where larger industrial and commercial buildings are located.



Source: Photos courtesy of Tucson Airport Authority, 2016

DRAFT

Environmental Impact Statement

Tucson International Airport

Airport Lighting

EXHIBIT: **3-16**

12/5/2017 Y:\TUS\TUS-EIS\E-L&B Work Product\2-GIS\MXD\DOCUMENT\ 3-16_Airport Lighting.mxd

THIS PAGE INTENTIONALLY LEFT BLANK

Source: Landrum & Brown, 2017

DRAFT

Environmental Impact Statement
Tucson International Airport

Visual Character - Daytime

EXHIBIT: **3-17**

12/5/2017 Y:\TUS\TUS-EIS\E-L&B Work Product\2-GIS\MXD\DOCUMENT\ 3-17_Visual Character Daytime.mxd

THIS PAGE INTENTIONALLY LEFT BLANK

Source: Landrum & Brown, 2017

DRAFT

Environmental Impact Statement
Tucson International Airport

Visual Character - Nighttime

EXHIBIT: **3-18**

12/5/2017 Y:\TUS\TUS-EIS\E-L&B Work Product\2-GIS\MXD\DOCUMENT\ 3-18_Visual Character Nighttime.mxd

THIS PAGE INTENTIONALLY LEFT BLANK

3.15 WATER RESOURCES

3.15.1 REGULATORY SETTING

Water resources are surface waters and groundwater that are vital to society; they are important in providing drinking water and in supporting recreation, transportation and commerce, industry, agriculture, and aquatic ecosystems. Surface water, groundwater, floodplains, and wetlands do not function as separate and isolated components of the watershed, but rather as a single, integrated natural system.

3.15.1.1 Federal Clean Water Act

The 1972 Federal Water Pollution Control Act, 33 U.S.C. § 1251 *et seq*., also known as the Clean Water Act (CWA), is intended to restore and maintain the chemical, physical, and biological integrity of the Nation's waters.

The CWA establishes the basic structure for regulating the discharge of pollutants into waters of the U.S., including jurisdictional surface waters, through Section 404 permit and Section 401 certification processes as well as the Section 402 permit process. Section 401 of the CWA (33 U.S.C. § 1341) requires any federal license or permit applicant to obtain a water quality certification if any proposed project activity may result in a discharge of pollutants into waters of the United States This certification assures that the discharge would comply with the applicable effluent limitations and water quality standards. Section 301 of the CWA (33 U.S.C. § 1311) prohibits discharges to waters of the United States except with a permit. As a condition of the permit, application of the best practicable control technology currently available is required.

Section 402 establishes a framework for regulating stormwater discharges under the National Pollutant Discharge Elimination System (NPDES) to ensure water quality standards are attained. The State of Arizona administers the approved program through the ADEQ, subject to continuing EPA oversight and enforcement authority, and is responsible for implementing the Arizona Pollutant Discharge Elimination System (AZPDES) stormwater discharge permit. If the proposed action or alternative(s) has the potential to discharge pollutants into waters of the United States through a point source, an AZPDES permit will likely need to be obtained. This permit has a number of requirements, including storm water sampling, implementation of Best Management Practices (BMPs) for controlling storm water pollution, inspection of other permitted facilities in the county to ensure that they are implementing their BMPs, performing outreach to permitted facilities and the general public, and submitting reports annually that discuss implementation of these requirements.

3.15.1.2 Safe Drinking Water Act (SDWA)

The SDWA, 42 U.S.C. §§ 300(f) – 300j-26,was established to protect the health of the public by ensuring that a safe drinking water supply exists. The Sole Source Aquifer Program, authorized by Section 1424(e) of the SDWA, requires the EPA to review any Federally financially-assisted projects that have the potential to contaminate a sole source aquifer or its recharge area. The Pima County Department of Environmental Quality (PDEQ) implements and enforces certain aspects of the ADEQ's Safe Drinking Water Program and the Aquifer Protection Permit APP program, to help comply with the requirements of the SDWA.

If the potential exists for contamination of an aquifer designated by the EPA as a sole or principal drinking water resource within the project area, the FAA is required to consult with the EPA regional office, Tribal, state, or local officials as required by Section 1424(e) of the Safe Drinking Water Act, as amended.

3.15.1.3 Fish and Wildlife Coordination Act of 1980

If a proposed action would impound, divert, drain, control, or otherwise modify the waters of any stream or other body of water, the Fish and Wildlife Coordination Act, 16 U.S.C. §§ 661 – 667d, is applicable, unless the project is for the impoundment of water covering an area of less than ten acres. The Fish and Wildlife Coordination Act requires the FAA to consult with the USFWS and the applicable state agency to identify means to prevent loss or damage to wildlife resources resulting from a proposed action. Separate from, but related to this Act is the Magnuson-Stevens Fishery Conservation and Management Act, which governs United States marine fisheries management. The act mandates the identification of Essential Fish Habitat for managed species, as well as measures to conserve and enhance the habitat necessary for fish to carry out their life cycles.

3.15.1.4 EO 11990, Protection of Wetlands and DOT Order 5660.1A, Preservation of the Nation's Wetlands

EO 11990 states federal actions must "... avoid to the extent possible the long and short-term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative." EO 11990 states that agencies shall provide leadership and shall take action to minimize the destruction, loss or degradation of wetlands. Agencies are also responsible for preserving and enhancing the natural and beneficial values of wetlands.

DOT has implemented EO 11990 through policies and procedures documented in DOT Order 5660.1A, Preservation of the Nation's Wetlands. DOT Order 5660.1A requires that transportation facilities and projects should be planned, constructed, and operated to assure the protection, preservation, and enhancement of the nation's wetlands to the fullest extent practicable, and establishes procedures for implementation of the policy.

3.15.1.5 EO 11988, Floodplain Management and DOT Order 5650.2, Floodplain Management and Protection

EO 11988 directs Federal agencies to take actions to reduce the risk of flood loss, minimize flood impacts on human safety, health and welfare, and restore and preserve floodplain natural and beneficial values. To do this, the Order bans approving activities in a floodplain unless:

(1) No practicable alternative exists; and

(2) Measures to minimize adverse impacts to the floodplain's natural and beneficial values are included.

DOT Order 5650.2 contains policies and procedures for carrying out EO 11988. Based on DOT Order 5650.2, if an action includes development within a floodplain, the analysis shall indicate if the encroachment would be a "significant encroachment," that is, whether it would cause one or more of the following impacts:

(1) The action would have a considerable probability of loss of human life;

(2) The action would likely have substantial encroachment- associated costs or extent, including interrupting aircraft service or loss of a vital transportation facility (e.g., flooding of a runway or taxiway; important navigational aid out of service due to flooding, etc.); or

(3) The action would cause notable adverse impacts on natural and beneficial floodplain values.

Moreover, the National Flood Insurance Act requires any community participating in the National Flood Insurance Program (NFIP), a voluntary floodplain management program, follow the community's Federal Emergency Management Agency (FEMA)-approved floodplain management regulations. FEMA coordinates with the Arizona Department of Water Resources (ADWR) and the Pima County Flood Control District (FCD) on the designation of floodplain boundaries within the State of Arizona. ADWR delegates the responsibility of adopting floodplain regulations to the Pima County FCD, which regulates development within the floodway and, through an administrative process, concurs with the latest FEMA map revisions. Additionally, the Pima County FCD regulations are designed to meet or exceed all state and federal requirements for floodplain control and management.[80]

The Pima County FCD requires that a Floodplain Use Permit (FUP) be obtained for proposed development within any lands lying within FEMA-designated Special Flood Hazard Areas, all other regulatory floodplains, riparian habitat areas, and erosion hazard areas.[81] Development may be permitted within the 100-year floodplain if the new development does not 1) divert, retard or obstruct the flow of floodwaters, 2) disturb or remove riparian habitat, or 3) comply with all other provisions for flood venting and anchoring to prevent lateral movement.

[80] PCC, Title 16, Floodplain and Erosion Hazard Management, Chapter 16.04.030.
[81] PCC, Title 16, Floodplain and Erosion Hazard Management, Chapter 16.20.010.

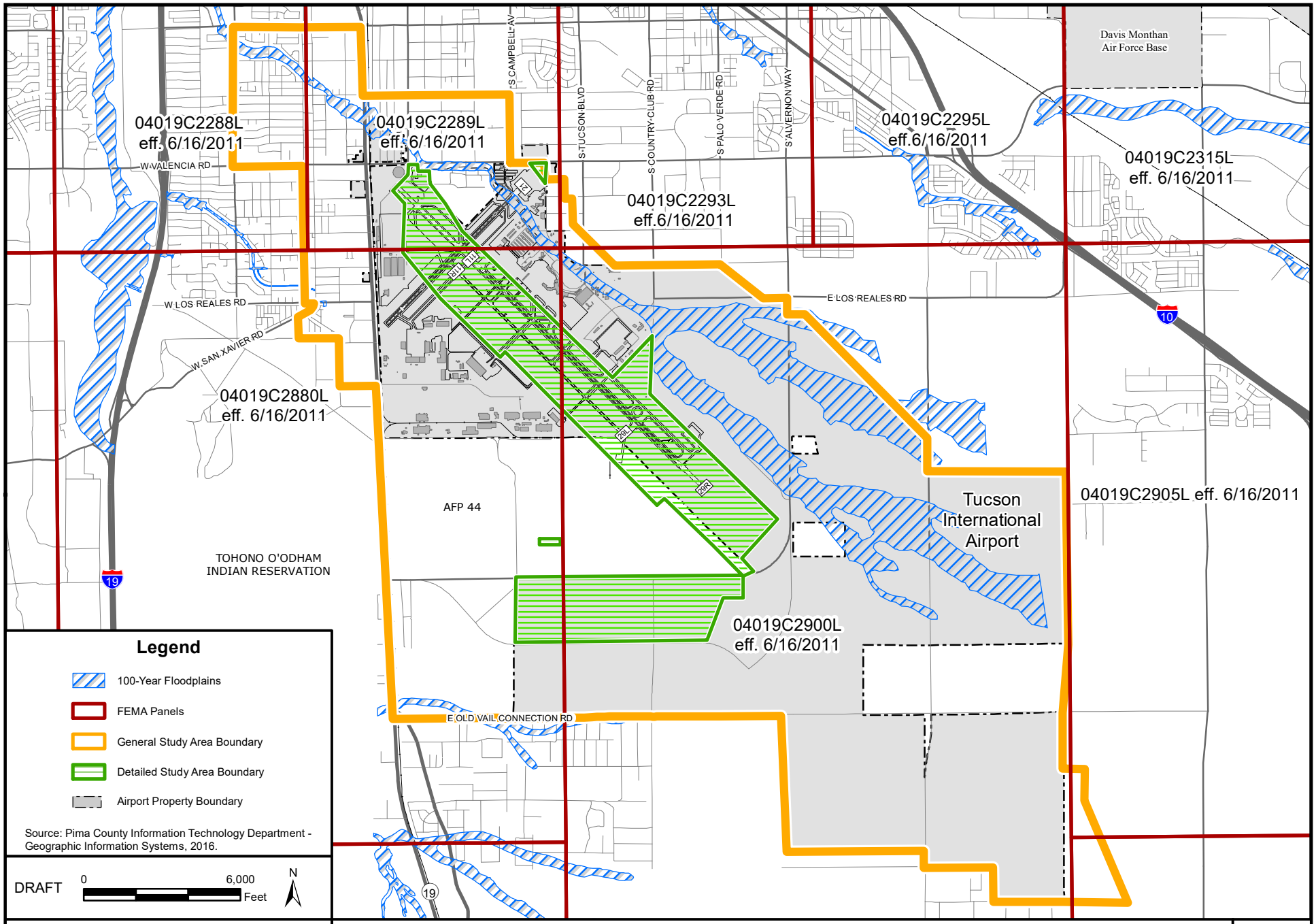
3.15.2 WETLANDS AND WATERS OF THE U.S.

A pedestrian survey to identify Waters of the United States was conducted in June 2017 for the wetland study area which is the same as the Detailed Study Area. The presence of wetlands was determined by visiting the project site to conduct a field delineation to determine if wetlands are present. A qualified wetland delineation specialist evaluated the area's physical, hydrologic, and biological characteristics to determine if any areas present in the affected environment met the regulatory definition of a wetland. The pedestrian survey followed the United States Army Corp of Engineers (USACE) Wetland Delineation Manual, which is the standard used by the USACE for purposes of determining the presence of wetlands as defined by USACE CWA implementing regulations. In addition to the pedestrian survey, the USFWS National Wetland Inventory (NWI) maps were reviewed to determine the presence of any wetlands. No mapped wetlands were identified on the NWI and no potential wetlands were observed during the pedestrian survey.

3.15.3 FLOODPLAINS

The 100-year flood has been adopted by FEMA as the base flood for floodplain management purposes. Floodplains are valued for their natural flood and erosion control, enhancement of biological productivity, and socioeconomic benefits and functions.

The Flood Insurance Rate Maps (FIRM) prepared by FEMA were used to establish the boundary of the 100-year floodplain in the area to be either directly or indirectly affected by the Proposed Action. The Detailed Study Area is depicted on three FIRM Panels (#04019C2289L, #04019C2880L, and #04019C2900L). The 100-Year floodplain boundary intersects with the Detailed Study Area in two locations along the Detailed Study Area's northern boundary as shown on **Exhibit 3-19**.



Environmental Impact Statement
Tucson International Airport

FEMA Floodplain Map

EXHIBIT:
3-19

4/19/2018 Y:\TUS\TUS-EIS\E-L&B Work Product\2-GIS\MXD\DOCUMENT\ 3-19_FEMA Floodplain Map.mxd

THIS PAGE INTENTIONALLY LEFT BLANK

3.15.4 SURFACE WATERS

There are no rivers, lakes, ponds, estuaries, or oceans in the geographic area with the potential to be either directly or indirectly impacted by the Proposed Action. There are five major drainages close to the Detailed Study Area as shown on **Exhibit 3-20**, Airport Wash, Valencia Wash, El Vado Wash, Santa Clara Wash, Hughes Wash, all of which are part of the larger Santa Cruz River watershed. These washes are considered ephemeral streams because they only conduct water during and immediately following precipitation events. Perennial streams conduct water all year long and intermittent streams are dry for part of the year, but conduct water for periods longer than ephemeral streams. There are no perennial or intermittent streams in the Detailed Study Area. During a precipitation event, stormwater runoff from the Airport is conveyed by a system of manmade channels and culverts to these drainages, which flow from southeast to northwest toward the Santa Cruz River.

In order to determine the area of a jurisdictional Water of the U.S., the ordinary high water marks were used, including but not limited to, differences in vegetation, changes in soil characteristics, water stains, cut banks, and presence of litter and debris. The ordinary high water marks generally defines the lateral limits of a water body.

During the same pedestrian survey to identify Waters of the United States conducted in June 2017, three Waters of the U.S., totaling 17.6 acres, were located. These areas were identified as the Hughes Wash, Hughes Wash Tributary #1 (Tributary #1), and Hughes Wash Tributary #2 (Tributary #2) depicted on **Exhibit 3-21**.

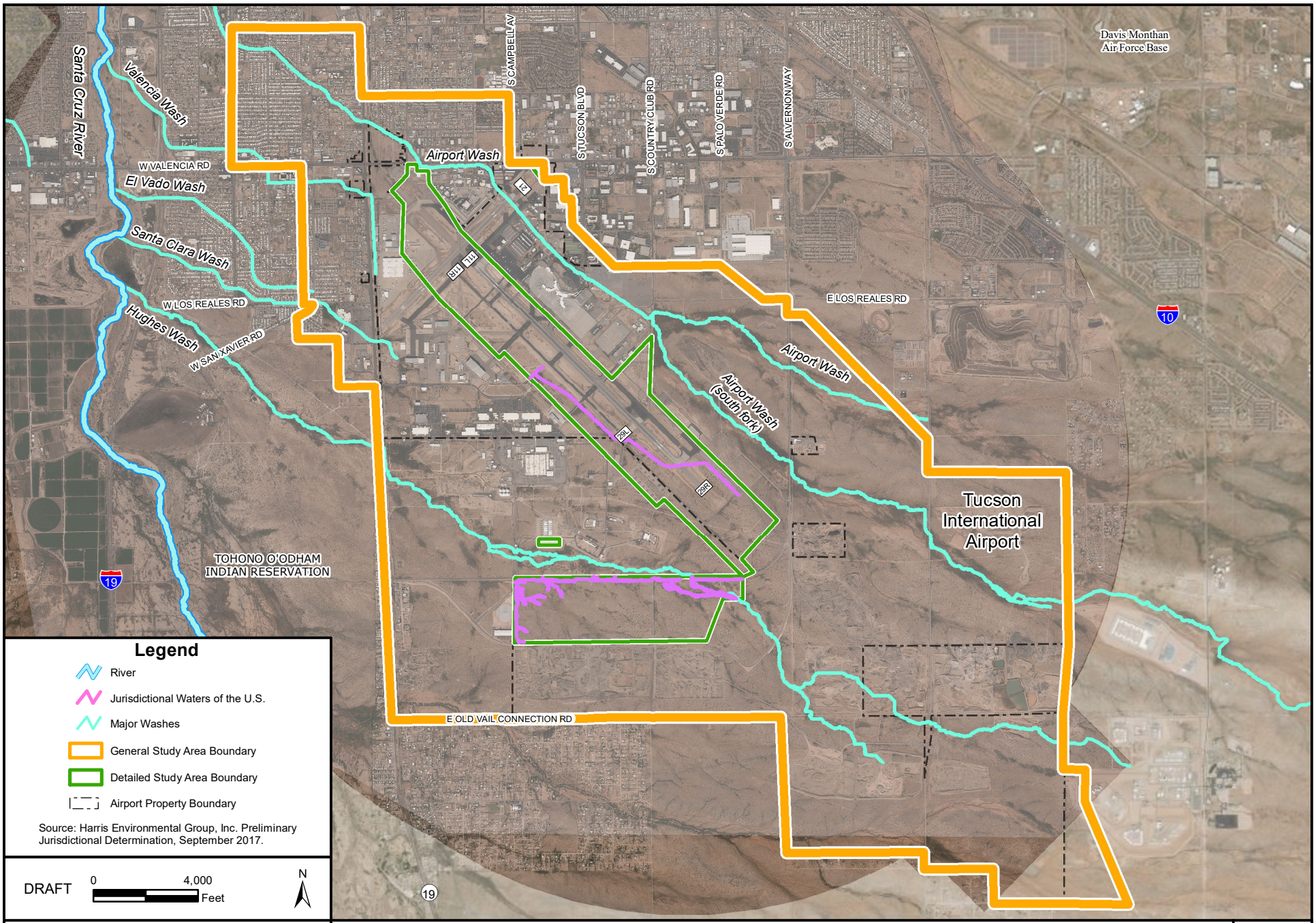
Approximately 2.7 acres of the Hughes Wash in Parcel G collects and conducts water northwest from Parcel G to the Santa Cruz River. Tributary #1 is an ephemeral tributary that collects and conducts water northwest into the Hughes Wash across the existing airfield through culverts. Approximately 1.7 acres of Tributary #1 was identified from southeast of Runway 29R to northwest of Runway 29L. Approximately 13.2 acres of Tributary #2, an ephemeral tributary primarily in Parcel G, collects and conducts water northwest into the Hughes Wash.

This preliminary finding was submitted to the USACE for review. See **Appendix H** for a copy of the preliminary jurisdictional determination.

3.15.5 GROUNDWATER

The Airport is located in the Tucson Active Management Area. Groundwater is subsurface water that occupies pore space between sandy clay and rock formations. The term aquifer is used to describe the geologic layers that store or transmit groundwater, such as to wells, springs, and other water sources. The geographic area with the potential to be either directly or indirectly impacted by the Proposed Action is located within the Tucson sub-area of the Upper Santa Cruz and Avra Basin sole source aquifer area, in the Tucson Active Management Area. The Pantano Formation, Tinaja beds, and Fort Lowell Formation form a single aquifer; however, the primary source of groundwater in the Tucson sub-area is the Fort Lowell Formation. Tucson Water provides potable water in the project area. From the mid-2000s to the present, the potable gallons per capita per day rate in Tucson has decreased substantially from a high of about 160 in 2005 to about 130 in 2012.[82] Water demand may increase to 145 gallons per capita per day by 2020 depending on a high-end population projection. Potable water supplies for the Tucson area are primarily drawn from groundwater wells that are located within and around the municipality.[83] Tucson Water regularly monitors the drinking water in order to obtain water quality information. From monitoring conducted in 2016, water supplies met all EPA regulatory standards for safe drinking water.[84] As discussed in Section 3.8, a total of 22 wells are located within the Detailed Study Area that are registered with the ADWR. Many of the wells are groundwater monitoring wells associated with the NPL Site investigations. Depth to the groundwater ranges from 79 to 205 feet below ground surface in the wells.

[82] HDR Engineering, Inc., December 2013, City of Tucson 2012 Water Plan Update: 2000-2050.
[83] City of Tucson, 2017, Drinking Water Distribution System. Available on-line: https://www.tucsonaz.gov/ water/distribution-system Accessed on August 29, 2017.
[84] Tucson Water, 2016, 2016 Annual Water Quality Report.



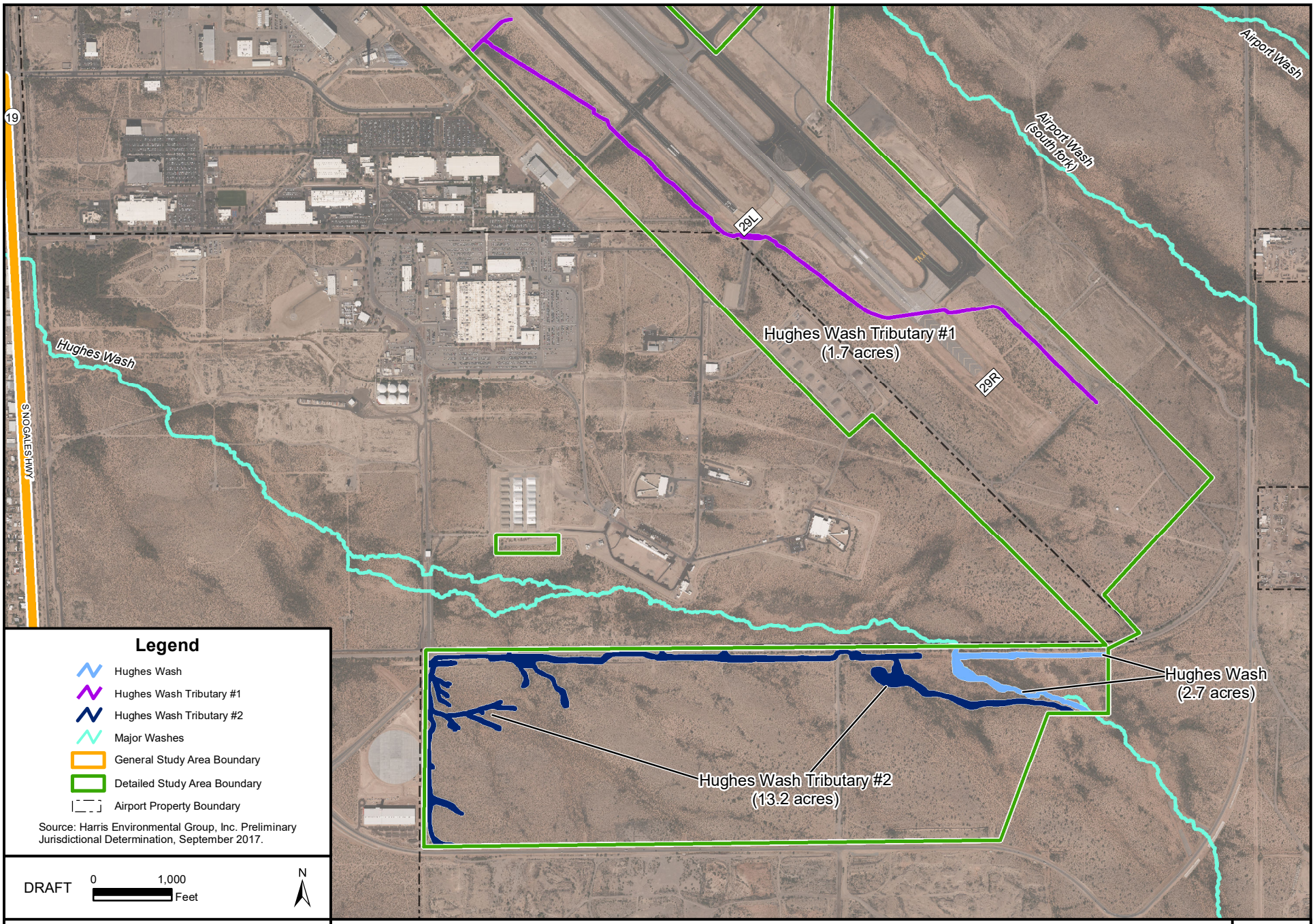
Environmental Impact Statement
Tucson International Airport

Major Drainages

EXHIBIT:
3-20

4/19/2018 Y:\TUS\TUS-EIS\E-L&B Work Product\2-GIS\MXD\DOCUMENT\ 3-20_Major Drainages.mxd

THIS PAGE INTENTIONALLY LEFT BLANK



Environmental Impact Statement
Tucson International Airport

Jurisdictional Waters of the U.S.

EXHIBIT: **3-21**

12/22/2017 Y:\TUS\TUS-EIS\E-L&B Work Product\2-GIS\MXD\DOCUMENT\ 3-21_Jurisdictional Waters of the US.mxd

THIS PAGE INTENTIONALLY LEFT BLANK