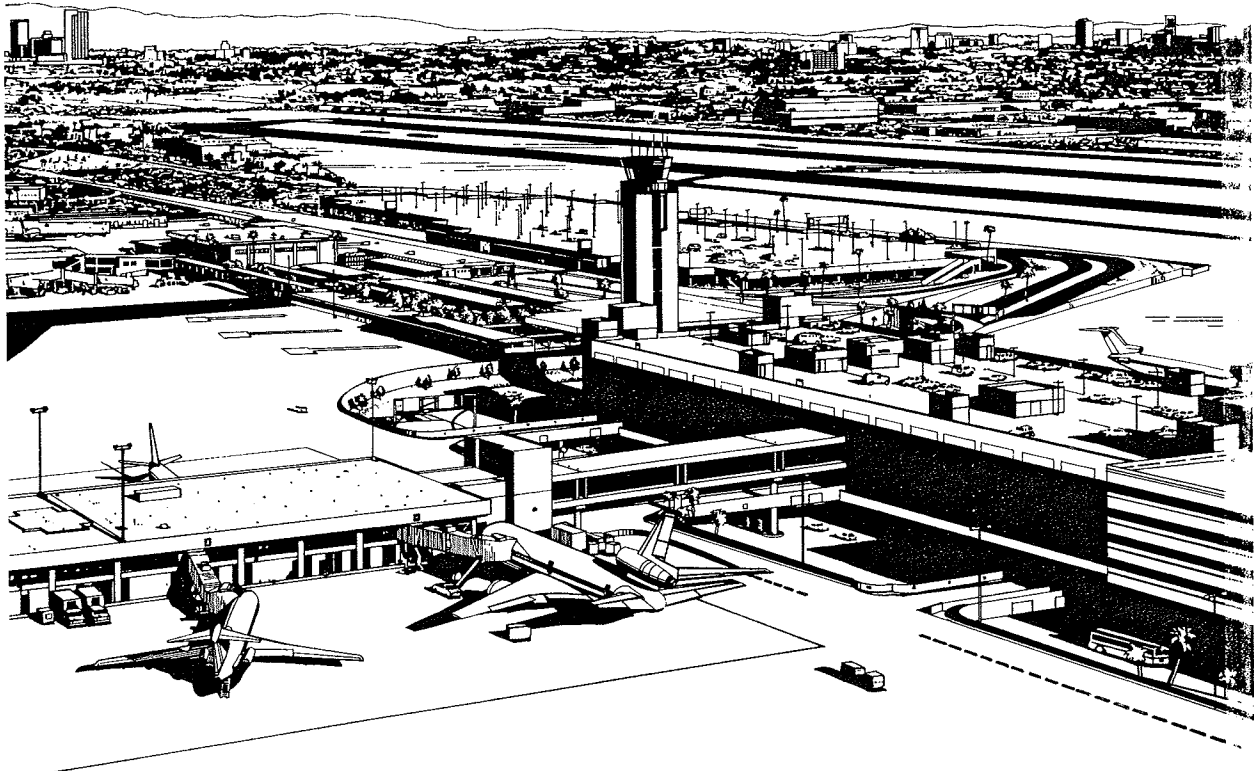


**Chapter One**  
**EXISTING CONDITIONS**

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## **Chapter One**

# **EXISTING CONDITIONS**

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An inventory of existing conditions at Phoenix Sky Harbor International Airport serves as an overview of the facility and its relationship to the community. With this information in hand, the study team is equipped for more detailed analysis in subsequent stages of the study. Included in the following inventory of existing conditions are:

- A description of airfield facilities including the runway-taxiway system, navigational aids and lighting, and functional areas on the airport. This information is used primarily in assessing possible changes to the airport layout which might abate aircraft noise.
  - A summary of historical aircraft operations, the current aircraft fleet mix, typical operating stage lengths, time of day at which operations typically occur, the use of runways (percentage and time of day), and existing noise abatement procedures.
- These data provide the critical input to the aircraft noise model calculations.
- A description of the airspace and air traffic control procedures in the Phoenix area, particularly as they relate to the flow of traffic to and from Sky Harbor International Airport. This discussion includes departure and arrival routes, operating sectors, airways, location of other airports, and instrument approach and departure procedures.
  - Definition of a study area, which provides a useful boundary for mapping and summarizing airport and community planning data.
  - An outline of the various political and administrative jurisdictions which interact with the airport, and their roles and responsibilities in reducing aircraft noise impacts and in controlling development of

neighboring land uses. This information provides the basis for establishing roles and responsibilities for implementation of recommended plans.

- A description of land development regulations in the airport vicinity, including zoning, subdivision, and building codes. These regulations may be adapted for use in implementing the Part 150 Plan recommendations and may need to be amended to bring about the recommended results.
- A socioeconomic profile of the study area, including land use, population, housing and economic activities. These data provide the basis from which aircraft noise impacts will be determined.

The study team and those who participate in an advisory role during the study must become intimately familiar with both the airport and the surrounding neighborhoods. They must know not only the physical and operational characteristics of the airport, but also where residents of the area live, work, play, shop, and go to school and how they travel among those places. When reliable evidence points to future changes in these conditions, particularly growth, they should be aware of how local governments are likely to respond to those changes. Finally, they should be aware of how the airport and its activities are changing and what the impacts on the community will probably be. This chapter summarizes the information needed to answer those questions.

## **AIRPORT LOCATION AND HISTORY**

Phoenix Sky Harbor International Airport, a publicly owned air carrier airport which serves extensive general

aviation activity, is located in the city of Phoenix, approximately four miles east southeast of the central business district, as shown in Exhibit 1A. The airport is generally bounded by Hohokam Expressway on the east, the Salt River and Interstate Highway 10 on the south, 24th and the Squaw Peak Expressway on the west, and the Southern Pacific Railroad tracks on the north. The airport covers nearly 3,000 acres.

Sky Harbor Airport was acquired by the City of Phoenix in 1935 from a private investment company. After the transfer of ownership, the facility rapidly became one of the busiest airports in the United States. The continuing development of the Phoenix area economy has resulted in the airport providing service to more than 13,000,000 passengers in 1986. The airport's present configuration of east-west parallel runways allowed 416,656 operations during the same year, of which nearly one third were by general aviation operators.

Expansion and remodeling of the terminal facilities has occurred frequently over the last 35 years. A major expansion program is planned for the near future with the construction of Terminal 4 and associated airfield and landside improvements. The short-term development plan also includes significant development in the general aviation and air cargo facilities, as well as redevelopment of the roadway access system.

## **AIRPORT FACILITIES**

### **RUNWAY/TAXIWAY SYSTEM**

Exhibit 1B shows the layout of existing facilities at the airport. Two runways, both of which are suitable for air carrier operations, are currently in use and are described in Table 1A. Both are

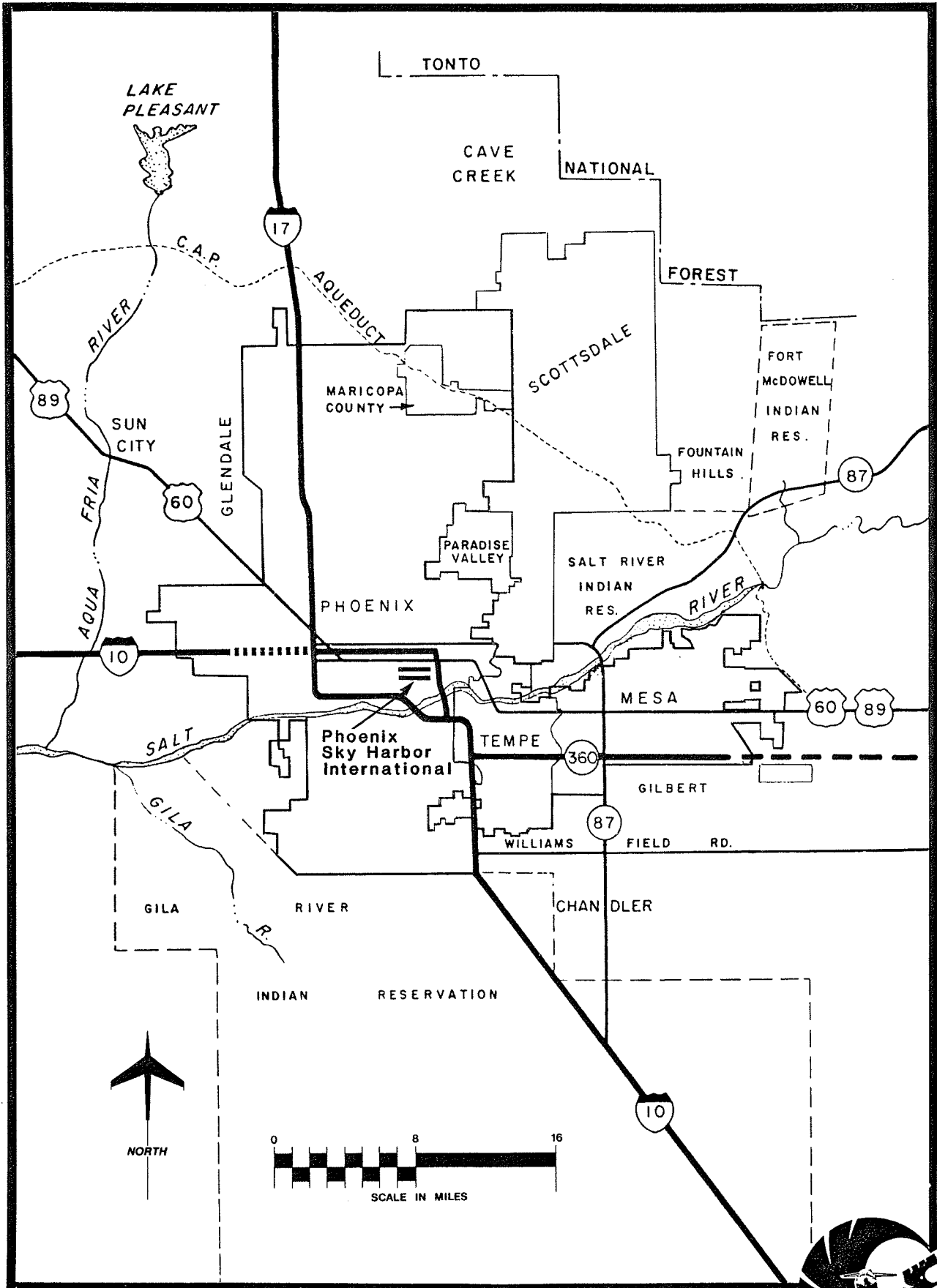


Exhibit 1A  
AIRPORT VICINITY



oriented in an east-west direction, generally paralleling the bed of the Salt River. Runway 8L-26R is located north of the central terminal facility area and is 11,001 feet long and 150 feet wide. The south parallel runway, 8R-26L, is 3,565 feet south of the other runway and is 10,310 feet long and 150 feet wide.

Each runway is served by a full-length parallel taxiway and several exit taxiways, providing for circulation between the runways and other parts of the airport.

The Airport Master Plan proposes the development of major runway improvements in the future. Space will become available for each parallel runway to be extended to an ultimate length of 12,500 feet. Also, a third parallel runway, 9,000 feet long by 150

feet wide, is programmed for future development south of the current south parallel runway (8R-26L). Runway 8R-26L will be relocated 400 feet to the south of its existing location. The third runway, which will be used primarily by general aviation category aircraft, is predicated upon the relocation of the Arizona Air National Guard facilities and overcoming obstacles created by the Salt River. The construction of the runway facilities will be addressed in other studies. Each of these improvements is anticipated in the ultimate airport development plan, but their need is not anticipated prior to the turn of the century. Parallel taxiways would be extended or constructed along each runway as needed. These improvements would leave the airport with three, non-intersecting parallel runways. See Exhibit 1B.

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**TABLE 1A**  
**Existing Runway Data,**  
**Phoenix Sky Harbor International Airport**

	Runway 08L-26R		Runway 08R-26L	
Length (feet)	11,001		10,310	
Width (feet)	150		150	
Surface	Asphalt		Asphalt	
Approach Slope	34:1	34:1	50:1	50:1
Approach Lighting	--	--	MALSR	--
Runway Lighting	MIRL	REIL	HIRL	<u>REIL</u>

Source: Airport Master Record, FAA Form 5010-1, for Phoenix Sky Harbor International Airport, June 3, 1986.

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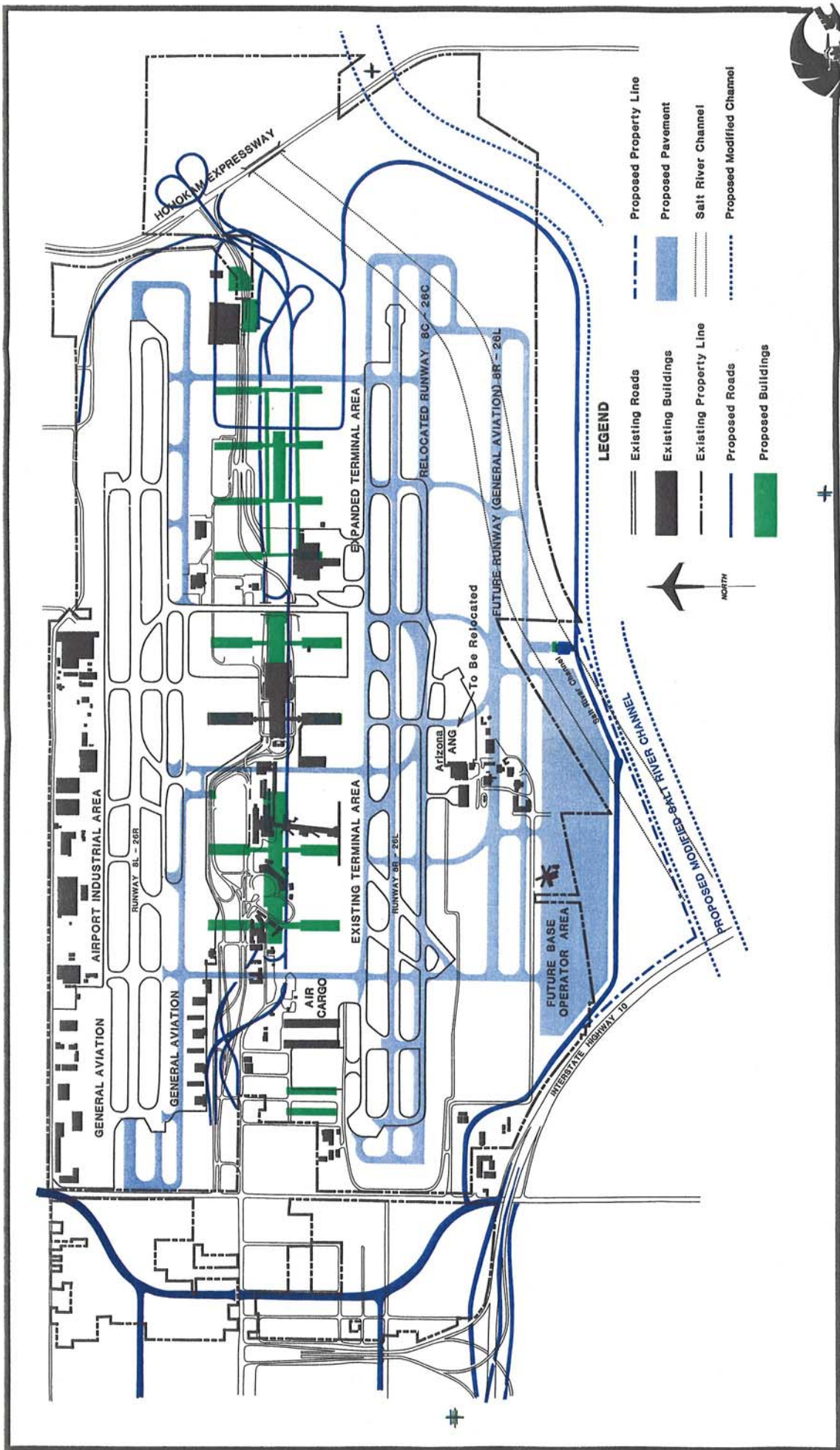


Exhibit 1B  
 EXISTING AND  
 PROPOSED FACILITIES



## NAVIGATIONAL AIDS

Navigational aids (navaids) include any visual or electronic devices, either airborne or on the ground, which provide point-to-point guidance, information or position data to aircraft in flight. Various types of navaids are in use at or in the vicinity of Sky Harbor International Airport. The ground-based electronic navigational aids that are located on or near the airport may be functionally classified as enroute navigational aids, terminal area navigational aids, and landing aids.

- **ENROUTE NAVIGATIONAL AIDS:** Locational aids operating at or near the airport for the purpose of enroute air navigation permit pilots to navigate accurately using only instruments.

A nondirectional beacon (NDB) is a general purpose, low frequency radio beacon that a pilot can home on, or determine his bearing from. Since the transmission is non-directional it does not provide the pilot accurate course guidance. For effective navigation using an NDB, aircraft must have automatic direction finder (ADF) capability so that the pilot may determine the aircraft's relative bearing from the NDB facility.

The primary enroute NDBs in Phoenix area are not used for instrument approaches to Sky Harbor Airport, although the Scottsdale NDB is used to assist approaches to several different airports. The Rio Salado NDB is located approximately 3.4 miles east of the airport, just southwest of the intersection of Rural Road and Curry Road. While not used for approaches, the NDB is the primary navigational aid used in Standard Instrument Departure (SID) procedures from Runway 08R or 08L. Each departure to the east by jet aircraft is directed to overfly the beacon before turning to assigned departure courses.

The Salt River VORTAC (SRP) is located approximately 5.3 nautical miles east of the airport. The VORTAC facility combines a Very High Frequency Omnidirectional Range (VOR) and a Distance Measuring Equipment (DME) system typically used by civilian aircraft with a Tactical Air Navigation (TACAN) preferred by the military. Both provide directional and distance guidance. Operating in conjunction with the ground station, a properly equipped aircraft is able to translate the VORTAC signals into a visual display of both azimuth and distance. Because of the high frequencies involved, the VORTAC is constrained to line-of-sight distances and is usable for navigational purposes only within approximately 40 miles of the facility.

- **TERMINAL AREA NAVIGATIONAL AND LANDING AIDS:** During inclement weather, various instrument approaches are available to Runways 8R, 26L, and 26R. An instrument approach is a prescribed procedure for the orderly transfer of an aircraft operating under instrument flight rules (IFR), from the beginning of the initial approach to a landing, or to a point from which a landing may be made visually.

The Instrument Landing System (ILS) for Runway 8R is a precision approach and landing aid designed to identify the exact alignment of the approach path. An ILS system provides three functions: guidance provided vertically by a glide slope beacon, and horizontally by a localizer; range furnished by marker beacons; and visual alignment, supplied by the approach lighting system and runway edge lights. The runway is equipped for Category I ILS approaches, which allow operating minimums of 200 foot ceilings and one-half mile of visibility.

The localizer (LOC) antenna is located 1,900 feet from the down-range end of the runways. It emits a very high

frequency signal that tells the pilot how far left or right the aircraft is from the runway centerline. The ultra-high frequency glide slope (GS) transmitter is located on the south side of the ILS-equipped runway and provides a signal to indicate if the aircraft is above or below the desired glide path.

To further assist the ILS approach, two marker beacons - the outer marker (OM) and the middle marker (MM) - furnish range information to indicate how far along the approach path the aircraft has progressed. The ILS approach to Runway 8R has a three-degree glide slope which intercepts the outer marker a distance of 4.0 nautical miles from the runway threshold. The middle marker is 0.4 nautical miles west of the runway end.

In addition to the guidance provided for approaches to Runway 8R, the ILS localizer antenna may be used to provide a non-precision backcourse approach to Runway 26L. This procedure essentially provides a reversal of the ILS approach from the east, passing over the Salt River VOR at or above 3,000 feet MSL (above sea level) or 1,878 feet above field elevation, and descending to touchdown. The operating minimums for this procedure vary by the approach speed of the aircraft, but for most air carrier jets, 700 feet ceilings and two miles visibility would be required.

An aircraft can make non-precision VOR approaches to Runways 26R and 26L utilizing the Salt River VOR. A VOR/DME approach is available to Runway 8R. Visual approaches may be made to all runways and have been published for Runway 8R (establishing final approach west of the Black Canyon Freeway) and for Runway 26L (with final approach established east of the power plant on the south side of the river). Visual approaches are the only available approach option for Runway 8L.

Phoenix Terminal Radar Approach Control (TRACON) uses the Airport Surveillance Radar (ASR) to vector aircraft throughout the terminal area. The ASR scans 360 degrees of azimuth to present radar target information for use by Air Traffic Control in the guidance of aircraft. Phoenix TRACON is able to use the radar facility to provide guidance vectoring for approaches by aircraft desirous of visual or non-precision approaches or for straight in or circling approaches when the approach lighting systems are inoperable. This capability allows controllers to issue instructions, based on an aircraft's position in relation to the final approach course depicted on the controller's radar scope, which will bring an aircraft to a position on the instrument approach path from which the pilot may land if in visual contact with the runway environment.

Both ends of Runway 8L-26R are equipped with four-box Visual Approach Slope Indicators (VASI-4). A six-box VASI system is available on Runway 26L. VASI is a system of lights on the edge of the runway which provide visual descent guidance information during an approach to the runway.

## LIGHTING

A variety of lighting aids is available at Sky Harbor International Airport to facilitate identification, approach, landing, and taxiway operations at night and in adverse weather conditions. These systems, categorized by function, are described below:

- Identification Lighting - The location and presence of an airport at night is universally indicated by an airport rotating beacon. Located near Terminal 1, the beacon operates from sunset to sunrise and during the daylight hours when ground visibility is less than three miles and/or the ceiling is less than 1,000 feet. This



beacon is equipped with an optional system that projects two beams of light, one green and one white, 180 degrees apart.

- Obstruction Lighting - Obstructions in the vicinity of the airport are marked or lighted to warn pilots of their presence during both day and night. Major obstructions are noted on aviation charts and instrument approach plates used by pilots.
- Approach Lighting - Approach Lighting systems (ALS) are used in the vicinity of runway thresholds as adjuncts to electronic navigational aids for the final portion of IFR approaches and as visual guides for nighttime approaches under VFR conditions. The approach lighting system supplies the pilot with visual clues concerning aircraft alignment, roll, height, and position relative to the threshold. At Sky Harbor International Airport, a Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR) has been installed on Runway 8R. While a variety of different ALS are available, all are designed to accomplish the objective of assisting the pilot in making a safe landing.
- Runway End/Threshold Lighting - The identification of the runway end, or threshold, is a major factor in the pilot's decisions during landing. Therefore, the runway end/threshold is given special lighting consideration. The identification lights make use of a two-color, red/green lens. The green half of the lens faces the approaching aircraft and indicates the beginning of the usable runway. The red half of the lens faces the airplane on the rollout or takeoff, indicating the end of usable runway. Runway end/threshold lights consist of a minimum of six fixtures, in two groups of three, and are located at the end of each air carrier runway.

- Runway Lighting - After crossing the threshold, pilots must complete a touchdown and vacate the runway. Runway lighting aids are designed to give pilots information on alignment, lateral displacement, roll, and distance.

Edge lighting is the standard runway lighting system on all runways at the airport. The white edge lights are visible through 360 degrees of azimuth. Runway 8R-26L is equipped with High Intensity Runway Lights (HIRL), while Runway 8L-26R has Medium Intensity Runway Lights (MIRL).

- Taxiway Lighting - Since pilots must maneuver on the taxiway system to and from the hangar and terminal areas, edge lighting is provided to indicate the location of taxiways.
- Taxiway/Runway Identification signs - The airport has also installed a set of taxiway and runway identification signs to assist pilots in properly locating taxiways and runways. The signs are lighted and clearly visible at night and during IFR weather conditions.

While navigational aids and lighting are most often related to airport master planning, they also play a role in the abatement of aircraft noise. Large aircraft nearly always use one or more of the navaids in operating into and out of an airport and, consequently, their noise is most often concentrated in areas associated with these facilities.

## TERMINAL AREAS

Airport offices and support services are located in three areas, shown in Exhibit 1B. The main concentration of facilities lies between the runways near the passenger terminals. The terminal buildings include concessions, ticketing, and baggage handling facilities, the

Aviation Department offices and other government offices. Sixty (60) gates are available to accommodate aircraft. Rental car services and a motel are also located in this area. The Executive Aviation Center, the FAA's TRACON facility and offices of several fixed base operators (FBOs), are located facing the north parallel runway west of the terminal complex. A major air cargo handling area is located facing the south parallel runway west of the passenger terminals.

East of the passenger terminals is a hangar occupied by DynAir Tech, a maintenance and repair station for large air carrier aircraft, as well as a variety of airline support facilities and the crash-fire-rescue station. It is in this eastern area that the new Terminal 4 is being planned for construction within the next five years.

North of Runway 8L-26R is an area which includes general aviation facilities (hangars, tie-downs, etc.), an air industrial complex and fuel storage facilities. South of Runway 8R-26L is the Arizona Air National Guard facility, a police compound/jail, and a newly developing complex for corporate aviation.

The airport master plan envisions several major additions to current terminal area facilities. Redevelopment of Terminal 1 and Terminal 2, on a design similar to that used for Terminal 3, are envisioned after completion of Terminal 4, which will be located east of Terminal 3. An ultimate development of six terminal buildings may be accommodated by the plan. Expanded air cargo facilities adjacent to Terminal 1 are also planned. Short-range plans call for new general aviation facilities adjacent to the Salt River. The overall development of the airport will be addressed in a master plan update which is scheduled to start in mid-1987.

While the airport's location and its associated facilities determine the orientation of aircraft noise patterns, the number and type of aircraft using the facility determine the levels of noise. A complex evaluation of many operational factors is necessary to determine aircraft noise impacts. These factors, discussed in the following sections, include activity levels, time of day of operation, fleet mix, trip lengths, runway utilization, and existing noise abatement procedures.

## AIRFIELD OPERATIONS

### ACTIVITY LEVELS

Sky Harbor International Airport is currently served by fourteen air carrier airlines, five commuter airlines, and seven cargo airlines, listed below. In addition, numerous general aviation and military aircraft also use the airport.

Table 1B shows aircraft operations (takeoffs and landings) at Sky Harbor International Airport for the last nine years. Operations are reported in three categories--air carrier, general aviation, and military. Air carrier operations include both large and small service carriers, air cargo operators and air taxi operations. This category increased steadily since 1977 to reach nearly 286,000 operations in 1986. This represents an increase of 242 percent over the nine year period. General aviation operations have steadily declined from a high of more than 264,000 in 1979 to less than 124,000 in 1986. Military operations account for only about 2% of total operations and have fluctuated between 6,700 and 9,800 per year during the nine-year period. Total operations generally held between 346,000 and 400,000 operations until 1986 when the total increased to more than 416,000 for the year.

## AIR CARRIER AIRLINES

Alaska Airlines  
 America West Airlines  
 American Airlines  
 Braniff  
 Continental Air Lines  
 Delta Air Lines  
 Eastern Air Lines  
 Northwest Airlines  
 Pacific Southwest Airlines  
 Southwest Airlines  
 StatesWest  
 Trans World Airlines  
 United Airlines  
 USAir

## COMMUTER AIRLINES

American Eagle  
 Golden Pacific Airlines  
 Havasu Airlines  
 Mesa Air Shuttle  
 Skywest Airlines

## ALL-CARGO AIRLINES

Airborne Express  
 DHL Airways  
 Emery Worldwide  
 Federal Express  
 Purolator Courier  
 SMB Stage Line  
 United Parcel Service

Historical airline passenger enplanement and deplanement data for the same nine-year period are shown in Table 1C. Passenger counts totaled 7,022,000 in 1979, the year the airline industry was deregulated. Traveler totals were depressed over the next three years in

response to higher fares, caused in part by a large increase in the price of oil, a national recession, and the air traffic controllers strike. Since 1980, the total number of passengers served by the airport has more than doubled, reaching 13,274,000 in 1986.

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**TABLE 1B**  
**Aircraft Operations, 1978-1986**  
**Sky Harbor International Airport**

<u>Year</u>	<u>Air*</u> <u>Carrier</u>	<u>General</u> <u>Aviation</u>	<u>Military</u>	<u>Total</u>
1978	117,981	264,192	8,480	390,653
1979	125,375	260,239	6,757	392,371
1980	145,705	223,415	7,301	376,421
1981	143,378	198,599	8,207	350,184
1982	172,476	167,511	8,747	348,734
1983	197,630	139,391	9,763	346,784
1984	252,348	138,965	7,986	399,299
1985	261,098	128,587	7,837	397,522
1986	285,949	123,110	7,597	416,656

Source: Phoenix Aviation Department Monthly Activity Reports, 1979-1986.

\*Includes: Air Carrier, Commuter, Air Taxi and Cargo Operations

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Commercial service departures over the last few years, also shown in Table 1C, have increased in accordance with the increases in passenger enplanements. Annual departures by this user category totaled 142,975 in 1986. Of these, 112,215 were by large air carriers, 4,158 were by air cargo carriers, 14,342 were by commuter carriers, and 12,260 were by air taxi operators. The number of enplaned passengers per departure,

however, gradually declined between 1979 (deregulation) and 1984, but has rebounded significantly in the last two years. Air cargo enplaned tonnage (Table 1D) is up substantially from the low period of 1982. This increase is due principally to freight/express cargo, which more directly affects aircraft operational levels than does airmail tonnage.

**TABLE 1C**  
**Airline Passenger Traffic, 1978-1986,**  
**Phoenix Sky Harbor International Airport**

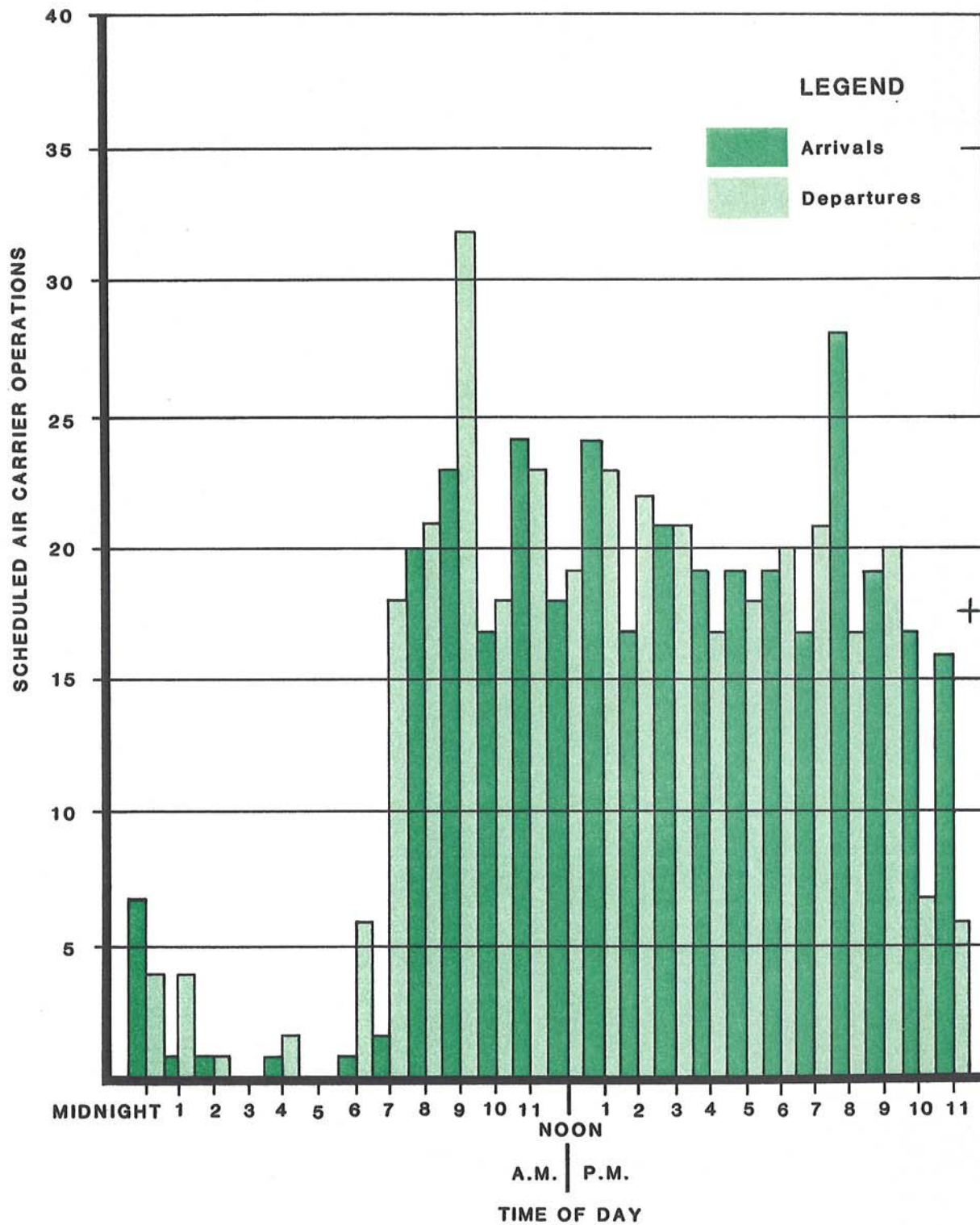
<u>Year</u>	<u>Enplaned Passengers</u>	<u>Percent of U.S. Total</u>	<u>Air Carrier Departures</u>		<u>Enplaned Passengers Per Departure</u>
			<u>Annual</u>	<u>Daily</u>	
1978	2,969,800	1.3%	50,639	139	58.6
1979	3,513,000	1.2%	56,764	155	61.9
1980	3,279,100	1.3%	58,669	161	55.9
1981	3,339,500	1.2%	54,434	149	61.3
1982	3,772,000	1.4%	67,995	186	55.5
1983	4,313,300	1.5%	75,458	207	57.2
1984	5,080,200	1.6%	95,747	262	53.1
1985	5,804,100	1.8%	101,445	278	57.2
1986	6,629,000	1.9%	112,215	307	59.1

Source: Phoenix Aviation Department. Airport Activity Statistics for Certificated Air Carriers, 1978-1985, Civil Aeronautics Board/Federal Aviation Administration.

**TIME OF DAY**

Operations occurring at night are especially important in the noise compatibility planning process. Nighttime operations are generally more disruptive to airport neighbors and, as a result, are given extra weight in the computation of airport noise exposure. Specifically, operations between the hours of 10:00 p.m. and 7:00 a.m. are assigned a 10 decibel penalty, meaning that they are assessed as the equivalent of ten daytime operations.

Exhibit 1C shows the distribution of scheduled air carrier operations throughout the day at Sky Harbor International Airport for the month of February, 1987. The typical peaking pattern is not pronounced at the airport, but rather, a relatively constant level of operations occur each hour from 8:00 a.m. to 10:00 p.m. Far less activity, 11% of all scheduled air carrier operations, occurs during the nighttime hours. From April through October, when Daylight Savings Time is in effect in the rest of the country, the flights occur one hour later.



SOURCE: Official Airline Guide  
February 1987

Exhibit 1C  
HOURLY DISTRIBUTION  
OF AIR CARRIER TRAFFIC



**TABLE 1D**  
**Air Cargo, 1978-1986,**  
**Phoenix Sky Harbor International Airport**

<u>Year</u>	<u>Enplaned Tons</u>		
	<u>Freight/Express</u>	<u>Mail</u>	<u>Total</u>
1978	16,154	7,108	23,262
1979	16,212	7,870	24,082
1980	14,435	8,987	23,422
1981	13,318	9,301	22,619
1982	12,523	9,531	22,054
1983	15,932	9,523	25,455
1984	18,125	10,807	28,932
1985	18,277	12,463	30,740
1986	18,480	11,024	29,504

Source: Phoenix Aviation Department Activity Reports and Airport Activity Statistics for Certified Air Carriers, 1978-1985, Civil Aeronautics Board/Federal Aviation Administration.

#### FLEET MIX

The aircraft operating at Sky Harbor International Airport include a wide mix of mid-sized air carrier jet aircraft, business jets, commuter turboprop aircraft, and small piston-engine general aviation aircraft. See Table 1E. Greater detail will be provided in the following chapter on aviation noise.

The most common air carrier aircraft include the Boeing 737 and 727, the DC-9 and the MD-80. Wide-body jets, such as the L-1011, DC-10 and the new Boeing 767, comprise only a small portion of the mix. The military aircraft using the airport are generally limited to the KC-135 (a military tanker version of the B-707), small personnel transports and helicopters.

Air carrier operations account for 54% of the activity at the airport, general aviation accounts for 29%, air taxi and commuter for 13%, charter and cargo for 2%, and military for 2%.

#### STAGE LENGTHS

The stage length is the number of air miles an aircraft flies nonstop between two airports. This is not necessarily between the originating city and final destination, as many aircraft make several stops for passengers and refueling. Air carrier stage lengths are a particularly important input to the Integrated Noise Model in determining noise contours because they are the principal determinant of aircraft fuel load which, in turn, determines aircraft weight and affects takeoff and climb-out performance.

Table 1F shows the percentage of departures by stage length for air carrier, commuter, and cargo flights. Most flights, including all commuter departures, involve Stage I lengths.

**TABLE 1E**  
**Fleet Mix, 1986,**  
**Phoenix Sky Harbor International Airport**

<u>Operations Category</u>	<u>Typical Aircraft</u>	<u>Percent of Daily Operations</u>
Air Carrier	B-727, B-737, B-767, L-1011, DC-9, DC-10, MD-80, B-757, BAe-146	54%
Air Taxi & Commuter	Metroliner, SF-360 Cessna 402, Beech 99, other light aircraft	13%
Charter/Cargo	B-727, DC-9, CV-600, DC-8, Various medium twin-engine turboprops, business jet.	2%
General Aviation	Various light single and twin-engine, medium twin-engine, business jet, helicopter	29%
Military	KC-135, small personnel transport, helicopter	2%

Source: Phoenix Aviation Department, monthly landing reports, based aircraft list, 1986.

**TABLE 1F**  
**Stage Lengths, 1986**  
**Phoenix Sky Harbor International Airport**

<u>Stage</u>	<u>Length</u>	<u>Percent of Departures</u>		
		<u>Air Carrier</u>	<u>Air Taxi/Commuter</u>	<u>Cargo</u>
I	0-500 mi.	56%	100%	52%
II	500-1000 mi.	26%	0	16%
III	1,000-1,500 mi.	13%	0	13%
IV	1,500-2,500 mi.	5%	0	19%
Total		100%	100%	100%

Fifty-six percent of air carrier and 52% of cargo departures involve initial flights of less than 500 nautical miles. These flights are generally to southern California or other southwestern cities. Stage II length flights involve 26% of air carrier and 16% of cargo departures. These departures are typically to northern California, Texas, and the Rocky Mountain states. Stage III length flights involve 13% of air carrier and 13% of cargo departures. These flights are to northwestern or midwestern destinations. Stage IV length flights are to eastern and Ohio Valley cities and include 5% of air carrier and 19% of all cargo departures. Except for an occasional charter, no flights of more than 2,500 nautical miles depart from the airport.

**RUNWAY UTILIZATION**

Runway utilization is another important factor in determining noise contours.

During the past few years, the distribution of traffic flow to the east or to the west of the airport has been an issue of concern to those residents surrounding the airport. Based on information collected and tabulated by the City of Tempe, runway use percentages have been developed for the year 1986 and are shown in Table 1G. The source was FAA control tower flight strips indicating operational data on each departing flight during the year. These will, for the purpose of the noise study, be assumed to be representative of the distribution of traffic between the north and south parallel runways for current conditions. The directional flows from the runways will be assumed to concur with the agreement between the cities of Phoenix and Tempe calling for equalization of departure traffic to both the east and west of the airport. The alternative assessments to be conducted in later portions of the study will likely assess methodologies to adjust the runway use patterns to enhance the abatement of aircraft noise.

**TABLE 1G  
1986 Runway Utilization**

<u>Runway Direction</u>	<u>Percentage of Use</u>		<u>Total</u>
	<u>Day</u>	<u>Night</u>	
8R	38.7%	46.4%	39.6%
26L	39.7%	25.3%	38.1%
8L	11.7%	20.1%	12.6%
26R	10.0%	8.2%	9.8%
	100.0%	100.0%	100.0%

Source: Compilation of 1986 FAA Flight Strip data by the City of Tempe

**EXISTING NOISE ABATEMENT EFFORTS**

Numerous complaints about the levels of aircraft noise have been made by persons and community groups in

neighborhoods near the airport. The Phoenix Aviation Department has, for several years, been cognizant of the need to abate aircraft noise and to control land use within areas over which



aircraft contribute a significant amount of noise. A number of measures have been taken in attempts to reduce the amount of noise over incompatibly used areas. These include the preparation of public information programs, the assessment of flight procedures to relocate noise corridors, the acquisition of large areas of severely impacted land, and the development of runway use programs to equalize the distribution of traffic east and west of the airport.

Among the procedures now in place which are designed to abate noise are the standard instrument departure procedures used at Sky Harbor. Departures to the west fly generally along the runway heading to a point thirteen miles west of the Salt River VOR prior to turning to their next departure heading. This procedure concentrates departure noise along a single corridor west of the airport until the aircraft are six and one-half miles west of the airport. Departures by large aircraft and small business jets from Runway 8R/L turn from the runway heading to overfly the Rio Salado NDB (near the intersection of Curry and Scottsdale Roads prior to turning to their next departure heading.

An intergovernmental agreement between the cities of Tempe and Phoenix was signed in 1986 and has provided an interim response to a variety of concerns relative to the frequency and level of aircraft noise events east of the airport. This agreement, signed in 1986, called for the preparation of a Part 150 Study, jointly sponsored by the two communities. The work now being accomplished is a result of that agreement.

Additionally, on August 7, 1986, the mayors of the two cities requested that the manager of the Phoenix TRACON (Terminal Radar Approach Control) facility at Sky Harbor implement a series of four separate measures which they

felt would result in meaningful reductions in noise levels to the City of Tempe. The four actions were:

- Develop a procedure that would insure that jet aircraft departures from Phoenix Sky Harbor International Airport be equally divided between east and west. This division would be 50-50 during daytime hours (7:00 a.m. to 10:00 p.m.) and 50-50 during nighttime hours (10:00 p.m. to 7:00 a.m.).
- Develop a Runway 8 departure that would require jet aircraft to proceed to the Salt River VOR prior to an on-course transition.
- Relocate the Rio Salado NDB to the center of the Salt River bed.
- Require jet aircraft departing Runway 8 with destinations north of Los Angeles to use the Drake SID instead of the Buckeye SID.

This request has resulted in the beginning of investigations into methodologies for the abating noise from departures to the east of the facility. A test was conducted of the noise impact associated with redesigned departure procedure from Runways 8R and 8L which called for turns on course after reaching a location one mile west of the VOR rather than after passing the NDB. This procedure would effectively retain aircraft on their initial departure headings until approximately one mile east of their current turn locations. The test indicated that noise exposure increased slightly at the north Tempe site; also, at the three monitoring sites in Mesa, noise exposure increased in greater proportions than the decreases of noise exposure at three sites in Tempe south of the river.

The Aviation Department has undertaken a number of additional measures which predate the previous actions and are

directed to the abatement or control of noise. As a community response mechanism, the department has employed a noise abatement specialist, acquired a set of six portable noise monitors, established a 24-hour noise complaint phone line, developed an audio-visual program of noise education, and prepared an educational brochure for broad distribution in the community. While none of these actions results in the actual reduction of noise, each contributes to the general understanding of what actions can be taken to reduce noise.

Changes to noise exposure have been monitored on a continuing basis. An up-to-date set of noise contours were prepared which represented the exposure pattern present throughout the community during 1985. These patterns were validated through field measurements. Use of the Rio Salado radio beacon departure procedure has been monitored for several years with compliance increasing from 40 to 97 percent as pilots were educated as to its effect.

A noise abatement committee, composed of persons representing both aviation and community interests was organized and meets periodically to review and discuss noise related issues. Meetings have been held with the various land use control agencies to promote the development of compatible uses in the noise-impacted areas.

Instrument procedures which have been investigated and tested during the last few years include the installation of a VOR on the airport, the relocation of the Rio Salado NDB and the redesign of easterly departure procedures. None have been implemented to date.

The airport has an on-going program of land acquisition related to both noise abatement and airport development. During the past few years, a large area

of incompatibly-used property west of the airport has been acquired for the development of new compatible facilities. This acquisition has resulted in the removal of approximately 5,600 persons from within areas impacted by high levels of aircraft noise. Later portions of this study will address the mitigation of impacts over areas not included within the land acquisition program.

## AIRSPACE AND ATC

Effective noise abatement procedures require efficient airspace management. Without good air traffic control (ATC) procedures, utilized in a well-developed airspace environment, implementation of a noise abatement program could not be accomplished. Therefore, a critical analysis of ATC and airspace is necessary. Since the Federal Aviation Administration (FAA) retains the ultimate responsibility for all decisions pertaining to airspace management and air traffic control at the airport, implementation of any recommendation requires its review and approval.

Albuquerque Air Route Traffic Control Center (ARTCC) was established to control aircraft flying under Instrument Flight Rules (IFR) within controlled airspace across the multi-state area. The Albuquerque ARTCC has delegated a section of airspace around Phoenix to the controllers at Phoenix. This area, illustrated in Exhibit 1D, is assigned to the Phoenix Terminal Radar Approach Control (TRACON) facility for control of all IFR traffic in the Phoenix Airport Radar Service Area (ARSA, discussed below) and all IFR traffic at Phoenix Sky Harbor International Airport, Scottsdale Municipal Airport, Phoenix-Deer Valley Airport, Falcon Field Municipal Airport, Chandler Municipal Airport, Stellar Airpark, Casa Grande Municipal Airport and military facilities at Williams AFB, Luke AFB, and Luke

Air Force Auxiliary Field Number One. These and a large number of other airports are all located in the Phoenix area.

The air traffic flow in Phoenix consists of a mixture of airline, air taxi, military, and general aviation aircraft, ranging in size from large air carrier jets to small single engine propeller or helicopter aircraft. Even in visual meteorological conditions, most airline and military aircraft generally operate IFR, while the remaining aircraft generally operate under Visual Flight Rules (VFR). IFR arriving aircraft are transferred from Albuquerque ARTCC control to TRACON control prior to reaching one of the designated arrival gates. TRACON controllers direct the aircraft to the airport by instructing the pilots to fly either Standard Terminal Arrival Routes (STARs) or specific radar headings, called radar vectors. Since the TRACON controls all IFR traffic, the maintenance of separation between aircraft is critical to its selected approach procedure.

The FAA uses a series of Standard Instrument Departure (SID) procedures at Phoenix Sky Harbor International Airport to expedite the handling of departing traffic. Aircraft departing on Runway 8R or 8L and using a SID should turn from runway heading to overfly the Rio Salado NDB and then turn to the left or right along defined compass headings from the Phoenix VORTAC. Aircraft departing to the west on Runway 26R or 26L should climb along the runway heading until passing a point 13 miles from the Salt River VORTAC and then turn to the left or right to preassigned headings. All aircraft using the SID should clearance to enroute altitudes after departure. The standard departure and arrival routes are depicted on Exhibit 1E.

Actual flight tracks vary depending upon aircraft weight, type, velocity, wind speed and direction, and pilot

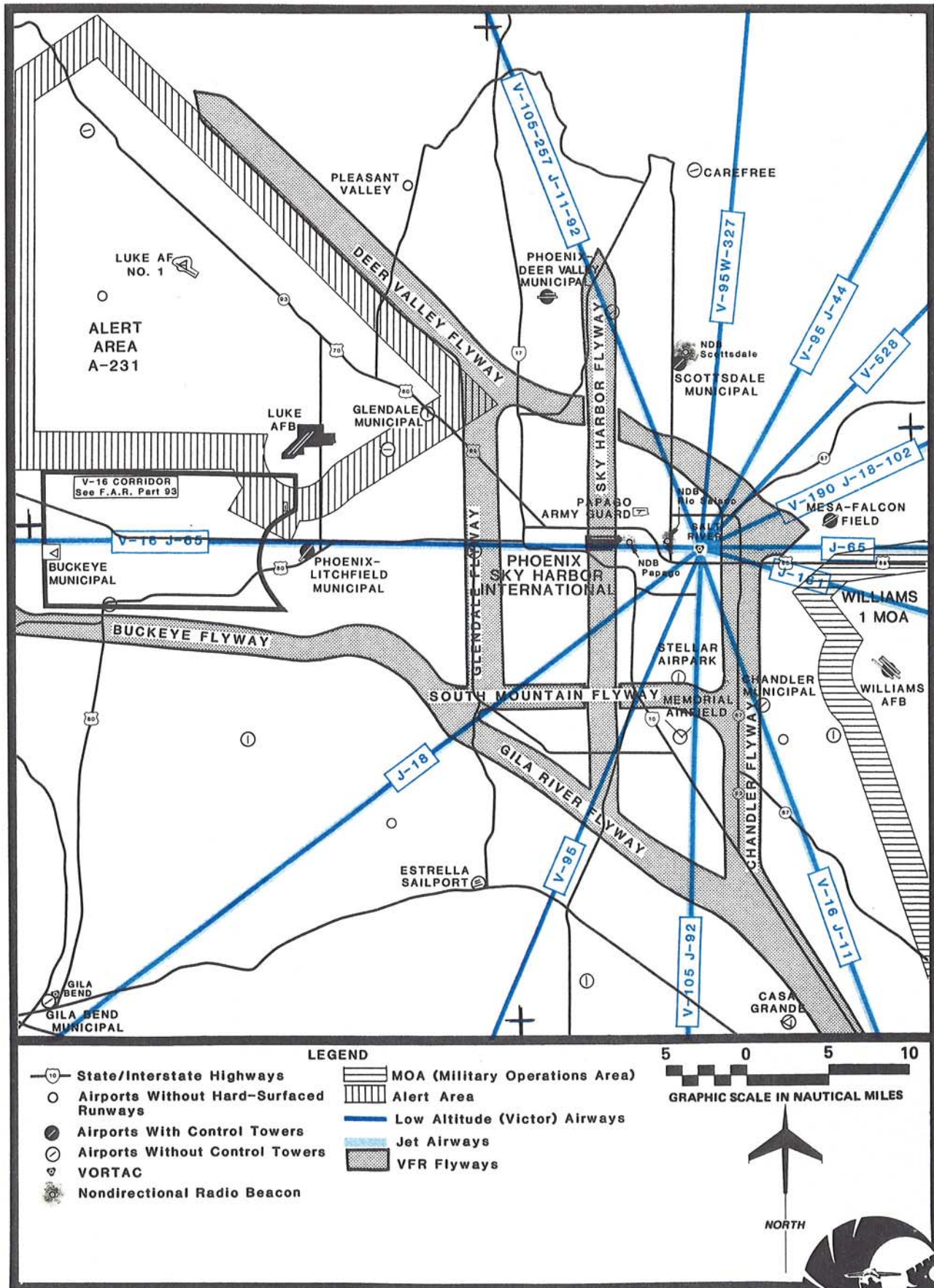
performance. Upon passing beyond the boundaries of the TRACON airspace, control of departing aircraft is transferred to Albuquerque ARTCC, but before an aircraft climbs through 17,000 feet MSL.

Most IFR aircraft transit the Phoenix airspace via one of the federal airways depicted in Exhibit 1D, Airspace Structure. Many general aviation, air taxi, and commuter operations use VHF Omnidirectional Range (VOR) Low Altitude Airways or fly along designated flyways, while the military and air carrier operations use the Jet Route (High-Altitude) System. The VOR Airway System is commonly referred to as the Victor Airway System and is established for flight operations below 18,000 feet MSL; the Jet Routes also use VOR facilities on the ground to provide pilots with course guidance.

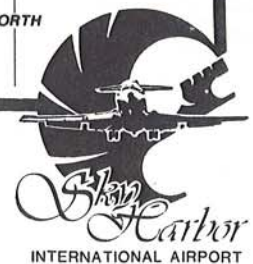
Phoenix TRACON also provides STAGE III radar service to VFR aircraft operating within the Phoenix Airport Radar Service Area (ARSA). The ARSA is depicted in Exhibit 1F. In an ARSA, STAGE III radar sequencing and separation service between IFR aircraft and participating VFR aircraft is provided to VFR pilots who request it.

The Phoenix Sky Harbor International Airport Control Zone extends to a radius of 5 miles from the airport, with easterly and westerly extensions to accommodate instrument approaches. All Control Zones in the area are depicted in Exhibit 1F. The Phoenix Sky Harbor Control Zone originates at ground level and extends up to an altitude of 14,500 feet MSL.

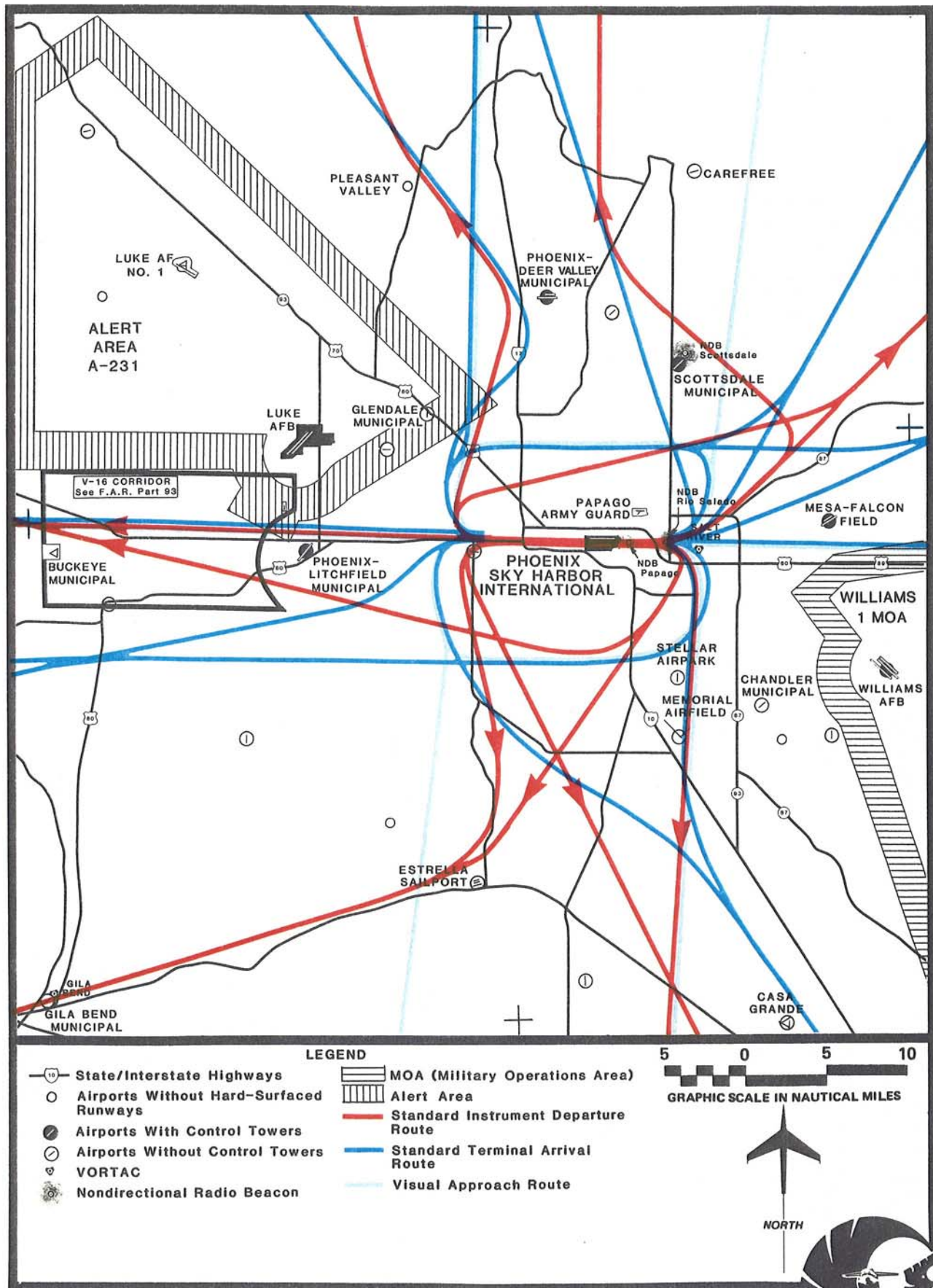
In addition to the zones of airspace specifically related to Sky Harbor, the presence of Military Operations Areas (MOAs) within the area will influence the potential alternatives available for noise abatement. Prior investigations have indicated that procedures to the east of the airport are constrained by



**Exhibit 1D  
AIRSPACE STRUCTURE**







**Exhibit 1E**  
**ARRIVAL AND DEPARTURE ROUTES**



airspace conflicts with MOA 1 of Williams Air Force Base. The MOAs are intended to separate military activity from IFR traffic and provide notice of the location of intense military training to VFR traffic. The MOAs are normally used only on weekdays from 6 a.m. to 9 p.m. A second area of significant military activity has been designated by the FAA as Alert Area A-231. North of Luke Air Force Base, it is the location of concentrated student jet training and is so designated to inform pilots to use caution within its boundaries. Both areas are indicated on Exhibit 1F.

For those interested in further investigation of the airspace structure within the region, the Maricopa Association of Governments has published **Phase II - Airspace Analysis, Regional Aviation System Plan Update** (October 1984) which details the interactions between the public airports in the area and assesses potential enhancements of the system.

## **NEIGHBORING AIRPORTS**

Among the other airports located in the vicinity of Phoenix Sky Harbor International Airport, several are especially important to this study. Most critical to the assessment of solutions to the noise concerns at Sky Harbor at the airports interactions and potential for conflicts with traffic at Williams or Luke Air Force Base. Of lesser concern is the potential for interaction with Chandler Municipal Airport, Memorial Airfield, Mesa-Falcon Field, Papago Army Aviation Support Facility, Scottsdale Municipal Airport, and Stellar Airpark. Because of their close proximity to Phoenix Sky Harbor International or its traffic corridors, the potential exists for interaction of aircraft among the various airports.

**Williams Air Force Base** - This facility is one of the busiest airports in the world.

In 1986, a total of 536,352 operations occurred there or within one of the MOAs. The three parallel runways are aligned in a 12-30 direction and serve operations by high-performance military training aircraft. The base is located 20 miles southeast of Phoenix Sky Harbor International Airport, but its associated protected airspace areas and traffic patterns overlap those of the air carrier facility. Departures or arrivals to and from the northwest at Williams AFB constrain the development of departure and arrival procedures to and from the east at Sky Harbor.

**Luke Air Force Base - Luke AFB** is a training facility for supersonic jet aircraft and served 224,404 operations in 1986. Its two parallel runways are aligned in a 3-21 orientation. Although the facility is approximately 22 miles west of Sky Harbor International Airport, there are moderate constraints on Sky Harbor arrival and departure procedures from the west caused by Luke AFB departures and arrivals to the south. Furthermore, the MAG Airspace Study found that significant conflicts are present between civilian VFR traffic using the Buckeye flyway or the V-16 airway and military traffic on the south side of the Air Force Base.

**Chandler Municipal Airport** - Located 15 miles to the southeast of Phoenix Sky Harbor International Airport, this facility has a single runway aligned as 4-22. The runway is 4,395 feet long. During 1986, the airport had 135,000 operations and 196 based aircraft. While the airport lies near the flight corridor associated with the Stanfield SID departure no airspace conflicts between the two airports are noted. Instrument procedures at Chandler Municipal Airport do however have the potential to conflict with operations at Stellar Airpark and Williams AFB.

**Memorial Airfield** - This restricted use general aviation airport is 14 miles

southeast of Phoenix Sky Harbor International Airport, under the flight corridor of the Stanfield SID. Its runways, 12-30 and 3-21, are marked as closed, but are used by pilots who base approximately 50 aircraft at the facility. Approximately 25,000 operations occurred at the airport in 1986. Operations at Memorial do not conflict with Sky Harbor traffic, but do interact with traffic at Chandler Municipal and Stellar Airpark.

**Mesa-Falcon Field Municipal Airport-** This general aviation reliever facility is located approximately 15 miles east of Phoenix Sky Harbor International Airport, slightly north of the extended centerline of parallel Runways 8-26. It has a set of parallel runways in a 4-22 orientation. Runway 4R-22L is 5,100 feet long and Runway 4L-22R is 3,800 feet in length. All traffic patterns are to the west side of the airport for noise abatement and pilots are advised not to fly westbound from the airport because of heavy air carrier activity at Sky Harbor. During 1986, 181,361 operations took place at the airport and there were 725 based aircraft. No significant airspace conflicts have been noted between the two airports.

**Papago Army Aviation Support Facility-** This is an Army helicopter base located 2 miles northeast of Phoenix Sky Harbor International Airport. Because it is within the Sky Harbor ARSA and control zone, aircraft operating to and from the facility do so in compliance with a letter of agreement between the Papago AASF and the Phoenix ATC Tower. This agreement delineates specific departure-arrival routes along McDowell Road. Operation under the procedures avoids the occurrence of conflicts between aircraft using the two facilities.

**Scottsdale Municipal Airport -** Located 11 miles northeast of Phoenix Sky Harbor International Airport, is a general aviation reliever facility.

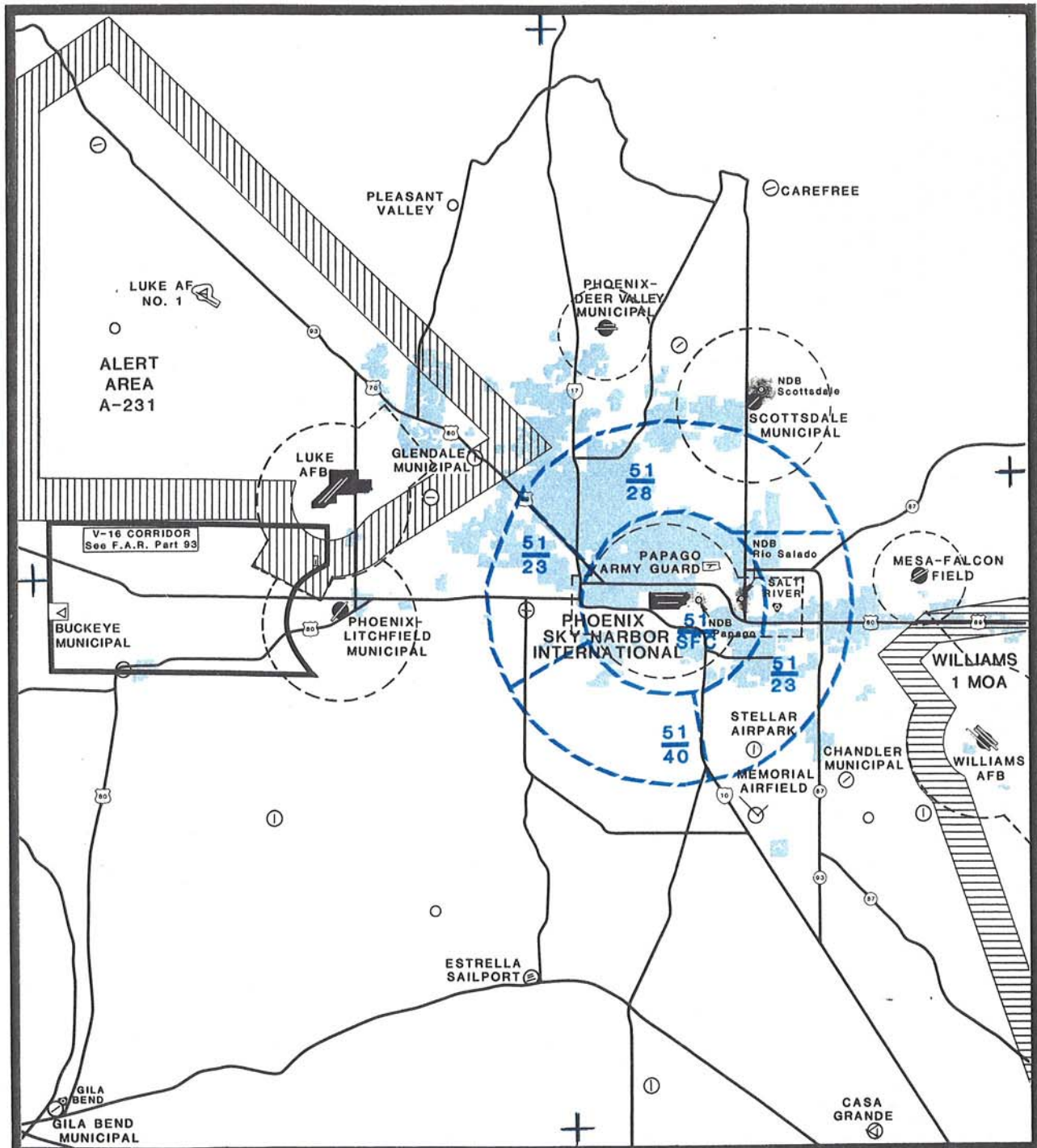
Runway 3-21 is 8,250-foot long, but limited to aircraft not exceeding 60,000 pounds gross weight. Noise abatement arrival and departure procedure have been developed which concentrate traffic on the northwest side of the airport. The airport hosts 500 based aircraft and was credited with approximately 190,000 operations in 1986. The only instrument approach to the airport from the south, the VOR-A, conflicts with Sky Harbor aircraft using the Payso Hi Two or Drake Eight departure procedures.

**Stellar Airpark -** This is a privately owned airport located 9 miles southeast of Phoenix Sky Harbor International Airport, under the Stanfield SID departure route. Missed approach procedures at the airport have the potential to conflict with activity on the east side of Sky Harbor. The airport has a single 4,000 foot long runway oriented as Runway 17-35.

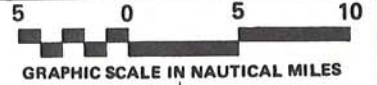
## STUDY AREA DELINEATION

One or more study areas and their boundaries are delineated early in the study during the inventory phase in order to establish a consistent basis for reporting geographically-related background information. Three primary criteria are used in defining the boundaries: 1) the 1987 and future Ldn 65 aircraft noise contours, to be calculated later, should fit within the boundaries; 2) the boundaries should be consistent with other standardized data collection areas, such as census tracts and local traffic analysis zones; and 3) major noise complaint areas and areas of official concern should fit within the boundaries. Additionally, study areas are drawn to include areas which could be affected by rerouting of aircraft flight tracks.

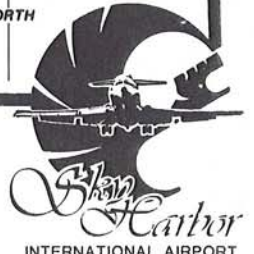
To define the study area, a review was first made of earlier noise contours prepared for the airport. This review



- LEGEND**
- State/Interstate Highways
  - Airports Without Hard-Surfaced Runways
  - Airports With Control Towers
  - Airports Without Control Towers
  - VORTAC
  - Nondirectional Radio Beacon
  - MOA (Military Operations Area)
  - Alert Area
  - Control Zones
  - Urbanized Areas
  - Altitudes
  - ARSA Boundary



**Exhibit 1F  
PHOENIX AIRPORT  
RADAR SERVICE AREA  
AND CONTROL ZONES**





was supplemented by the calculation of a test set of noise contours for current operating conditions. The area covered by those contours is generally bounded by Dobson Road to the east and 35th Avenue to the west and is generally bounded by McKellips Road to the north and University Drive to the south. This area was expanded to allow for slight changes in flight tracks and for substantial growth in airport operations. The resulting area is bounded by McDowell to the north, Alma School to the east, Broadway to the south and 43rd Avenue to the west. This area is defined as the Detailed Study Area and will be the primary geographical unit of analysis during the study.

Beyond the Detailed Study Area are areas in which airport noise is also of concern and the source of formal complaints. Generally, these areas lie beneath departure turn tracks on which operations are insufficient to create an Ldn 65 contour but which produce frequent and regular single-event noise levels so as to annoy residents. These areas are primarily located east of the airport, north and south of the Detailed Study Area. A review of past noise complaint data and discussion with local officials indicate that boundaries drawn along Indian School Road to the north and Guadalupe Road to the south will contain the vast majority of residents who are seriously concerned about Sky Harbor related aircraft noise. These north-south boundaries would also contain even the most extreme changes in airport flight tracks. The boundaries of 43rd Avenue (to the west) and Alma School Road (to the east) would continue to serve for these purposes. The resulting area is defined as the Generalized Study Area and will be used for inventory purposes and on an as-needed basis throughout the study.

The Detailed and Generalized Study Areas are shown in Exhibit 1G. The

Detailed Study Area is a rectangle four miles wide and 17 miles long, containing 68 square miles. The Generalized Study Area is a rectangle nine miles wide and 17 miles long, containing 85 square miles, excluding the inner Detailed Study Area, and a total of 153 square miles.

The City of Phoenix comprises the center and western end of the Detailed Study Area (approximately 43.5 square miles) while Tempe (13.7 square miles), Scottsdale (2.3 square miles), Maricopa County (1.3 square miles), Mesa (3.3 square miles) and the Salt River Indian Reservation (4.0 square miles) comprise the eastern end. Municipal boundaries are shown on Exhibit 1-G. Phoenix Sky Harbor International Airport occupies approximately 4.6 square miles of the center portion of the Detailed Study Area, all within the corporate limits of the City of Phoenix.

The Generalized Study Area contains 34 square miles to the north of the Detailed Study Area and 51 square miles to the south. The northern sub-area contains 23.3 square miles of Phoenix land in the central and western portions, as well as 6.7 square miles of Scottsdale and 4.0 square miles of Reservation land to the east. Comprising the southern sub-area are Phoenix (26.5 square miles) in the west and central portions, Maricopa County (4.1 square miles) in the far western portion, and Guadalupe (.6 square miles), Tempe (14.8 square miles) and Mesa (5.0 square miles) in the eastern portion.

It is extremely important to note that the two study areas are not a definition of the noise impact areas. They are simply areas for which background data will be gathered and differing levels of analysis will be performed. The areas significantly impacted by aircraft noise will be rigorously defined in later analysis.

## JURISDICTIONS AND RESPONSIBILITIES

Reduction of aircraft noise impacts is a complex issue, with several parties sharing in the responsibility: the Federal government, state and local governments and planning agencies, the airport proprietor, air carriers, military and general aviation airport users, air travelers and shippers, and local residents. All interests must be considered and involved in the development of this airport noise compatibility plan. Additionally important is an understanding of which parties have vested power to take action and the limits of their authority to do so.

### FEDERAL

The Aviation Safety and Noise Abatement Act of 1979 (P.L. 96-193), signed into law on February 18, 1980, was enacted "to provide and carry out noise compatibility programs, to provide assistance to assure continued safety in aviation, and for other purposes." This legislation requires the establishment, by the U.S. Department of Transportation, of single systems for measuring aircraft noise, determining noise exposure, and identifying land uses which are normally compatible with various noise exposure levels. The Aviation Safety and Noise Abatement Act does not direct the FAA to preempt local authority and responsibility for airport noise abatement.

FAR Part 150, developed in response to the Act, prescribes requirements for airport operators who choose to develop an airport noise compatibility planning program under the federal program, including the development and submission to the FAA of noise exposure maps and a noise compatibility program. Under the program, standard methodologies for analyzing noise data and standard

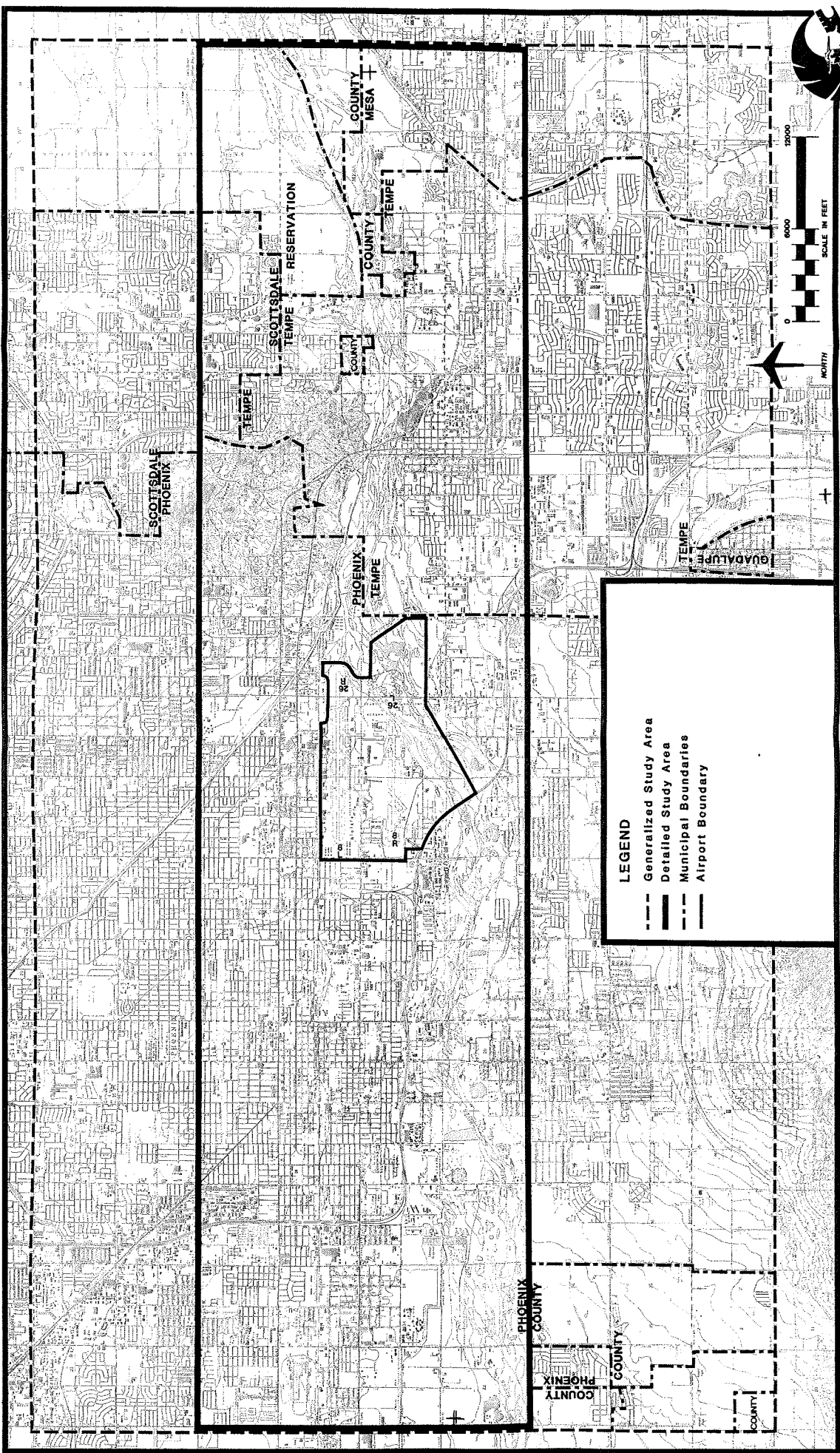
metrics or indices for describing noise measurements should be used. In addition, land uses should be identified as to their compatibility with the aircraft noise to which they are exposed. The program must also contain provisions for its implementation, updating and periodic revision.

Procedures and criteria for FAA evaluation are also provided in Part 150. Among other factors, two important considerations in the FAA approval of a Part 150 Plan are that the proprietor may not take any action that imposes an undue burden on interstate or foreign commerce, and the proprietor may not unjustly discriminate between different categories of airport users.

The FAA also reviews changes in flight procedures proposed for noise control purposes on the basis of safety of flight operations, safe and efficient use of the navigable airspace, management and control of the national airspace and traffic control systems, effect on national defense, security factors, and other similar statutory and regulatory matters. Since the FAA implements and/or regulates flight procedures, these measures are clearly in the purview of the FAA and may not be implemented unilaterally by the airport proprietor.

Airport proprietors having an approved Part 150 Noise Compatibility Plan are eligible for additional funds for land acquisition and noise control under a federal set-aside fund established exclusively for that purpose.

The Federal Aviation Administration (FAA) has required reduction of aircraft noise at the source through certification, modification of engines, or replacement of aircraft. It also regulates noise abatement procedures, to the extent that it must approve any changes in arrival and departure procedures, and provides assistance to airport operators and community representatives in the



**LEGEND**

- Generalized Study Area
- Detailed Study Area
- - - Municipal Boundaries
- Airport Boundary

Exhibit 1G  
AIRPORT STUDY AREA



development of compatible land use controls.

Federal Aviation Regulation (FAR), Part 36, prohibits the further escalation of noise levels of subsonic civil turbojet and transport category aircraft, and requires newly certificated airplane types to be markedly quieter than those developed previously. Subsequent amendments extended the noise standards to include propeller-driven small airplanes and supersonic transport-category airplanes.

As currently constituted, Part 36 has three stages of certification: Stage 3 is the most rigorous and applies to aircraft certificated since November 5, 1975; Stage 2 applies to aircraft certificated between December 1, 1969, and November 5, 1975; Stage 1 includes all previously-certificated aircraft.

FAR Part 91, Subpart E, known as the "Fleet Noise Rule," applies to jet aircraft over 75,000 pounds and mandates a compliance schedule under which Stage 1 aircraft were to be retired or retrofitted by January 1, 1985. A very limited number of exemptions have been granted by D.O.T. for foreign aircraft operating into specified international airports. Twin-engine aircraft having 100 or fewer seats such as the BAC-111 and some DC9-10s, can continue to be operated until January 1, 1988. Aircraft under 75,000 pounds do not have a phase-out schedule; that portion of the fleet mix will become FAR 36 compliant as older aircraft are retired or retrofitted because of age or poor fuel efficiency. The louder commercial jet aircraft at Phoenix-Sky Harbor International Airport are certificated for weights above 75,000 pounds and must comply with Part 91. Presently, there appear to be very few Stage I aircraft operating at Sky Harbor, and these must be discontinued by the end of 1987.

Responsibilities of the FAA pertaining to safety and the promotion of air commerce include:

- The regulation of air commerce in such a manner as best to promote its development and safety and fulfill the requirements of national defense.
- The promotion, encouragement, and development of civil aeronautics.
- The control of the use of navigable airspace of the United States, and the regulation of both civil and military operations in such airspace in the interest of the safety and efficiency of both.
- The development and operation of a common system of air traffic control and navigation for both military and civil aircraft.

The FAA also administers a program of Federal grants-in-aid for airport construction and development, thus giving the Federal government substantial power to influence airport development through its administration of this program.

#### STATE AND LOCAL

Control of land use around airports to ensure that only compatible development may occur in noise-impacted areas is a key tool in limiting the number of citizens exposed to those impacts, and it remains exclusively in the control of state and local governments. There are seven general-purpose local governments in the Study Area; Phoenix, Tempe, Mesa, Scottsdale, Guadalupe, Maricopa County, and the Salt River Indian Reservation. Through enabling legislation from the State of Arizona, the local jurisdictions (excluding the reservation), may incorporate provisions into their various regulatory documents that address the problems associated

with aircraft noise. However, to date, the State has failed to adopt legislation that would permit local governing bodies to restrict land use solely on the basis of noise impacts. The Salt River Indian Reservation has similar powers, but they are not derived from the State of Arizona or limited by the State.

Community planning for the local jurisdictions is accomplished under their respective planning departments. Overall planning coordination is assisted through the Maricopa Association of Governments and through direct coordination efforts between and among local governments. Each planning agency is responsible for preparing, adopting, and maintaining a long-range Comprehensive Development Plan. Their respective planning commissions may hold public meetings, adopt zoning and subdivision regulations, and make recommendations to the governing bodies on all planning matters. Administrative duties are carried out by the various planning agencies. From research conducted by the planning agency staff and outside consultants, studies and reports are prepared that form the basis of the comprehensive plans. Any changes in regulations are made by the governing bodies upon the recommendation of the planning commissions.

The basis for planning on the Salt River Indian Reservation is much different. The Indian Reorganization Act of 1934 authorized Indian Communities to establish constitutions and enabled them to include land use control and land ordinances among their constitutional powers, if desired. The Salt River Pima-Maricopa Indian Community included land use control powers in their constitution at that time. Land use control ordinances adopted by the community are reviewed by the U.S. Secretary of the Interior to assure compliance with Federal regulations (CFR 25). Other than that review, the Indian community is totally independent

in matters of control of development on their lands.

The principal legal tools available to assure enforcement of the comprehensive plan are:

- Zoning Ordinances
- Building Codes
- Subdivision Regulations
- A-95 Review (the responsibility of reviewing and commenting on all applications from local agencies for federal funding)
- Capital Improvement Programs (the priority listing of major public capital expenditures)

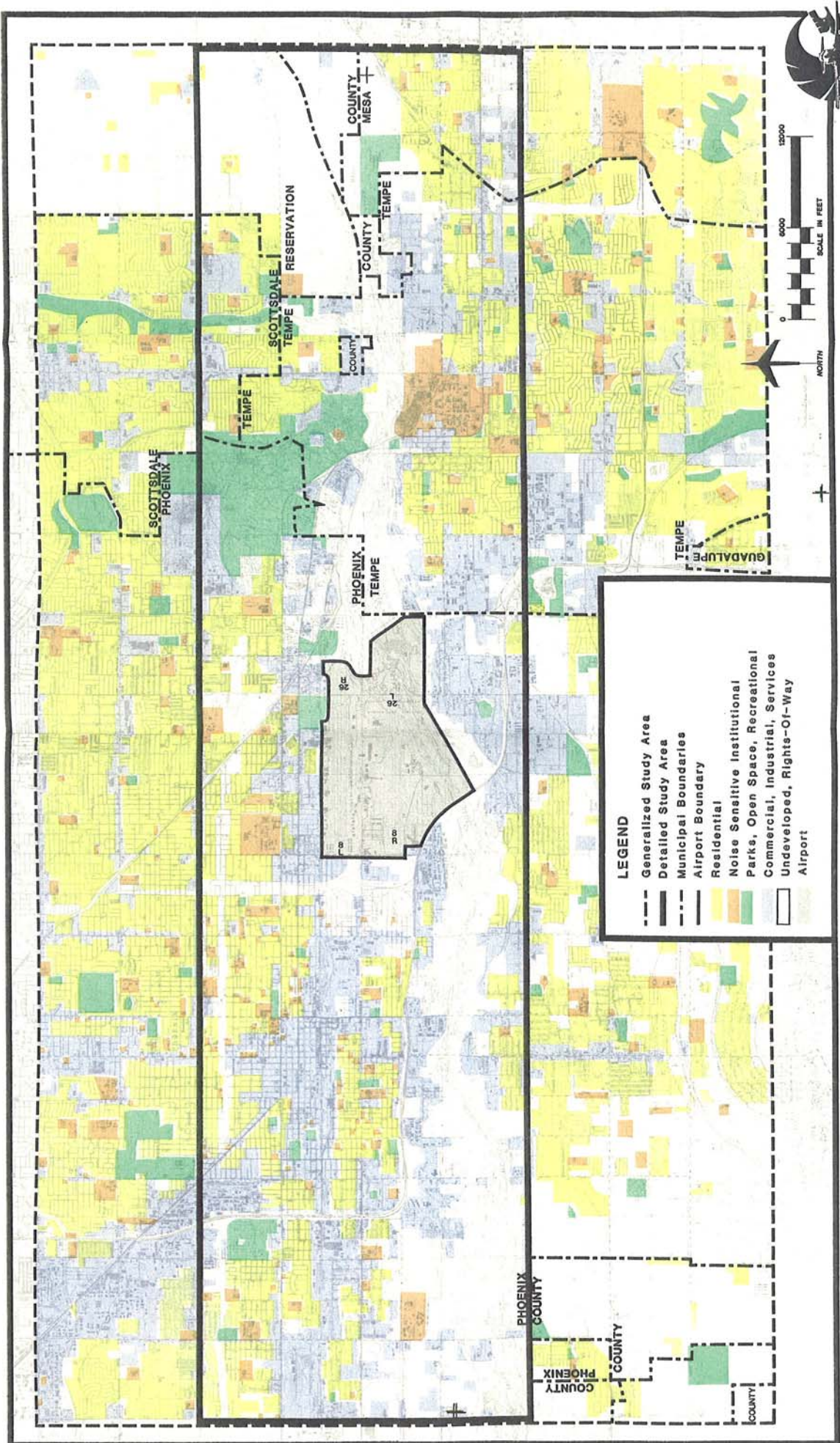
The local planning agencies are directly represented on the Planning Advisory Committee. Their review and comments of working papers during this process assist the study team in recommending land use management measures that are both effective and implementable.

#### **AIRPORT PROPRIETOR**

Phoenix-Sky Harbor International Airport is owned and operated by the City of Phoenix, a general purpose municipal corporation. The city is authorized to levy taxes, issue general obligation and revenue bonds, acquire property, exercise the power of eminent domain, and construct airport facilities to serve the citizens of Phoenix.

A 7-member Municipal Aeronautics Advisory Board, appointed by the Mayor and confirmed by City Council, acts on all staff recommendations that require council action and, if acceptable, forwards them to the Council. The Aviation Director, who manages Sky Harbor, reports to the Phoenix Transportation Services Manager who





**LEGEND**

- Generalized Study Area
- Detailed Study Area
- - - Municipal Boundaries
- Airport Boundary
- Residential
- Noise Sensitive Institutional
- Parks, Open Space, Recreational
- Commercial, Industrial, Services
- Undeveloped, Rights-Of-Way
- Airport



Exhibit 1H  
EXISTING LAND USE



PHOENIX COUNTY

PHOENIX COUNTY

COUNTY

COUNTY

COUNTY MESA

COUNTY TEMPE

COUNTY

SCOTTSDALE TEMPE RESERVATION

TEMPE

SCOTTSDALE PHOENIX

PHOENIX TEMPE

TEMPE GUADALUPE

oversees all transportation departments and is answerable to the City Manager.

Airport proprietors historically have been made liable for aircraft noise damages resulting from aircraft operations at the airport. The airport, within certain limits, may control what types of aircraft use its airport, impose curfews or other use restrictions, impose user fees based on relative noisiness of aircraft or time of day of operation, and modify airport facilities such as runway configuration to redirect and/or reduce noise levels.

The airport may also prepare plans for actions which are beyond their direct control and may propose those actions to the FAA, airlines, and local land use planners. Such actions may include runway use systems, flight track changes, flight operational procedures, steeper glide slopes, displaced thresholds, flight rescheduling, land use zoning, building codes, and real estate sales disclosure requirements.

The airport may also take steps to control on-airport noise by ordering the construction of sound barriers and acoustical shielding, and by controlling the times when aircraft engine run-up operations may take place. Within the limits of the law and financial feasibility, the city may acquire land and the interests therein, including air rights, easements, and development rights, so as to assure the use of property for purposes which are compatible with airport operations.

The airport may not take actions which would (1) impose an undue burden on interstate or foreign commerce, (2) unjustly discriminate between different categories of airport users, or (3) constitute unilateral action in matters preempted by the federal government.

## SOCIOECONOMIC PROFILE

The socioeconomic characteristics of the study area are evaluated to provide a basis in Chapter Five for determining current and potential aircraft noise impacts. Land use patterns are reviewed to identify potentially noise-sensitive uses and to perceive development trends. Economic activities are reviewed to determine the opportunities for nonresidential land use development, the least noise-sensitive urban use. Finally, population data are compiled to determine population densities, the most important measure of noise impacts.

### EXISTING LAND USE

Exhibit 1H shows existing land use in the Sky Harbor Airport Study Area. A summary of land use data, by community, is shown in Table 1H.

Land use data was developed through a field survey of the study area conducted in February of 1987, supplemented by aerial photographs and maps provided by local planning agencies. The land use categories were selected to conveniently fit the requirements of noise and land use compatibility planning.

The residential category includes all types of residential dwellings except transient lodging such as hotels and motels, which is included in the commercial category, and college campus housing, which are included in the noise-sensitive institutional category.

The noise-sensitive institutional category includes schools, libraries, churches, hospitals, and ambulatory care centers. The parks, open space, recreation category includes public parks, cemeteries, and golf courses.

The noise-insensitive categories include developed land uses, undeveloped land, and airport. The noise-insensitive developed land uses comprise the

commercial, industrial and services category and include all businesses, offices, services, utilities, and industrial uses. The undeveloped category includes vacant lots, farmland, river bed, and road and rail rights-of-way. The airport category is used exclusively for the land holdings of Sky Harbor, whereas the Papago Military District air strip is included in the industrial category since there are so few aviation operations and so much nonaviation use of the facility.

Approximately 71 percent of the total study area is developed and 29 percent is undeveloped. A major portion of the undeveloped land (60 percent) is comprised of three land areas, each approximately nine square miles in size: the bulk of the Salt River Indian Reservation, the Salt River floodway, and the southwestern corner of the study area.

The Detailed Study Area is smaller than the Generalized Study Area, but is more intensely developed for commercial/industrial uses and airport use. In contrast, the Generalized Study Area is more residential in character.

Approximately 27 percent of the Detailed Study Area is developed for residential uses and local residential streets, while a much higher portion of the Generalized Study Area (48 percent) is so developed. The two study areas are developed in approximately equal proportions for noise-sensitive institutional uses and parks and open space uses. The Detailed Study Area has a much higher proportion of commercial/industrial development (25 percent vs 11 percent) and the two areas are approximately equally undeveloped.

**TABLE 1H**  
**Land Use Percentages**  
**By Community**

	Area Sq. Mi.	Land Use Percentages					Un- devel.	Total
		Resid.	Noise Sensitive	Parks Open	Comm Ind.	Air- port		
Detailed Study Area	68.0	27.0	5.1	5.6	24.9	6.8	30.6	100.0
Phoenix	43.5	26.6	2.8	5.3	32.2	10.6	22.5	
Tempe	13.7	28.0	10.9	9.5	13.9	0	37.7	100.0
Scottsdale	2.3	57.0	4.2	7.6	26.0	0	5.2	100.0
Maricopa County	1.3	23.0	0	0	15.6	0	61.4	100.0
Mesa	3.3	35.9	18.1	1.9	22.7	0	21.4	100.0
Salt River Reserv.	4.0	4.7	2.0	0	1.0	0	92.3	100.0
Generalized Study Area	85.0	47.7	4.4	5.3	11.4	0	31.2	
Phoenix	49.8	48.4	2.0	4.7	12.1	0	32.8	100.0
Tempe	14.8	51.2	4.1	4.7	13.5	0	26.5	100.0
Scottsdale	6.7	72.2	4.5	11.2	9.5	0	2.6	100.0
Maricopa County	4.1	6.1	.1	12.2	.6	0	81.0	100.0
Mesa	5.0	62.5	13.8	5.7	18.0	0	0	100.0
Salt River Reserv.	4.0	2.5	1.0	0	3.3	0	93.2	100.0
Guadalupe	.6	80.0	2.0	0	0	0	18.0	100.0



In the Detailed Study Area, Phoenix has the highest absolute quantity of commercial/industrial land use, as well as the highest percentage of area devoted to such use. Only Tempe, of the others, has significant commercial/industrial development. Noise-sensitive institutional uses comprise approximately five percent or less of the areas of each of the communities, while parks and open spaces comprise no more than six percent. Unincorporated Maricopa County is very lightly developed, and the Salt River Indian Reservation is less than eight percent developed.

With respect to development of individual communities, the Generalized Study Area is nearly a mirror image of the Detailed Study Area. Unincorporated Maricopa County and the Salt River Indian Reservation are very lightly developed while Phoenix is the most commercial industrial. In general, however, development is less intense in the Generalized Study Area, even though the absolute acreage data do not provide that information.

A review of Exhibit 1-H will show the overall land use patterns near Sky Harbor Airport and beneath its arrival and departure tracks. In the immediate neighborhood of the airport, the predominant land is commercial and industrial. Additionally, a large amount of land is undeveloped near the airport, especially in the Salt River floodway and to the west to 16th Street where much of the land has been cleared.

The area west of the airport, north of the river and south of McDowell is mostly in a neighborhood locally defined as the Central City Village. This is the heart of the Phoenix metropolitan area with local and state governmental centers, numerous college and hospital campuses, cultural facilities, and the downtown office and shopping centers.

Between the downtown area and the airport is a mixture of residential, commercial, industrial and transportation land uses usually found around an urban center core. The area between 16th Street and the airport, called the West Approach Land Acquisition Area (WALA), is transitioning from a mixed residential/industrial area to industrial re-use, but is presently vacant for the most part. Other areas are similarly in transition as they adjust from the effects of freeway development, decline of railroad land usage, and from expansion of the downtown core and large institutions.

North of the airport, beyond Van Buren, is the southern portion of the Camelback East Village, a sub-area called the Gateway Core. This area is an equal mixture of residential, commercial, industrial and undeveloped land. The present level of office and industrial development suggests that a change is occurring in that blend of land uses. Two large hospital campuses are also found in this area.

East of the airport, beyond Priest Drive, land uses change from industrial and undeveloped to a more complex mixture. The Salt River lies along the extended runway centerlines while to the south, in Tempe, is found a large residential area, the Arizona State University campus, and Tempe's downtown. To the north of the Salt River is the Papago Park complex, the Papago Military District, and the Salt River Project facilities. Beyond these areas, north and south of the Salt River between Rural/Scottsdale Road and Price/Pima Road, the land use patterns become even more complex. Scottsdale's Indian Bend Wash Park and linear commercial/industrial development along McDowell and Scottsdale Roads outline large residential areas of single-family, multiple-family and mobile home units. Directly south in Tempe are large industrial areas along the river, Broadway and the S.P.R.R.

tracks. Within those areas and farther south are large residential areas of mixed densities.

Beyond Price/Pima Roads lie the Salt River Indian Reservation, north of the river, and Mesa south of the river. Mesa's Riverview Park is located along the southern edge of the river. Further south are mixed-density residential areas, a commercial/industrial corridor bounded by University Drive and Broadway, more large residential areas, Mesa Community College, and the Fiesta Mall.

South of the airport, beyond the Salt River lies an area which in Phoenix is called South Mountain Village. This area is largely industrial north of Southern Avenue and low-density residential farther south. Along the southern edge of the Generalized Study Area is the South Mountain Park, locally touted as the largest urban park in the world. The small community of Guadalupe also is found in this area.

In summary, the Detailed Study Area is fairly intensively developed, outside of the Salt River floodway and the Indian Reservation, and is experiencing infilling, land use transitioning, and neighborhood redevelopment. Within the Generalized Study Area development is intense in Scottsdale, Tempe, Mesa and the northern portion of the area in Phoenix. The southern portion of the area in Phoenix, as well as the unincorporated Maricopa County land and the Indian Reservation range between being virtually undeveloped to moderately developed.

## POPULATION

The total study area constitutes a large portion of Maricopa County; approximately 32 percent of its resident population is in the Detailed Area and the Generalized Study Area. (Resident

population excludes seasonal and transient population.)

All current population figures are for October 1985, the benchmark period for the 1985 Phoenix area special census. Presently, 55 percent of the resident population of the study area is located in Phoenix (262,895 people) and 25 percent is in Tempe (117,338). The remaining 20 percent of the population resides in Scottsdale, Guadalupe and Maricopa County (including the Salt River Indian Reservation (see Table 1-I). Of this total number, 63 percent (300,438) are found in the Generalized Study Area and 37 percent (174,984) in the Detailed Study Area.

Within the Detailed Study Area, Phoenix comprises 58 percent of the total resident population, while Tempe, Mesa, Scottsdale, and unincorporated Maricopa County comprise 28, 7, 6 and one percent respectively.

In addition to present levels of population, forecast levels are also of interest in Part 150 planning, as they are indicators of potential changes in noise impacts. The Maricopa Association of Governments (MAG) recently adopted countywide population projections by municipal planning areas, districts and traffic analysis zones (TAZ's). These forecasts were based on the Maricopa County control total prepared by the Arizona Department of Economic Security. Sub-county allocations were prepared for MAG by Mountain West Research-Southwest, Inc. These forecasts are shown for communities in the two study areas in Table II. The percentages of forecast growth are shown in Table 1-J relative to the base reference time of October 1985.

The fastest growth rates in the study areas are forecast to 2005 for Tempe (nearly 47 percent). Phoenix and Scottsdale rates are also high for that period (39 percent and 25 percent

respectively). Mesa and Guadalupe will grow at a more modest rate (16 percent and 12 percent), and the unincorporated county is expected to decline slightly.

In terms of absolute growth, the picture is somewhat different. Phoenix will be the growth leader with over 100,000 new residents in the study areas while Tempe will grow by about half that amount (55,000). The remainder of the two study areas will grow only about 20,000 in total. In some cases, these absolute growth rates are limited by demand (e.g. Maricopa County) while in others the rates are limited by available developable land (e.g. Scottsdale, Mesa and Tempe).

Focusing on the Detailed Study Area, overall growth through 2005 will be about 55,000, or 31 percent, a slower rate than the Generalized Study Area. Phoenix, Mesa and Scottsdale will grow at slightly below the area average, while Tempe will grow much above and Maricopa County will actually decline slightly. In absolute terms, Phoenix is forecast to grow by 25,000 residents in the Detailed Study Area, compared to 23,000 in Tempe and to about 7,000 in Scottsdale, Mesa and the county combined.

Other population factors which are of importance in the Part 150 planning process are shown in Table 1K. The information was derived as part of the 1980 decennial census and is probably still suitable for comparing areas within the study area, in spite of the great change in population counts.

In general, research has shown that sensitivity to noise increases with age (after adulthood). Median age and percent of population age 65 or over are

two indicators of especially noise-sensitive population groups. Table 1-K shows comparative median ages in 1980 for Maricopa County, Mesa, Phoenix and Scottsdale, as well as the percent of population age 65 or over. Mesa and Scottsdale were only slightly below the county median age of 29.7, while Tempe was somewhat lower and Scottsdale was substantially higher. Similar relationships exist for percent age 65 or over.

A much wider range of median ages exists in the census tracts within the study area. Phoenix has the widest range, 18.9 to 48.0, but the variation is caused mostly by populations below age 65. In fact, few census tracts had a percentage of population over age 65 in excess of 20 percent of the tract total. Most of the Phoenix tracts of substantially older than normal residents are northwest of the airport between McDowell and Indian School Road and between I-17 and 40th Street. Some older tracts are also found immediately south of McDowell.

Scottsdale and Tempe have about the same ranges of ages from tract to tract, a variation of approximately 30 years median age, but Scottsdale range is older. Most of the Scottsdale and Tempe tracts having older than typical populations are outside of the Detailed Study Area, similar to the case in Phoenix. Mesa, in contrast did not have a significant variation in median ages, by tracts, in 1980.

The unincorporated part of the study area, mostly Reservation land, matched the county median age almost exactly. Guadalupe showed an extremely young median level of 19.4 years.

**TABLE 11**  
**Total Resident Population**  
**Sky Harbor Study Areas**

	October	Forecast			
	<u>1985</u>	<u>1990</u>	<u>1995</u>	<u>2000</u>	<u>2005</u>
<u>Phoenix</u>					
Detailed Area	102,176	111,316	118,175	124,960	127,496
General Area	<u>160,719</u>	<u>187,314</u>	<u>205,685</u>	<u>221,952</u>	<u>237,058</u>
Total	<u>262,895</u>	<u>298,630</u>	<u>323,860</u>	<u>346,912</u>	<u>364,554</u>
<u>Tempe</u>					
Detailed Area	49,049	56,585	61,776	67,323	72,569
General Area	<u>68,289</u>	<u>75,587</u>	<u>83,831</u>	<u>92,227</u>	<u>99,582</u>
Total	<u>117,338</u>	<u>132,172</u>	<u>145,607</u>	<u>159,550</u>	<u>172,151</u>
<u>Mesa</u>					
Detailed Area	11,366	11,819	13,737	14,429	14,576
General Area	<u>32,932</u>	<u>34,332</u>	<u>35,479</u>	<u>36,654</u>	<u>36,946</u>
Total	<u>44,298</u>	<u>46,151</u>	<u>49,216</u>	<u>51,083</u>	<u>51,522</u>
<u>Scottsdale</u>					
Detailed Area	11,095	12,141	13,276	14,009	14,072
General Area	<u>33,184</u>	<u>35,247</u>	<u>37,281</u>	<u>39,793</u>	<u>41,127</u>
Total	<u>44,279</u>	<u>47,388</u>	<u>50,557</u>	<u>53,802</u>	<u>55,199</u>
<u>Maricopa Co.<sup>1</sup></u>					
Detailed Area	1,298	1,285	1,272	1,259	1,246
General Area	<u>705</u>	<u>705</u>	<u>705</u>	<u>708</u>	<u>714</u>
Total	<u>2,003</u>	<u>1,990</u>	<u>1,977</u>	<u>1,967</u>	<u>1,960</u>
<u>Guadalupe</u>					
General Area	4,609	4,711	4,816	5,011	5,154
<u>Grand Total</u>					
Detailed Area	174,984	193,146	208,236	221,980	229,959
General Area	<u>300,438</u>	<u>337,896</u>	<u>367,797</u>	<u>396,345</u>	<u>420,581</u>
Total Study Area	475,422	531,042	576,033	618,325	650,540

<sup>1</sup> Unincorporated Area. Includes Salt River Indian Reservation.

**TABLE 1J**  
**Forecast Population Growth**  
**Sky Harbor Study Areas**  
**(Percent Above October 1985)**

	<u>1990</u>	<u>1995</u>	<u>2000</u>	<u>2005</u>
<u>Phoenix</u>				
Detailed Area	8.9	15.7	22.3	24.8
General Area	16.5	28.0	38.1	47.5
Total	13.6	23.2	32.0	38.7
<u>Tempe</u>				
Detailed Area	15.4	25.9	37.3	48.0
General Area	10.7	22.8	35.1	45.8
Total	12.6	24.1	36.0	46.7
<u>Mesa</u>				
Detailed Area	4.0	20.1	26.9	28.2
General Area	4.3	7.7	11.3	12.2
Total	4.2	11.1	15.3	16.3
<u>Scottsdale</u>				
Detailed Area	9.4	19.7	26.3	26.8
General Area	6.2	12.3	19.9	23.9
Total	7.0	14.2	21.5	24.7
<u>Maricopa County<sup>1</sup></u>				
Detailed Area	(1.0)	(2.0)	(3.0)	(4.0)
General Area	0.0	0.0	0.4	1.3
Total	(0.6)	(1.3)	(1.8)	(2.1)
<u>Guadalupe</u>				
General Area	2.2	4.5	8.7	11.8
Total Area	11.7	21.2	30.1	38.3
Detailed Area	10.4	19.0	26.9	31.4
General Area	12.5	22.4	31.9	40.0
Total				
Maricopa County	23.1	51.9	77.0	98.3

<sup>1</sup> Unincorporated Area. Includes Salt River Indian Reservation.

**TABLE 1K**  
**Study Area**  
**Population Profile**

<u>Area</u>	<u>Median Age</u>	<u>% Age 65+</u>	<u>Pop. Per Unit</u>	<u>Unemployed % 1979</u>	<u>Family Income Below Poverty</u>
<u>County</u>	29.7	2.73	12	5.4	7.5
<u>Mesa</u>					
Total	28.1	2.80	11	5.1	6.2
Study Area	23.7-29.7	1.91-3.30		2.0-10.0	1.4-10.5
<u>Phoenix</u>					
Total	28.9	2.74	9	5.6	8.1
Study Area	18.9-48.0	1.04-4.01		2.3-20.1	3.2-57.4
<u>Scottsdale</u>					
Total	36.0	2.55	12	3.9	2.4
Study Area	28.8-51.4	1.75-2.74		2.0-7.9	0.7-7.8
<u>Tempe</u>					
Total	25.2	2.73	5	4.5	5.5
Study Area	20.1-43.6	1.82-3.21		2.1-11.4	2.1-21.1
<u>Uninc. Study Area</u>					
Area	29.8	3.27	15	9.6	18.3
<u>Guadalupe</u>					
Area	19.4	4.67	8	17.3	35.7

Source: 1980 Census on Population and 1985 Special Census.

Population per household is useful information in determining whether to use housing units or population as the measure of residential impact. Maricopa County, in 1985, had an average of 2.73 occupants per household, an amount matched by both Phoenix and Tempe. Mesa was slightly higher and Scottsdale was slightly lower. The unincorporated portions of the study area was significantly higher (3.27 per household) and Guadalupe was substantially higher (4.67), nearly twice that of Scottsdale.

Census tracts within the communities in the study area showed a much wider variation in persons per household.

Phoenix tracts varied the most (1.04-4.01) and Scottsdale the least. This wide variation around the mean suggests that the most useful measure of residential impacts would be population rather than housing units, since impacts on people could be misstated by a factor of one-half or of two depending on where the impacts occurred, if housing units were used as the measure.

Based on the consultants' experience in many such studies, economic status is loosely linked to noise impacts in that lower income residents tend to complain formally about noise less than higher income residents exposed to the same

formally about noise less than higher income residents exposed to the same noise levels. Because of this, it is possible to overrate the severity of noise impacts on wealthier neighborhoods, based on numbers of complaints received, and/or underrate the severity of impacts on poorer neighborhoods.

Two factors were used to identify such poor neighborhoods, to the extent that 1979 data is applicable for that purpose today: percent of unemployment in the civilian labor force, and percent of families with incomes below the poverty level. Not surprisingly, Phoenix generally reflected the county's 5.4 percent unemployment level and 7.5 percent poverty level.

Within the study area portion of Phoenix, there was a vast range, some areas matching the wealthier neighbors to the east and others showing the highest indicators of poverty in the entire study area. These poverty areas are found primarily to the west of the airport between McDowell and Buckeye Road. Large portions of these tracts have since been cleared for freeways and as part of the WALA, West Approach Land Acquisition Area.

Guadalupe, though quite small in population, exhibits high poverty indicators of household crowding, high unemployment, and sub-poverty level family incomes. Most of Mesa's poorer areas are located outside of the Detailed Study Area (south of Broadway) while most of Tempe's are located in the Detailed Study Area (near the University). All areas considered, however, the largest area of concentrated poverty and unemployment in 1979 lies to the west of Sky Harbor in Phoenix.

## ECONOMY

The economic vitality of the airport study area is exemplified by the vigorous growth of Maricopa County and the State of Arizona. Between 1975 and 1985, Arizona had the third highest percent of population growth (39.4%), exceeded only by Nevada and Alaska, both states with much lower absolute population levels. More importantly, Arizona growth in per-capita personal income (PCPI) was the highest in the nation. PCPI grew 230.9% during the decade. In Maricopa County, real population growth was highest in the State during the 1975-85 decade, as was PCPI (\$13,199 in 1984).

As would be expected the communities in Maricopa County shared in this property in vastly different amounts. Shown below are family income levels for 1980, by community, and their relative rank in the county:

<u>Community</u>	<u>Fam.-Income</u>	<u>Co. Rank of 19</u>
Paradise Valley	\$49,888	1
Scottsdale	26,155	2
Tempe	23,776	3
Glendale	21,215	4
Phoenix	20,365	5
Mesa	20,347	6
Guadalupe	11,891	17

Communities in the study area ranked 2nd, 3rd, 5th, 6th and 17th in the county in terms of 1980 family income. Family income figures were not available for the Salt River Indian Reservation, but they are expected to be relatively quite low. The unincorporated portions of the study area were also not reported, but they are too fractionalized and scattered to estimate how well they might fare relative to the reported

communities. Based on indices of poverty described in the population profile, it appears that most of the Phoenix and Tempe portions of the study area are well below their community averages in family income levels.

A profile of employment for Arizona and Maricopa County is shown in Table 1L. Comparable data were not available for the communities or census tracts in the study area. The data shown were based on actual levels for the first six months of 1986 and forecast levels for the second half.

The state and the county both experienced large increases in total employment in 1986, with the county at a slightly faster rate. Unemployment increased at about the same rate as employment in the state and somewhat faster in the county, but unemployment rates were comparatively moderate and below national averages in both jurisdictions.

Wage and salary employees constitute the largest segment of the labor force, over 95 percent in Maricopa County and 91 percent in the state, reflecting the lower level of agricultural activity in the county. Retail and wholesale trade constitute the largest employment sector of wage and salary-earning workers, followed closely by services. Together, these two employment groups constitute one half of wage and salary employment. Manufacturing in the county accounts only for 14 percent of such employment, followed closely by government, the two together accounting for nearly 30 percent of wage and salary employment. The position of these two sectors is reversed for the state.

Of the remaining one quarter of employment in Maricopa County,

construction is highest, followed by F.I.R.E. (finance, insurance and real estate), T.C.P.U. (transportation, communications, and public utilities) and mining. At the state level, the order is the same and the proportions are similar. Only mining showed an absolute decline at the state level in the prior year, while no sector declined for Maricopa County but mining was unchanged.

## COMPREHENSIVE CITY PLANS

The customary nomenclature for a comprehensive city development plan in the Phoenix area is the general plan. To quote from Tempe's General Plan, "A general plan is the adopted definition of a city's aspiration for its future. It sets forth goals, objectives, and policies for development". Basically, a general plan describes the way a city wants to develop as it grows and provides guidelines for achieving the desired results.

General plans may consist of a policy plan and/or official maps. From the perspective of airport noise compatibility planning, general plans are of special interests in two important respects: land use and airports. The land use policies in the plans are usually reflected on an official map showing intended future land use. This map provides an indication of areas in which future development will be compatible or incompatible with future airport noise, or where future redevelopment will mitigate impacts. The aviation or airport element of the general plan, when one exists, may indicate expansion of airport land holdings, changes to airport facilities, and policies pertaining to ensuring land use compatibility.



**TABLE 1L**  
**Profile of Employment - 1986**

	Arizona			Maricopa County		
	Jobs (000's)	Annual Incr.%	% of Empl.	Jobs (000's)	Annual Incr.%	% of Empl.
Labor Force	1580.3	6.9		984.9	7.9	
Unemployed	102.9	7.1		51.0	9.6	
Unemployment Rate	6.5%	-		5.2	-	
Total Employment	1477.4	6.9		933.9	7.8	
Wage & Salary Empl.	1344.8	5.2	91.0	887.8	5.7	95.1
Manufacturing	183.4	1.4	12.4	130.5	0.1	14.0
Mining	10.7	-10.8	0.7	0.6	0.0	0.1
Construction	115.1	4.2	7.8	80.4	4.0	8.6
TCPU	64.6	2.5	4.4	42.2	2.9	4.5
Trade	335.5	6.7	22.7	230.7	7.4	24.7
FIRE	90.0	11.6	6.1	70.7	12.0	7.6
Services	319.6	7.2	21.6	217.4	7.7	23.3
Government	226.0	3.4	15.3	115.3	3.9	12.3

Source: Arizona Market Information Newsletter, Sept. 1986  
Based on actual first six months of 1986 and last six months forecast

The General Plan for Phoenix 1985-2000 consists of nine general plan elements in one document and a generalized land use map, policies, and summaries of the elements published in a summary document. The elements are land use, public services, conservation, safety, circulation, housing, rehabilitation and development, public buildings, and recreation. The General Plan is based, in part, on specific plans for urban villages prepared by Village Planning Committees and, in part, on plans prepared by city staff. There is no aviation element in the Phoenix General Plan, nor is airport compatibility specifically addressed in the Land Use

Element, but it is apparent from reviewing the land use map that noise compatibility was a major consideration in developing the plan. The composite plan for future land use, as extracted from the various local general plans, is shown in Exhibit 1-I. Note that, to the west of Sky Harbor, the general plan shows only noise-compatible commercial and industrial development for approximately 1 1/2 miles beyond the runway ends. For the northerly of the two runways, no large residential areas are impacted for 2 1/2 miles. All land in Phoenix to the east of Sky Harbor is planned to be noise compatible.

It is worthy of note that certain areas of Phoenix are still undergoing the land use planning process. One area is located in the airport study area to the west of the Black Canyon Freeway, between the Salt River and Van Buren. In order to complete the land use patterns shown in Exhibit 1-I, the Composite Future Land Use Plan for Maricopa County - 1983 was used. This plan indicates a continuation of the east-west industrial corridor from the east. It is assumed that the final Phoenix plan for this area will reflect this plan to some extent.

The Tempe General Plan, prepared in 1978, has four major plan components: goals and objectives, policies for land use, community facilities, and transportation. Additionally, the plan contains an extensive statistical profile of the community. Like Phoenix, the Tempe plan does not specifically address airports or aviation noise.

The area immediately to the east of Sky Harbor is occupied by the Salt River floodway, Papago Park, and industrial/utility uses. The first residential area on the land use plan to the east lies 1 1/2 miles from the extended centerline of the southerly parallel runway and three miles from the northerly runway. The City of Tempe is presently in the process of revising the General Plan.

The General Plan for Scottsdale, updated in 1987, is a policy plan for land use, public facilities, circulation, airport compatibility, and environmental design. It is intended as a framework for "assessing and integrating policy discussions comprehensively into the community's long-range plans." For each of the four elements, planning guidelines are provided along with a map of key geographical features of the plan.

Scottsdale Municipal Airport, to which the airport plan applies, is located outside of the study area.

The Mesa General Plan was updated in 1981 and is generally based on 1980 planning conditions, with plans for the year 2000. The plan consists of sections on goals and policies; population, housing and employment; land use and town center; transportation; utilities; public services; recreation; and implementation. Additionally, the introductory section of the plan contains two policy plans: the Superstition Freeway Corridor Policy Plan and the Falcon Field East Mesa Development Policies, the latter facility of which is located outside of the study area.

The 1983 General Development Plan of the Salt River Pima - Maricopa Indian Community covers land within the Salt River Indian Reservation. In addition to the considerable introductory and background material, the plan contains three elements: land use, economic development, and circulation. None of the elements contains references to aviation, airports, or airport noise. The proposed land use for the portion of the reservation located in the study area is shown in Exhibit II.

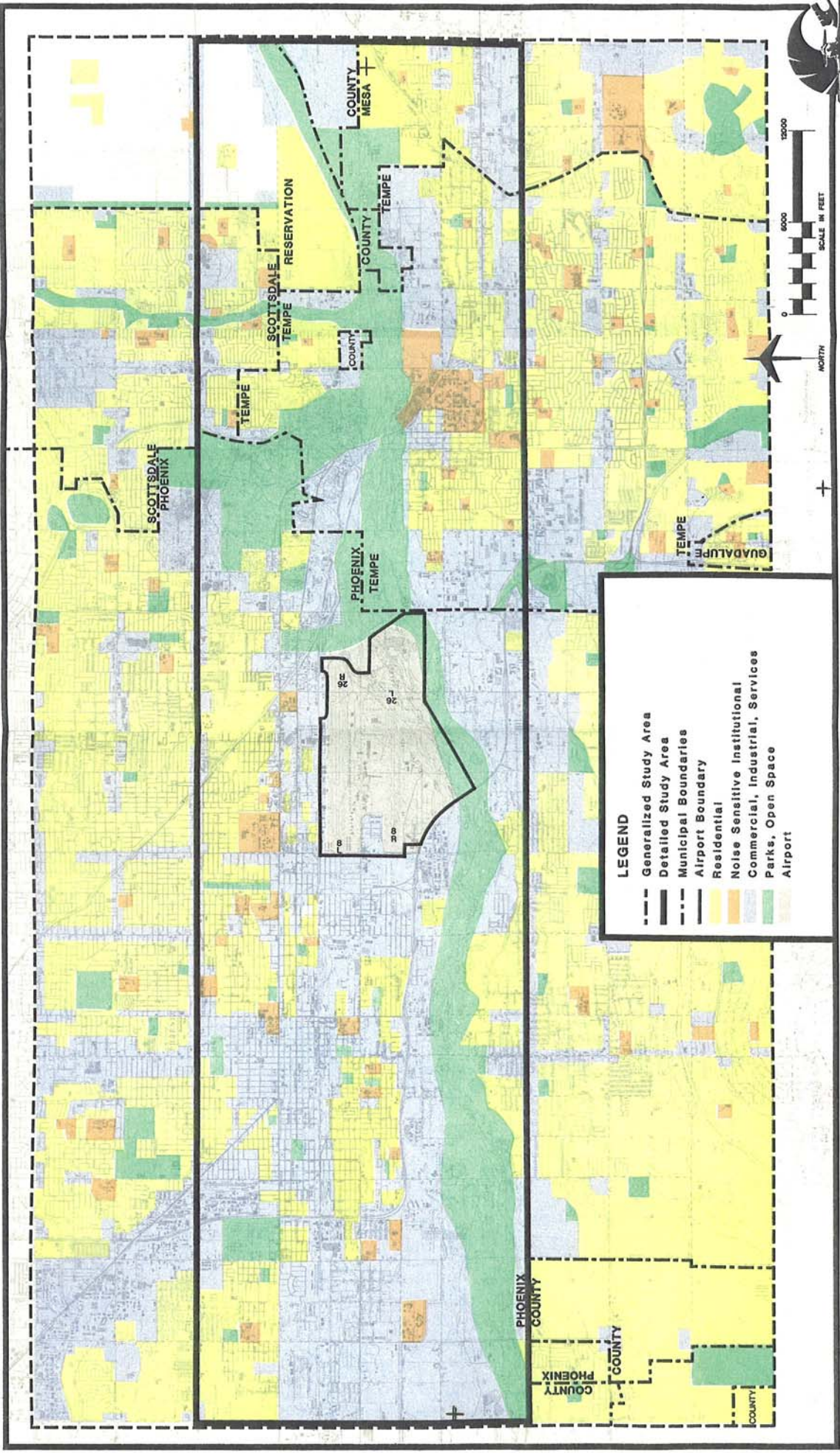
Also in 1983, the Composite Future Land Use Plan was prepared by Maricopa County. This document shows proposed land uses for all areas of Maricopa County. For incorporated areas, the land use patterns are a composite of municipal plans. For unincorporated areas, the patterns reflect County development policy. No comments are made in the plan pertaining to airports or noise compatibility.

## ZONING

Zoning ordinances are important in noise compatibility planning because they control the type and intensity of land uses in an area. Zoning also can be used in certain circumstances to attach special conditions to the use of land which may in some way serve to protect the general health and welfare. Finally,



Exhibit II  
COMPOSITE GENERAL  
PLAN FOR FUTURE  
LAND USE



- LEGEND**
- Generalized Study Area
  - Detailed Study Area
  - Municipal Boundaries
  - Airport Boundary
  - Residential
  - Noise Sensitive Institutional
  - Commercial, Industrial, Services
  - Parks, Open Space
  - Airport

zoning patterns may provide a general view of how future land use changes will appear.

The purpose of this analysis is to develop background material which will aid in determining which zoning districts around the airport provide a compatible land use buffer for the airport and which ones potentially can allow encroachment by noise-sensitive land uses. The analysis will also help to reveal whether some districts where noise-sensitive uses are allowed may be easily adapted to promote noise-compatible development. For example, a noise-sensitive land use which is permitted only as a conditional use in a particular district could potentially be prohibited from noise-impacted areas if sufficient guidelines were provided in the zoning ordinance. Alternatively, it may be decided later in this study, on the basis of further analysis, that such land uses should be entirely prohibited in noise-impacted areas.

With the exception of the Salt River Indian Reservation zoning ordinance, all of the local zoning ordinance have many common aspects, in part because of state enabling legislation. In all cases the ordinances are permissive ordinances, that is the land users may do only what is specifically allowed in the ordinance. All ordinances are structured generally the same and districts are similarly grouped into agricultural, residential, commercial, industrial, special, and overlay districts. Overlay districts are used in all jurisdictions, permitting certain deviations from or requiring additional features beyond the restrictions of the underlay zones.

In all cases (other than the Indian community) the City Council or County Board of Supervisors enacts zoning legislation with advisory assistance from the Planning Commission. Variances and appeals are administered by the Board of Adjustment (except in Tempe where a Hearing Officer handles variances). Major differences exist among the

jurisdictions with respect to agencies responsible for interpretation, administration, enforcement and issuance of the various permits.

### Mesa

The Zoning Ordinance of the City of Mesa, Section 11, Chapters 1-21 of the Mesa Code contains 18 basic zoning districts, plus 3 overlay districts and references to a fourth. One district is a very low density agricultural zone, 11 are residential zones, 3 are commercial zones, 2 are industrial zones, and one is a public facilities zone. One overlay zone the Age Specific District, is keyed to developments for the elderly while two apply only in the town center area to permit special high rise and bonus intensity incentives. A flood plain overlay district is also referenced to, but is enforced by the Floodplain Board (City Council) and administered by the City Engineer.

Special permits are required for certain land uses in Mesa, notably the manufacture of certain hazardous and/or heavy industrial products. These permits are granted by the Mesa City Council. No special or conditional use permits required for land uses generally regarded to be noise sensitive.

A listing of the various zoning districts in Mesa is shown in Table 1-M, along with the noise-sensitive uses permitted in those zones and the permissible maximum residential development densities.

### Tempe

The Zoning Ordinance of the City of Tempe was established by City Ordinance No. 808. Enforcement and interpretation is the responsibility of the Office of the Zoning Administrator (Director of Community Development), with direct enforcement by the Building Safety Director. Use permits and variances are



granted by the Hearing Officer and appeals of the Hearing Officer's actions are heard by the Board of Adjustment.

The Tempe zoning ordinance contains 26 basic districts and 2 overlay districts. Fourteen districts are residential zones, 8 are commercial zones, and 4 are industrial zones. The two overlay districts are for limited areas of the city and are to support two area plans: The Tempe Rio Salado Plan and the Southwest Tempe General Plan. Within the basic districts, some noise-sensitive uses are permitted as a matter of right while others are permitted only with a Conditional Use Permit. Table 1N outlines the Tempe zoning districts and their important characteristics for this study.

established by Phoenix City Ordinance No. G-449. The ordinance designates enforcement and use permit responsibilities to the Zoning Administrator, appeals and variances to the Board of Adjustment, and special permits to the City Council. Special permits may be granted by the Council in all districts for the following noise sensitive uses: religious retreats, botanical gardens and group homes. Special permits may also be granted for drive-in theaters on 10 or more acres (R-5, S-1, S-2, PSC, C-1 and C-2) handicap schools (RE-43 to R-5, all PAD's), RV parks (C-1, C-2, C-3), hospitals (R-5), recovery homes (S-1, S-2) specialized treatment facilities (R-5), and mobile and manufactured homes on 10 or more acres (R-2, R-3).

**Phoenix**

The Zoning Ordinance, as Amended, of the City of Phoenix, Arizona was

**TABLE 1M**  
**Zoning Provisions for Noise-Sensitive Uses**  
**City of Mesa**

<u>Zoning District</u>	<u>Noise Sensitive Uses</u>		<u>Lot or Area/D.U.</u>
	<u>Permitted</u>	<u>By Spec/Cond Permit</u>	
AG	Single Fam (SF) Foster Homes	None	10 acres
SR	SF, Schools, Colleges Churches	None	one acre
R1-90 Residential	SF, Foster Homes	None	90,000 s.f.
R1-35	Same as SR	None	35,000 s.f.
R1-15	Same as SR	None	15,000 s.f.
R1-9, 8,7,6	Same as SR	None	9,000/6,000
R-2	Same as SR & Multi Fam. (MF) MH and RV subdivisions	None	6,000 s.f. lot 2,904 d.u.
R-3	Same as R-2	None	6,000 s.f. lot 2,178 d.u.

**TABLE 1M (continued)**  
**Zoning Provisions for Noise-Sensitive Uses**  
**City of Mesa**

<u>Zoning District</u>	<u>Noise Sensitive Uses</u>		<u>Lot or Area/D.U.</u>
	<u>Permitted</u>	<u>By Spec/Cond Permit</u>	
R-4	Same as R-2 & Hotels/Motels Offices, MH & RV parks Hosp., Nurs. Homes	None	6,000 s.f. lot 1,452 d.u.
R-S	Offices	None	8,000 s.f. lot
C-1	None	None	None
C-2	Movie theaters, Hotels/Motels Special Schools	None	None
C-3	Same as C-2	None	None
M-1	Same as C-2	None	None
M-2	Same as C-2	None	None
PF	Govt. owned/ operated facilities	None	10 acres
Overlays	N.S. Uses Permitted in Underlay Zones	None	Underlay

**TABLE 1N**  
**Zoning Provisions for Noise-Sensitive Uses**  
**City of Tempe**

<u>Zoning District</u>	<u>Noise Sensitive Uses</u>		<u>Lot or Area/D.U.</u>
	<u>Permitted</u>	<u>By Spec./Cond. Permit</u>	
AG	S.F., Ch., Pub Sch., Pub. Facil	Pr. Sch., B'cast Studios Religious, Hosp., Nurs. Home	1 acres net s.f.
R1-15, 10, 8, 7, 6	S.F., Churches, Pub. Sch.	Priv. Schools	15,000-6,000

**TABLE 1N (Continued)**  
**Zoning Provisions for Noise-Sensitive Uses**  
**City of Tempe**

<u>Zoning District</u>	<u>Noise Sensitive Uses</u>		<u>Lot or Area/D.U.</u>
	<u>Permitted</u>	<u>By Spec./Cond. Permit</u>	
R-Th, 2, 3, 3R, 4	Same as R-1 & Mult. Fam.	Same as R-1	2 acres - 6,000
MHS	Mob. Home Subdiv.	None	6,000 net s.f.
RMH	Mobile Home Parks	None	3,500 net s.f.
TP	Trailer/RV Parks	None	1,500 net s.f.
R/O	Mult. Fam, Churches, Offices	None	6,000 net s.f.
CCR	Churches, Offices	Hosp., NH, Relig., Hotels/Motels, B'cast Studios	6,000 net s.f.
C-1	Pvt. Schools, Theaters, Hotels/Motels, B'cast Studios	Hosp., Nurs. Homes Religious	N/A
PCC-1	Same as C-1	Same as C-1	2 acres
C-2	Same as C-1	Same as C-1 & Drive-in theaters	N/A
PCC-2	Same as C-2	Same as C-2	5 acres
CCD	SF, MF, Church Theater, Hotel/Motel, Schools, B'cast Studios	Same as C-2	N/A
MG	MF, Theaters, Offices, Hotel/Motel	Same as C-2	1 acre
IBD, I-1, 2, 3	Offices, Movie Studios	None	N/A
Overlays	N.S. Uses Permitted in Underlay Zone		Underlay



The Phoenix ordinance contains 8 single-family districts, 6 multi-family districts, 2 suburban districts, 19 special districts, and 7 overlay districts. A listing of the various zones is shown in Table 10, along with the noise-sensitive uses permitted in those zones and the maximum permissible residential densities.

### Scottsdale

The Zoning Ordinance of the City of Scottsdale, established by Ordinance No. 455, is an exclusive classification ordinance, that is residential uses may not occur within commercial or

industrial areas unless specifically permitted. The Superintendent of Buildings enforces the zoning ordinance while the Planning Director interprets the ordinance. Appeals are made to the Board of Adjustment, as are requests for variances. The Development Review Board provides site plan review to most development in the city, including municipal uses. The City Council must approve all locations of municipal facilities before review by the Development Review Board. Use permits may be conditional and are issued by the Planning Director after approval by the City Planning Commission and the City Council.

**TABLE 10**  
**Zoning Provisions for Noise Sensitive Uses**  
**City of Phoenix**

<u>Zoning District</u>	<u>Noise Sensitive Uses</u>		<u>Lot or Area/D.U.</u>
	<u>Permitted</u>	<u>By Spec./ Cond. Permit</u>	
R-43, 35	Single Family		1.0-1.32 d.u.
R-24, 18	Single Family	Sec. text of report for discussion of permissible uses by special permit of Phoenix City Council in various zones	1.8-2.34 d.u./gr.acres
R-14, 10	Single Family		3.1-4.2 du/gr.acres
R-8,6	Single Family		4.3-6.34 du/gr.ac.
R-2, 3, 3A	Single/Multi-Family		
R-4, 4A, 5	All D.U.s, Nurs. Homes		500-1500 s.f./d.u.
R-O	Offices, Business Dwellings		24,000
S-1, S-2	Farm Home, Schools		1-3 acres
C-O	Offices		N/A
PSC	Broadcast Studios		N/A
RSC	All D.U.'s, Nursing Homes		110 acres
C-1, C-2	All D.U.'s, Nursing Homes		14.5 d.u./gr.ac.
C-3	All D.U.'s, NH, Drive-in Theat.		14.5 d.u./gr.ac.
A-1	Nurs. Home, Drive-in Theat.	Use Permit for Resid.	None
A-2	None		N/A
CP	Church, Offices, Hotel/Motel		N/A
P-1, P-2	None		N/A
PAD 1-15	All DU's		.75-43.5 du/gr.ac.
RH	Resorts		20 rooms/ac.
Overlay	Uses in Underlay Zone		Underlay

The Scottsdale Zoning Ordinance contains 33 basic districts: 14 residential, 13 commercial, 2 industrial, 1 mixed-use, 2 parking, and one open space district. Additionally, there is one attachment district which expands commercial areas in certain

circumstances, and 5 overlay districts (a planned residential zone, a parking zone, a historic property zone, and 2 hillside zones). The noise-sensitive use provisions of the districts are summarized in Table 1P.

**TABLE 1P**  
**Zoning Provisions for Noise-Sensitive Uses**  
**City of Scottsdale**

<u>Zoning District</u>	<u>Noise Sensitive Uses</u>		<u>Lot or Area/D.U.</u>
	<u>Permitted</u>	<u>By Spec./Cond. Permit</u>	
R-1 190, 7	Single Family Public Schools	Churches, Priv. Schools	190,000 s.f. 7,000 s.f.
R-2	SF, 2F, Pub. Schools	Church, Priv. Schools	8,000 s.f.
R-3	All DU's	Church, Priv. Schools	3,500 s.f.
R-4	SF, SF Townhouse	Churches	8,000
R-4R	All DU's, Resort Hotel/Motel	Churches	6,000 s.f./d.u.
R-5	All DU's, Pub. Schools	Church, Convent, Priv. School	35,000 s.f.
M-H	Mobile Homes, Mfd. Housing	None	7,000/d.u. on 10 ac.
S-S	None	None	N/A
S-R	All DU's, Offices	Churches	3,500 s.f./d.u.
C-S	Offices	Churches	N/A
C-1	Offices w/one d.u.	Churches	None
C-2	Offices w/one d.u., Hotel/Motel, Theater	Church, Res. Health Care	None
C-3	Offices, Museum, Theater	Church, Res. Health, Drive-in Theat.	N/A
C-4	Priv. Schools, Movie Prod.	Broadcast Studios	N/A

**TABLE 1P Continued**  
**Zoning Provisions for Noise-Sensitive Uses**  
**City of Scottsdale**

<u>Zoning District</u>	<u>Noise Sensitive Uses</u>		<u>Lot or Area/D.U.</u>
	<u>Permitted</u>	<u>By Spec./Cond. Permit</u>	
PNC, PCC	Office w/DU's, Perf. Arts.	Movie Theater	4 d.u./ac.
PRC	All DU's, Offices, Hot./Mot., Movies Museum	Churches	2,000 s.f./d.u.
PCOC	All DU's as part of center	None	4 d.u./ac.
W-P	RV parks, Chapel, Outdoor Shows, Movie Prod.	None	N/A
I-G	Offices	None	N/A
I-1	Offices, B'cast Studios, Movie Prod.	None	N/A
P-C	None	All Noise-Sensitive Uses	160 acres
P-1, P-2	None	None	N/A
P-3 (Attachment)	Use in Attached Zone	Same	Attached Zone
Overlays	Uses Permitted in Underlay Zone	Same	Underlay

**Maricopa County**

Small portions of the study area are unincorporated and are zoned by Maricopa County. The Zoning Ordinance for the Unincorporated Area of Maricopa County is administered by the Maricopa County Department of Planning and Development and enforced by the Maricopa County Zoning Inspector. Appeals, variances and use permits are handled by the Board of Adjustment. Special Use Permits may be granted in any zone, after public hearing, by the

Board of Supervisors for certain noise-sensitive uses which are otherwise prohibited. Those uses include: drive-in theaters, group care facilities, guest ranches, mobile home parks and subdivisions, resort hotels, travel trailer and RV parks, residential health care facilities, and single-and multiple-family homes (in C-1, C-2 and C-3 zones).

The County Zoning Ordinance contains, 21 basic districts, including 3 rural residential, 10 residential, 5 commercial and 3 industrial districts. Additionally,

there are 4 overlay zones, including a senior citizen developments zone (5 acres), a manufactured house zone (3,000 s.f./d.u.), a hillside zone, and a planned development zone. The noise-sensitive use aspects of these districts are summarized in Table 1Q.

In addition to conventional zoning, Maricopa County has in effect the Floodplain Regulations for Maricopa County, adopted and enforced by the

County Flood Control District Board of Directors. The ordinance covers all unincorporated land and all incorporated areas that have not adopted their own ordinances. The floodplain zoning is an overlay zone on areas covered by the floodwater from the 100-year flood. The zoning regulations seek to prevent development which interferes with flow of water, substantially raises flood level, and poses a risk to the users of the property.

**TABLE 1Q**  
**Zoning Provisions for Noise-Sensitive Uses**  
**Maricopa County**

<u>Zoning District</u>	<u>Noise-Sensitive Uses</u>		<u>Lot or Area/D.U.</u>
	<u>Permitted</u>	<u>By Spec./Cond. Permit</u>	
Rural 190, 70, 43	SF, Church, Pub. School, Library	None	190,000-43,560
R1-35,18,10,8,7,6	Same as Rural above	None	35,000-6,000
R-2, 3	Same as Rural plus Multi-family	None	4-3,000/du 6,000 sf lot
R-4	Same as R-3 plus Convents, NH, Orphanage	None	2,000/du 6,000 sf lot
R-5	Same as R-4 plus Hosp., Resort	None None	1,000/du 6,000 sf lot
CS, CO	None	None	N/A
C-1	Church, Office, Libr. Museum, Pub. School	None	N/A
C-2	C-1 + RV park, theat. hotels, b'cast studios	None	N/A
C-3	C-2 + drive-in theaters	None	N/A
IND-1	Offices, movie prod. b'cast studios	None	N/A
IND-2, 3	None	None	N/A
Overlays	Uses permitted in underlay zones	None	Underlay

**Salt River Indian Reservation**

The Zoning Ordinance of the Salt River Pima-Maricopa Indian Community, SRO 74-82, controls development on the Salt River Indian Reservation. Enforcement is by the Planning Director and administration is by the Building Official who issues building and construction permits, as well as certificates of occupancy. Conditional use permits are given by the Community Council after a determination of the Land Management Board.

The Salt River Zoning Ordinance has 10 basic zones and one overlay district. The ordinance reflects the primarily

agrarian economy by permitting agricultural and animal husbandry uses in all zones, although only one zone is specifically labeled as agricultural. All zones but the flood plain zone (not an overlay zone) permit agricultural uses by right.

The A-agricultural zone is the only zone which permits all types of residences by right (for community members). Dwellings for nonmembers are permitted only in guest ranches and resort hotels/motels. The overlay zone is a planned community overlay district. The noise-sensitive use regulations of the ordinance are summarized in Table 1R.

**TABLE 1R  
Zoning Provisions for Noise-Sensitive Uses  
Maricopa County**

<u>Zoning District</u>	<u>Noise Sensitive Uses</u>		<u>Lot or Area/D.U.</u>
	<u>Permitted</u>	<u>By Spec./Cond. Permit</u>	
A	All DU's for members	Seas. Labor Camps, Educ. Guest Ranches	Exist. Size
OS	Incid. Resid. Dwellings (members)	Same as A	Exist. Size
AP	Offices, Resort Hotels/Motels	Hosp, Relig, Movies NH, Libr, B'cast Studios	10,000 s.f. (hotels 40,000)
C-1	None	None	N/A
C-2	None	None	N/A
C-3	Offices, Theaters	Hospitals	10 ac.
NR	None	None	N/A
IP	None	None	N/A
I-1	None	None	N/A
FP	None	None	N/A
PC Overlay	Uses Permitted in Underlay Zone		Underlay

## **SUBDIVISION REGULATIONS**

Subdivision regulations apply in cases where land is proposed to be divided into two or more lots or tracts. Accordingly, they have the most influence in communities with large amounts of undeveloped land.

Subdivision regulations are established to ensure the proper arrangement of streets, adequate and convenient open space, efficient movement of traffic, adequate and properly-located utilities, access for fire-fighting apparatus, avoidance of congestion, and the orderly and efficient layout and use of land.

Subdivision regulations can be used to enhance noise-compatible land development by requiring developers to plat and develop land so as to minimize noise impacts or reduce the noise sensitivity of new development. The regulations can also be used to protect the airport proprietor from litigation for noise impacts at a later date. The most common requirement is the dedication of a noise or aviation easement to the local government by the land subdivider as a condition of development approval. The easement authorizes overflights of the property, with the noise levels attendant to such operations. It also requires the developer to provide noise insulation in the construction of the buildings.

All of the local jurisdictions administer subdivision regulations. None has any special provisions relating to subdivisions near airports. As a result of the Scottsdale Part 150 Plan, however, both Scottsdale and Phoenix have adopted the policy of requiring aviation easements for planned unit development projects in the immediate vicinity of Scottsdale Municipal Airport.

## **BUILDING CODES**

Building codes regulate the construction of buildings, ensuring that they are built

to safe standards. Building codes may be used to require noise insulation in new residential, office, and institutional building construction when warranted by existing or potential high aircraft noise levels.

Most features of building codes for sound insulation are features applied for energy efficiency as well. Caulking of joints, continuous sheathing, dead air spaces, and use of materials with high R-values are construction techniques which can attenuate aircraft noise while conserving energy used for home heating and cooling. Other measures which can help attenuate noise, but which are not always justifiable for energy efficiency alone, are vent baffling and year-round, closed-window ventilation systems. Surprisingly, some highly efficient storm window designs for energy conservation purposes are less efficient for sound insulation than other older style designs.

Building codes apply to existing buildings only when remodeling or expansion is contemplated. Therefore, amendments to building codes are of little value in correcting noise sensitivity problems in completely developed areas. In those circumstances, noise insulation programs must be instituted retroactively.

All six jurisdictions in the study area administer building codes. These codes are based on the Uniform Building Code.

## **CAPITAL IMPROVEMENTS PROGRAMS**

Capital improvements programs are multi-year plans, typically covering five or six years, which list major capital improvements planned to be undertaken during each year.

Specific capital improvements programmed in the study area can potentially assist or thwart noise-compatible land use planning. An improvement, per se, may be compatible or incompatible with aircraft noise. More importantly, an improvement may

foster or deter other development that is compatible or incompatible.

Most capital improvements have no direct bearing on noise compatibility; few municipal capital improvements are noise-sensitive. The obvious exceptions to this are schools and, in certain circumstances, libraries, medical facilities and cultural/recreational facilities. The noise compatibility planning process includes a review of planned facilities of these types as a matter of course.

Some capital improvements may have an indirect, but more profound, relationship to noise compatibility. For example, the installation of standard sewer and water facilities in a large vacant area could encourage residential development.

In contrast, the installation of good streets and oversized sewer and water facilities designed for industrial users could encourage industrial development in the same area.

All jurisdictions within the study area have official capital improvements program except the Indian Community and Guadalupe. However, officials in these jurisdictions and in other special districts have unofficial plans and ideas about possible future capital improvements.

The significance of the proposed capital improvements to noise compatibility planning will be evaluated later in the study in the growth risk analysis and in the evaluation of land use management alternatives.