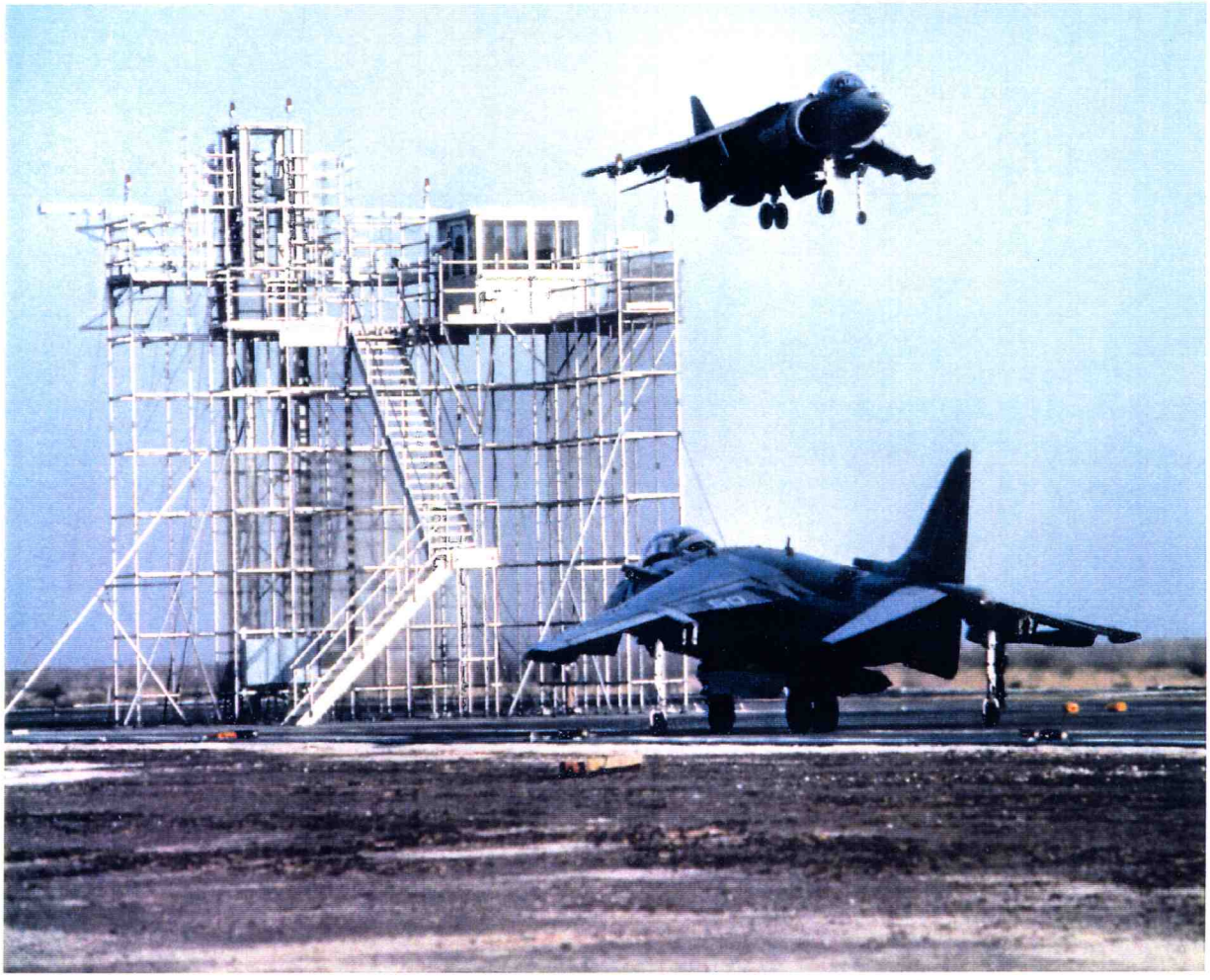
U.S. MARINE CORPS
AIR STATION YUMA
AUX-2 AICUZ



Prepared for

Southwest Division

Naval Facilities Engineering Command

San Diego, California

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San Diego, California
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LIST OF ACRONYMS

AGL	- above ground level
AICUZ	- Air Installation Compatible Use Zone
APZ	- Accident Potential Zone
ATCAA	- Air Traffic Control Assigned Airspace
AUX-2	- Yuma Auxiliary Field 2
BLM	- Bureau of Land Management
CZ	- Clear Zone
dBA	- A-weighted decibels
DOD	- Department of Defense
FAA	- Federal Aviation Administration
FAR	- Federal Aviation Regulations
FCLP	- Field Carrier Landing Practice
FOB	- Forward Operating Base
Goldwater Range	- Barry M. Goldwater Air Force Range
I-8	- Interstate 8
IFR	- Instrument Flight Rule
kV	- kilovolt
Ldn	- sound level
LHA	- landing helicopter assault
MCAS	- Marine Corps Air Station
MOA	- Military Operations Area
msl	- mean sea level
NLR	- noise level reduction
OLF	- outlying field
R-2301W	- restricted area 2301 west
T/G	- touch and go
VFR	- Visual Flight Rule
Western	- Western Area Power Administration

I. EXECUTIVE SUMMARY

INTRODUCTION

This report describes the findings of the first Air Installation Compatible Use Zone (AICUZ) program developed for the Marine Corps Air Station (MCAS) Yuma Auxiliary Field 2 (AUX-2). It has been prepared under the directives of the Department of Defense (DOD) that established the AICUZ program to investigate problems of incompatible land uses and associated encroachments on military installations, and to promote courses of action that encourage harmonious land uses in these areas. The AICUZ program, by providing a tool to promote compatible development around military airfields, has the following objectives:

- protect the health, safety, and welfare of civilians and military personnel by discouraging land uses that are incompatible with aircraft operations
- promote the development of compatible land uses within the AICUZ study area
- minimize noise levels caused by aircraft operations, while not compromising operational and training capabilities, and flight safety requirements of AUX-2
- encourage liaison between the Marine Corps and the nearby community, to inform the general public about the AICUZ program and to seek cooperation in minimizing noise impacts and accident potential concerns in the vicinity of AUX-2
- protect the federal investment and operational capabilities of the facilities at AUX-2

LOCATION AND FACILITIES

AUX-2 is located within the far western portion of the Barry M. Goldwater Air Force Range (Goldwater Range) approximately 2.5 miles east of the range boundary. The field is in Yuma County about eight miles southeast of MCAS Yuma, just south of County 19th Street.

AUX-2 is a triangular airfield consisting of two runways and an access road at 60 degree angles to one another. Runway 09/27 is oriented east/west. A portion of the runway has been overlayed with aluminum decking to provide a landing helicopter assault (LHA) pad. Runway 04/22 is oriented northeast/southwest. Although this runway is currently in disrepair, it is used for austere takeoffs and landings. The third leg of the airfield is a single-lane paved road used for vehicle access to the Moving Sands and Cactus West targets and to other parts of the Goldwater Range. Proposed improvements at AUX-2 include two press-up pads for AV8B Harrier use, and the rehabilitation of Runway 04/22 to include a paved "road operations" runway and an unpaved runway for austere take-offs and landings, and a taxiway connecting Runway 04/22 to the LHA pad.

MISSION AND OPERATION LEVELS

The mission of AUX-2 is to accommodate AV8B Harrier Field Carrier Landing Practice (FCLP) operations and AV8B Harrier, C130 transport aircraft Touch and Go (T/G) operations, and C130 full stop landings.

Aircraft operations at AUX-2 were modeled to predict levels of usage at AUX-2 facility after the completion of planned improvements to the facility. The number of operations were estimated by MCAS Yuma personnel based in part on the following assumptions:

- All AV8B Harrier FCLP operations will move from MCAS Yuma to AUX-2.
- AV8B Harriers will make full stop landings at AUX-2 to refuel/rearm.
- AV8B Harriers will practice hover operations on the AUX-2 LHA pad.
- C130 transport aircraft will use AUX-2 for T/G operations.
- C130 transport aircraft will make one full stop landing for every four T/Gs.
- Groups of eight CH46 helicopters will accompany C130 transport aircraft approximately 20 percent of the time.

Existing annual operation levels for AV8B Harriers, C130 transport aircraft, and CH46 helicopters using AUX-2 total 42,928 operations.

Upon completion of the planned improvements to Runway 04/22, including press-up pads and the road operation runway, it is anticipated that AUX-2 will experience an increase of 8,352 annual operations. This increase is due to the addition of AV8B Harrier Forward Operating Base (FOB) operation practice activity.

In total, it is projected that AUX-2 will experience 51,280 annual operations. The noise study developed by Harris Miller Miller and Hanson (HMMH 1993) used 51,280 annual operations as the basis of its noise impact projections and analysis.

AICUZ METHODOLOGY

The AICUZ development process considers noise impacts and accident potential. Aircraft noise is perhaps the most significant factor in the AICUZ development process. The primary method of describing aircraft noise is through the use of average noise contour lines on the ground. These contour lines represent the total pressure level and duration of sound during a sample period divided by the time. This average is weighted for objectionable nighttime noise and is representative of the busiest level of flight activity. The noise contours, then, represent the average noise received in the area over the period of a year. Actual noise levels would, at times, exceed the average noise.

Strategies for the local government jurisdictions are also examined and recommended, including the development and use of:

- planning and zoning ordinances
- building codes
- truth-in-sales and rental ordinances
- transfer of development rights
- public relations and education programs

II. INTRODUCTION

PURPOSE AND NEED

The purposes of the AICUZ program are to (1) promote compatible development in high noise exposure areas, (2) minimize public exposure to potential safety hazards associated with aircraft operations, and (3) protect the operational capability of the air installation. The purpose of this AICUZ study is to address these issues as they relate to AUX-2 at MCAS Yuma.

This is the first AICUZ program established for AUX-2 at MCAS Yuma. The need for this study has resulted from the increased utilization of the field by aircraft from MCAS Yuma, the increased potential for incompatible adjacent land uses, and the potential for conflicts with other training activities on the military reservation. The AICUZ study developed for AUX-2 provides both a method and a program to assist in the protection of aviation training missions from incompatible land uses and activities.

The study quantifies noise zones and APZs, identifies existing land uses and future community plans, and develops alternatives for minimizing incompatibilities. Based on these analyses, an AICUZ implementation plan is proposed for areas within the noise and APZ areas, and strategies are set forth to encourage and preserve compatible land uses.

GOALS AND OBJECTIVES

The overall goal of the AUX-2 AICUZ program is to encourage continued land use compatibility among AUX-2, the local community, and military activities within the Goldwater Range. One goal is to preserve the ability to operate at the airfield while conducting other Marine Corps functions nearby. Another goal is to retain low density land uses such as agriculture and sparsely populated residential areas to the west of Goldwater Range. This should be accomplished in a manner that retains the positive relationship that exists between the Marine Corps and the community, while maintaining the operational integrity of AUX-2.

Primary objectives of the AUX-2 AICUZ program are to:

- protect the health, safety, and welfare of civilians and military personnel by discouraging land uses that are incompatible with aircraft operations
- promote the development of compatible land uses within the AICUZ study area
- minimize noise levels caused by aircraft operations, while not compromising operational and training capabilities, and flight safety requirements of AUX-2.
- encourage liaison between the Marine Corps and the nearby community, to inform the general public about the AICUZ program and to seek cooperation in minimizing noise impacts and accident potential concerns in the vicinity of AUX-2

- protect the federal investment and operational capabilities of the facilities at AUX-2

CONCEPT DEVELOPMENT

The AICUZ study began with a review of existing conditions. In particular, the study identified noise contours and safety conditions, and existing and proposed land uses. Noise contours were developed through computer simulation noise studies by Harris Miller Miller and Hanson (HMMH 1993). Noise zones for AUX-2 were predicted by modeling proposed aircraft operations and flight tracks. Noise zone limits were validated by a review of the base's history of noise complaints from the community. APZs were developed by reviewing the facility's aircraft operations data, airspace requirements, and military guidelines based on OPNAVINST 1101036.A. Compatible and incompatible land uses within each AICUZ subzone were identified.

Land use strategies to achieve compatible land uses are identified in Section VII. Strategies for application of land use compatibility guidelines were chosen from among a wide variety of regulatory programs oriented to the federal, state, local, and private lands, and were tailored to meet specific objectives for the MCAS Yuma AUX-2 AICUZ.

III. MCAS YUMA AUXILIARY FIELD-2

LOCATION

MCAS Yuma AUX-2 is located in Yuma County approximately eight miles southeast of MCAS Yuma and just south of County 19th Street. The field is located entirely within the Goldwater Range, approximately 2.5 miles from the Western range boundary. Figure 1 depicts the general location of AUX-2.

AUX-2 FACILITIES

AUX-2 is a triangular airfield consisting of two runways and an access road at 60 degree angles to one another. AUX-2 is primarily used by AV8B Harriers, C130 transport aircraft, and CH46 helicopters. Existing facilities at AUX-2 are shown in Figure 2. Runway 09/27 is oriented in an east/west direction. A portion of the runway has been overlayed with aluminum decking to provide a LHA pad for AV8B Harrier use. A control tower is located next to the pad. Runway 04/22 is oriented in a northeast/southwest direction. Although this runway is currently in disrepair, it is used for austere C130 takeoffs and landings. The third leg of the airfield is a paved single-lane road used for vehicle access to the Cactus West and Moving Sands targets. All other areas of AUX-2 are undeveloped. Proposed improvements to AUX-2 include press-up pads near each end of Runway 04/22, rehabilitation of Runway 04/22 including a paved "road operations" runway and an unpaved runway for austere take-offs and landings, and a taxiway connecting Runway 04/22 to the LHA pad. Existing and proposed facilities at AUX-2 are depicted in Figure 2.

VICINITY AIRSPACE

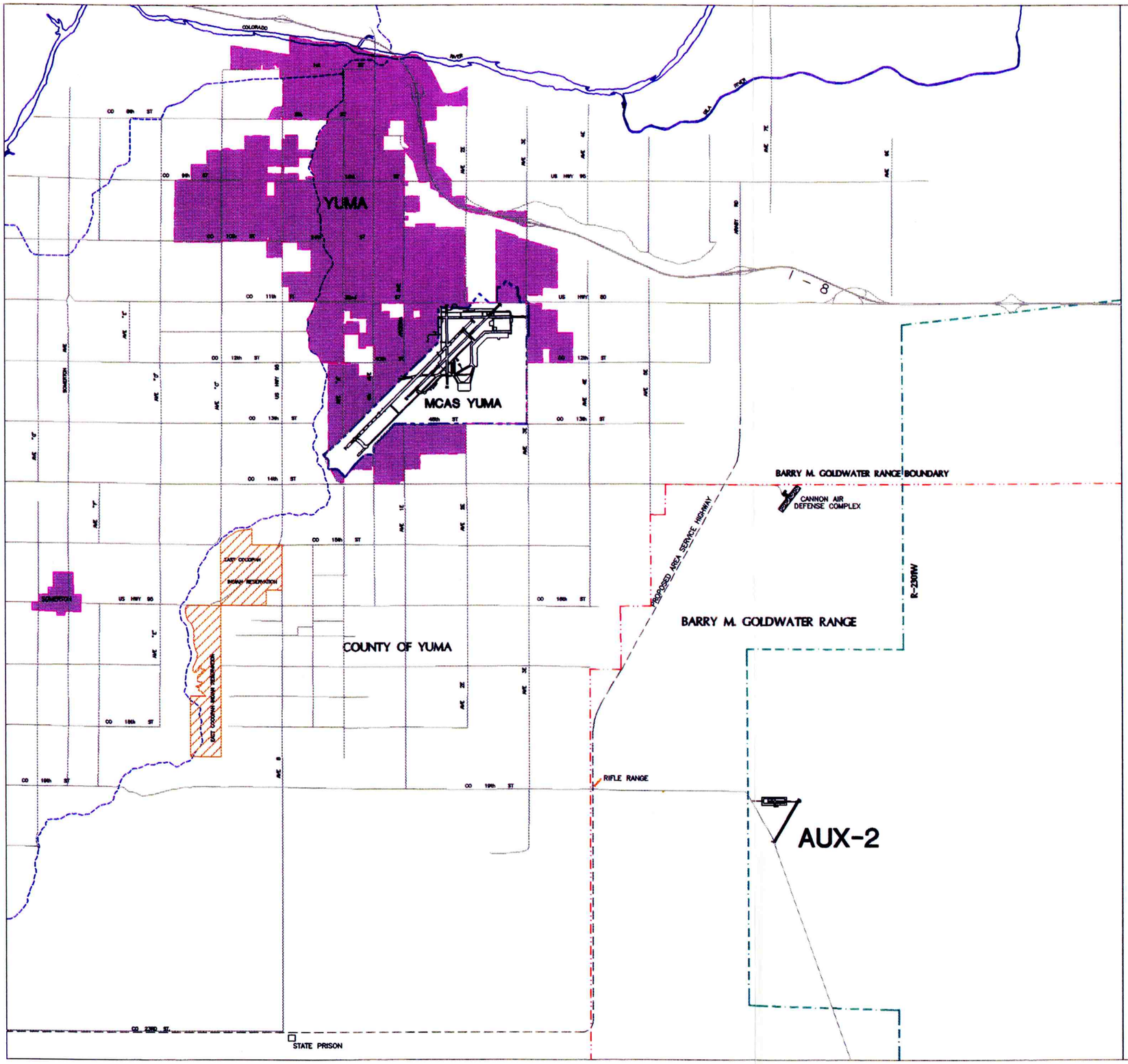
AUX-2 is located entirely within the extreme western portion of Restricted Airspace R-2301 West (R-2301W) as are portions of several flight tracks associated with AUX-2. The westerly edge of the airspace boundary is about 2.5 miles east of and within the Goldwater Range boundary. Restricted airspace is Federal Aviation Administration (FAA) designated airspace where military activities that are potentially hazardous take place. Only aircraft participating in a scheduled activity may enter an active restricted area; all other military and civil aircraft are restricted from entry. R-2301W is shared by Luke Air Force Base and MCAS Yuma according to a joint use agreement. Vertically, the airspace begins at the surface and continues to an elevation of 80,000 feet mean sea level (msl).

Moving Sands and Cactus West, the principal bombing targets used by MCAS Yuma, are located southeast of AUX-2 in the western portion of R-2301W (Figure 3). Flight tracks associated with the Cactus West target are within one mile of AUX-2 and are coordinated so that conflicts with AUX-2 operations do not occur.

Immediately west of R-2301W is the Dome Military Operations Area (MOA). MOA airspace is established at altitudes of less than 18,000 feet msl. The purpose of a MOA is to separate certain

FIGURE 1
VICINITY MAP
11 X 17

MCAS YUMA
AUX-2 AICUZ



0 4500 9000 18000 feet

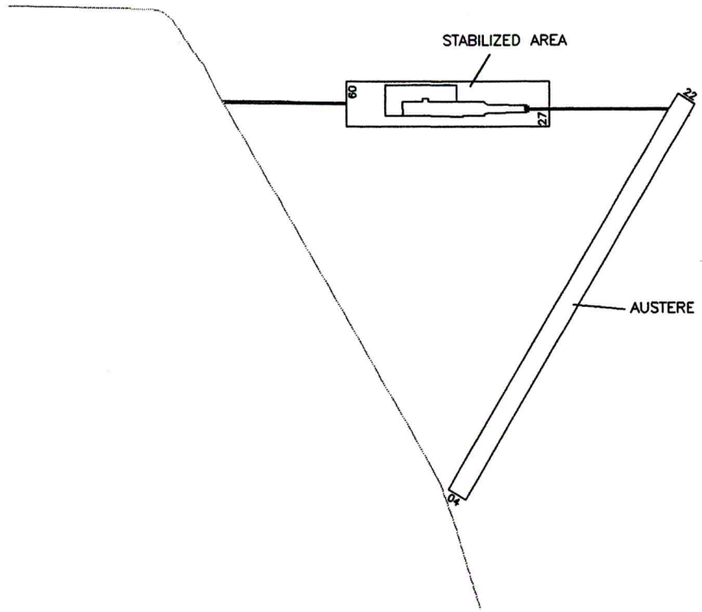
0 1 2 3 miles

Vicinity Map

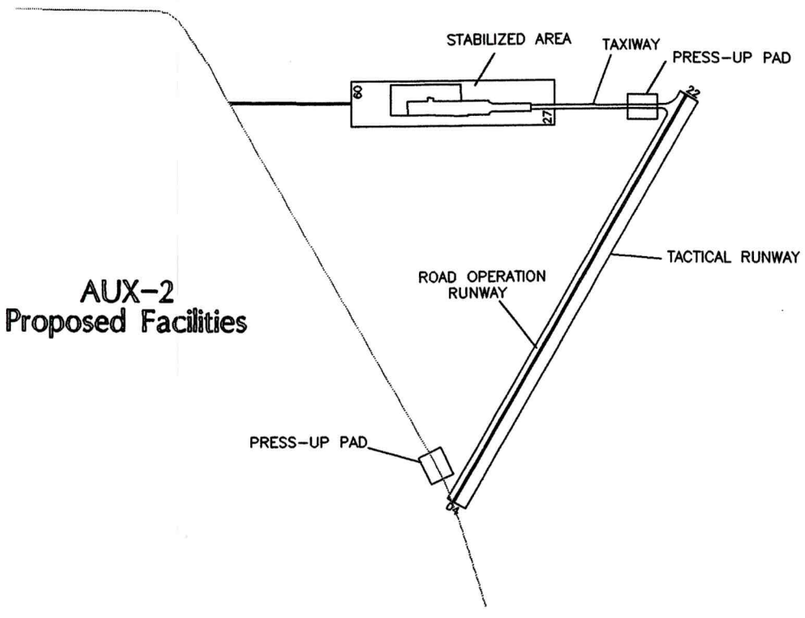
Figure 1

FIGURE 2
AUX-2 EXISTING AND PROPOSED AUX-2 FACILITIES
11 X 17

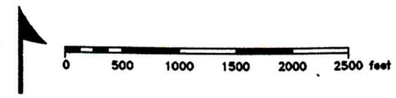
MCAS YUMA
AUX-2 AICUZ



AUX-2
Existing Facilities

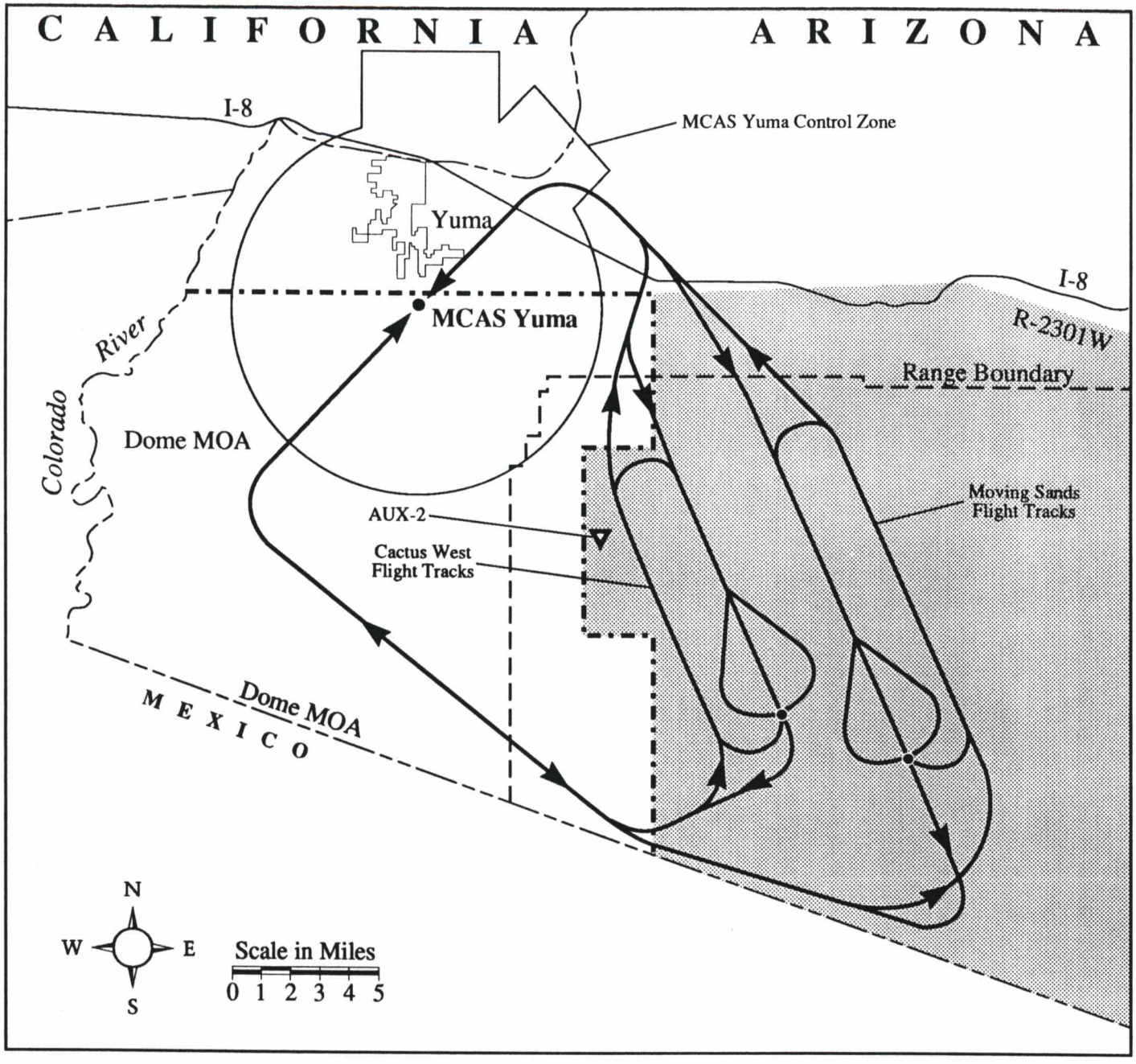


AUX-2
Proposed Facilities



AUX-2 Existing and Proposed Facilities

Figure 2



EXISTING AIRSPACE

LEGEND

- Goldwater Range Boundary
- Restricted Area Airspace
- Military Operation Area
- Target Flight Tracks
- Target Locations

Figure 3

"non-hazardous" military training activities from Instrument Flight Rule (IFR) traffic and to alert Visual Flight Rule (VFR) traffic when and where these training activities are being conducted. The Dome MOA is overlain with an Air Traffic Control Assigned Airspace (ATCAA). ATCAAs are areas where non-hazardous military training activities can occur above the upper legal MOA altitude and are activated only to the extent that they do not adversely interfere with civil aircraft operations or FAA air traffic control procedures.

MISSION AND OPERATION LEVELS

AUX-2 is maintained and operated primarily to support training involving AV8B Harrier FCLP operations, AV8B Harrier and C130 transport aircraft T/G operations, and C130 full stop landings.

Aircraft operations at AUX-2 were modeled to predict levels of usage at the AUX-2 facility after the completion of planned improvements to the facility. The number of operations were estimated by MCAS Yuma personnel based in part on the following assumptions:

- All AV8B Harrier FCLP operations will move from MCAS Yuma to AUX-2.
- AV8B Harriers will make full stop landings at AUX-2 to refuel/rearm.
- AV8B Harriers will practice hover operations on the AUX-2 LHA pad.
- C130 transport aircraft will use AUX-2 for T/G operations.
- C130 transport aircraft will make one full stop landing for every four T/Gs.
- Groups of eight CH46 helicopters will accompany C130 transport aircraft approximately 20 percent of the time.

Existing annual operation levels (1993) for AV8B Harriers, C130 transport aircraft, and CH46 helicopters using AUX-2 total 42,928 operations. The number of annual operations by aircraft type and operation is shown in Table 1.

TABLE 1
EXISTING AUX-2 ANNUAL OPERATIONS

A/C Type	Total Ops	Departures	Arrivals	FOB Ops	FCLP Ops	T/G Ops
AV8B	41,280	1,056	1,056	0	39,168	0
C130	1,076	179	179	0	0	718
CH46	572	286	286	0	0	0
TOTALS	**42,928**	**1,521**	**1,521**	**0**	**39,168**	**718**

Upon completion of the planned improvements to Runway 04/22 it is anticipated that AUX-2 will experience an increase of 8,352 annual operations. This increase is due to the addition of AV8B Harrier FOB operation practice activity. The projected increased activity due to FOB operations at Runway 04/22 is shown in Table 2.

TABLE 2
AUX-2 PROJECTED INCREASE IN ANNUAL OPERATIONS

A/C Type	Total Ops	Departures	Arrivals	FOB Ops	FCLP Ops	T/G Ops
AV8B	8,352	432	432	7,488	0	0
C130	0	0	0	0	0	0
CH46	0	0	0	0	0	0
TOTALS	**8,352**	**432**	**432**	**7,488**	**0**	**0**

Table 3 represents the total projected annual operations at AUX-2. This table reflects the combination of existing annual operations with the projected increase in annual operations due to the addition of FOB operations. In total, it is projected that AUX-2 will experience 51,280 annual operations. The noise study developed by Harris Miller Miller and Hanson (HMMH 1993) used 51,280 annual operations as the basis of its noise impact projections and analysis.

TABLE 3
PROJECTED ANNUAL OPERATIONS

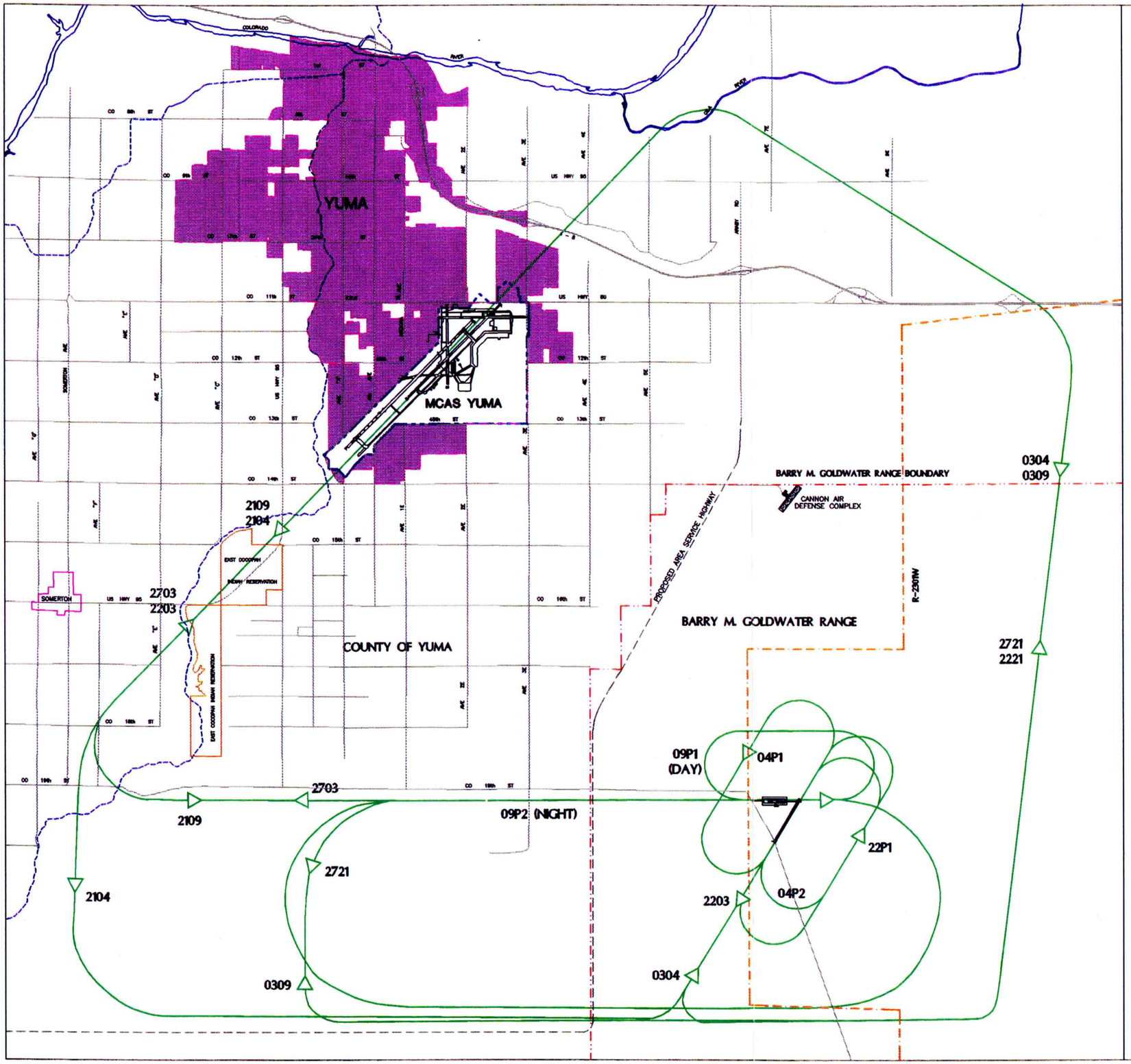
A/C Type	Total Ops	Departures	Arrivals	FOB Ops	FCLP Ops	T/G Ops
AV8B	49,632	1,488	1,488	7,488	39,168	0
C130	1,076	179	179	0	0	718
CH46	572	286	286	0	0	0
TOTALS	**51,280**	**1,953**	**1,953**	**7,488**	**39,168**	**718**

FLIGHT PATTERNS AND RUNWAY USAGE

Figure 4 depicts the current flight tracks and training patterns at AUX-2 including the flight tracks used between MCAS Yuma and AUX-2. The flight tracks illustrated form the basis of this AICUZ study. It is important to note that the flight tracks depicted are not precise and often divert from those shown due to factors such as varying aircraft speed, the number of aircraft in the pattern, and wind direction.

FIGURE 4
FLIGHT TRACKS
11 X 17

MCAS YUMA
AUX-2 AICUZ



0 4500 9000 18000 feet

0 1 2 3 miles

Flight Tracks

PROJECTED ANNUAL OPERATIONS

Arrival	
0309	357
2109	826
0304	265
2104	505
Departure	
2703	826
2721	357
2203	505
2221	265
Touch & Go	
09P1	467
22P1	251
FCLP	
09P1	29,376
09P2	9,792
FOB	
04P2	4,643
04P3	2,845
Total	51,280

Figure 4

As noted in the noise study (HMMH 1993), the runway and flight track usage at AUX-2 is interconnected with that at MCAS Yuma, since the majority of flights begin and end at the air station. The flight tracks are designated with four numbers that correspond to the numbers of the departure and arrival runways. For example, flight track 0322 departs from MCAS Yuma Runway 03 and arrives at AUX-2 Runway 22. Two FCLP flight tracks are depicted on Figure 4, flight track 09P1 (daytime pattern) and flight track 09P2 (nighttime pattern).

Table 4 depicts the maximum number of annual operations projected by flight track. Table 5 illustrates the maximum number of annual operations projected for each runway at AUX-2.

TABLE 4
PROJECTED OPERATIONS BY FLIGHT TRACK

Track	Function	Operations
0309	AUX 2 Arrival	357
2109	AUX 2 Arrival	826
0304	AUX 2 Arrival	265
2104	AUX 2 Arrival	505
2703	AUX 2 Departure	826
2721	AUX 2 Departure	357
2203	AUX 2 Departure	505
2221	AUX 2 Departure	265
04P1	T/G	467
22P1	T/G	251
09P1	FCLP	29,376
09P2	FCLP	9,792
04P2	FOB	4,643
04P3	FOB	2,845
Total		**51,280**

TABLE 5
PROJECTED OPERATIONS BY RUNWAY

Runway 09		Runway 27		Runway 04		Runway 22	
Track	**Ops**	**Track**	**Ops**	**Track**	**Ops**	**Track**	**Ops**
0309	357	2703	826	0304	265	2203	505
2109	826	2721	357	2104	505	2221	265
09P1	29,376			04P1	467	22P1	251
09P2	9,792			04P2	4,643		
				04P3	2,845		
Total	**40,351**		**1,183**		**8,725**		**1,021**

IV. AICUZ METHODOLOGY

The AICUZ development process considers noise impacts and accident potential. These two elements, noise impacts and accident potential, are described below.

NOISE

Aircraft noise is perhaps the most significant factor in the AICUZ development process. The primary method of describing aircraft noise is through the use of average noise contour lines on the ground. These contour lines represent the total pressure level and duration of sound during a sample period divided by the time. This average is weighted for objectionable nighttime noise and is representative of the busiest level of flight activity. The noise contours, then, represent the average noise received in the area over the period of a year. Actual noise levels would, at times, exceed the average noise.

The noise contours developed in the noise study (HMMH 1993) are based on the maximum capacity or utilization of AUX-2. As modeled, maximum capacity represents the number of operations occurring over a 24-hour period on 8 nights per month, for a total of 96 times per year. Table 6 represents the number of operations that are projected to occur in this maximum capacity scenario, and is the basis for the noise contours.

TABLE 6
PROJECTED MAXIMUM CAPACITY OPERATIONS

A/C Type	Total Ops	Departures	Arrivals	FOB Ops	FCLP Ops	T/G Ops
AV8B	416.00	24.00	24.00	80	288	0.00
C130	3.84	0.64	0.64	0	0	2.56
CH46	2.04	1.02	1.02	0	0	0.00
TOTALS	**421.88**	**25.66**	**25.66**	**80**	**288**	**2.56**

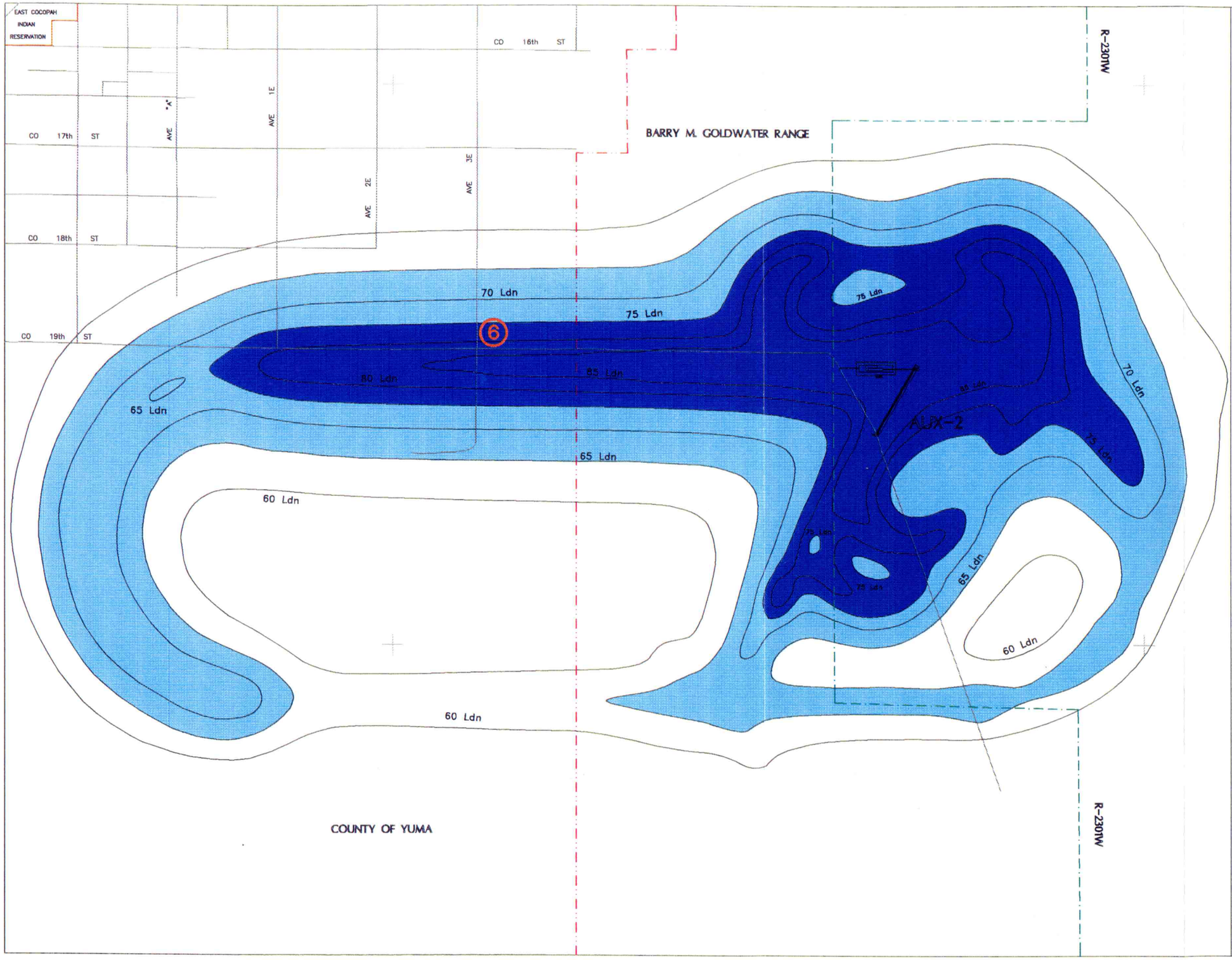
Noise Contours

Noise contours developed for the projected operations for AUX-2 are shown in Figure 5. These contour lines are derived from the combination of the flight patterns (see Figure 4) and operation level information (see Tables 1, 2, 3, and 6).

Noise contour lines are similar to topographic contour lines, in that there are no sudden changes in the noise or elevation level at the line; therefore, it is not possible for the human ear to distinguish the sound level from one side of a contour line to the immediate other side. The noise contour lines are simply tools to be used by decision makers to make informed planning recommendations.

FIGURE 5
NOISE ZONES AND NOISE COMPLAINTS
11 X 17

MCAS YUMA
AUX-2 AICUZ



0 2000 4000 6000 8000 10000 feet

0 .5 1 2 miles

Noise Zones and Noise Complaints

Legend

- 75+ Ldn
- 65–75 Ldn
- 65 Ldn AND BELOW
- (6) APPROXIMATE LOCATION AND NUMBER OF RECORDED NOISE COMPLAINTS

Figure 5

The noise exposure metric used in the noise study (HMMH 1993) is the day-night average Ldn. The units are A-weighted decibels (dBA). The day-night average metric accounts for the heightened intrusiveness of noise events occurring during the nighttime (defined as 2200 to 0700) by penalizing nighttime events as if they were equal to 10 daytime events.

Noise contour lines have numbers ranging from 60 Ldn to 80 Ldn in units of 5 Ldn. The 80 Ldn is the loudest contour line computed for AUX-2; 60 Ldn the quietest. Certain land uses allowed within the 60 to 65 Ldn contour may not be allowed or may require sound attenuation to be acceptable in the 75 to 80 Ldn contour. Noise contours are described in noise zones as follows:

- Noise Zone 3 = above 75 Ldn
- Noise Zone 2 = 65 to 75 Ldn
- Noise Zone 1 = below 65 Ldn

Noise Complaints

The number of complaints due to noise generated from AUX-2 operations and the location of those who complain were used to validate the impact of air operations on the community. Noise complaints received at MCAS Yuma for the years 1991-1993 are mapped (see Figure 5). In all, six complaints were received during this period of time. All six complaints originated from an area near County 19th and Avenue 3E.

Because of the remote location of AUX-2 and the relatively low number of operations in the area, historically there have been few noise complaints associated with the airfield.

SAFETY

In addition to noise, the other major consideration in the AICUZ development process is the potential for aircraft accidents in and around AUX-2. CZs and APZs are developed to identify areas of land use concern and are based on a review of historical accident and operations data and the application of Navy Accident Potential Guidelines. These guidelines support the basic concepts that areas of danger exist and the danger is highest adjacent to the runway. The CZs and APZs do not indicate the probability of an aircraft accident but indicate where accidents tend to occur most often.

DOD guidelines identify three APZs: CZ, APZ I, and APZ II.

CZ - The CZ has the highest probability for accidents. It lies immediately beyond the end of the runway and outward along the extended runway centerline for a distance of 3,000 feet. The width of the CZ varies from 1,500 feet at the end of the runway up to 2,284 feet at its widest point. These dimensions are consistent with DOD guidelines for Class B runways.

APZ I - APZ I, the area immediately beyond the CZ, possesses a measurable potential for accidents less than that of CZ but more than that of APZ II. Typically, the zone is 3,000 feet wide by 5,000 feet long and can be curved to conform to the slope of the flight paths.

APZ II - APZ II, the area beyond APZ I, has a measurable potential for accidents. APZ II is normally provided under a flight path whenever APZ I is required. Typically dimensions for APZ II are 3,000 feet wide by 7,000 feet long. APZ II is also applied to the entire FCLP track beyond APZ I.

DOD classifies runways in order to determine the proper configuration of the CZs and airspace criteria. The classification is dependent on the type of aircraft that operates from the runway. Runways 04/22 and 09/27 at AUX-2 are designated as Class B runways. The configuration of the CZs developed for Runways 04/22 and 09/27 are illustrated on Figure 6.

It is the purpose of the APZs to define areas of possible concern and the type of land use limitations that might apply. APZs are required for flight tracks that experience 5,000 or more annual operations (departures or approaches). Based on the projected operations per runway (refer to Table 5), APZs were developed for each departure and approach flight track and for the entire FCLP flight tracks. Figure 6 illustrates these APZs for AUX-2.

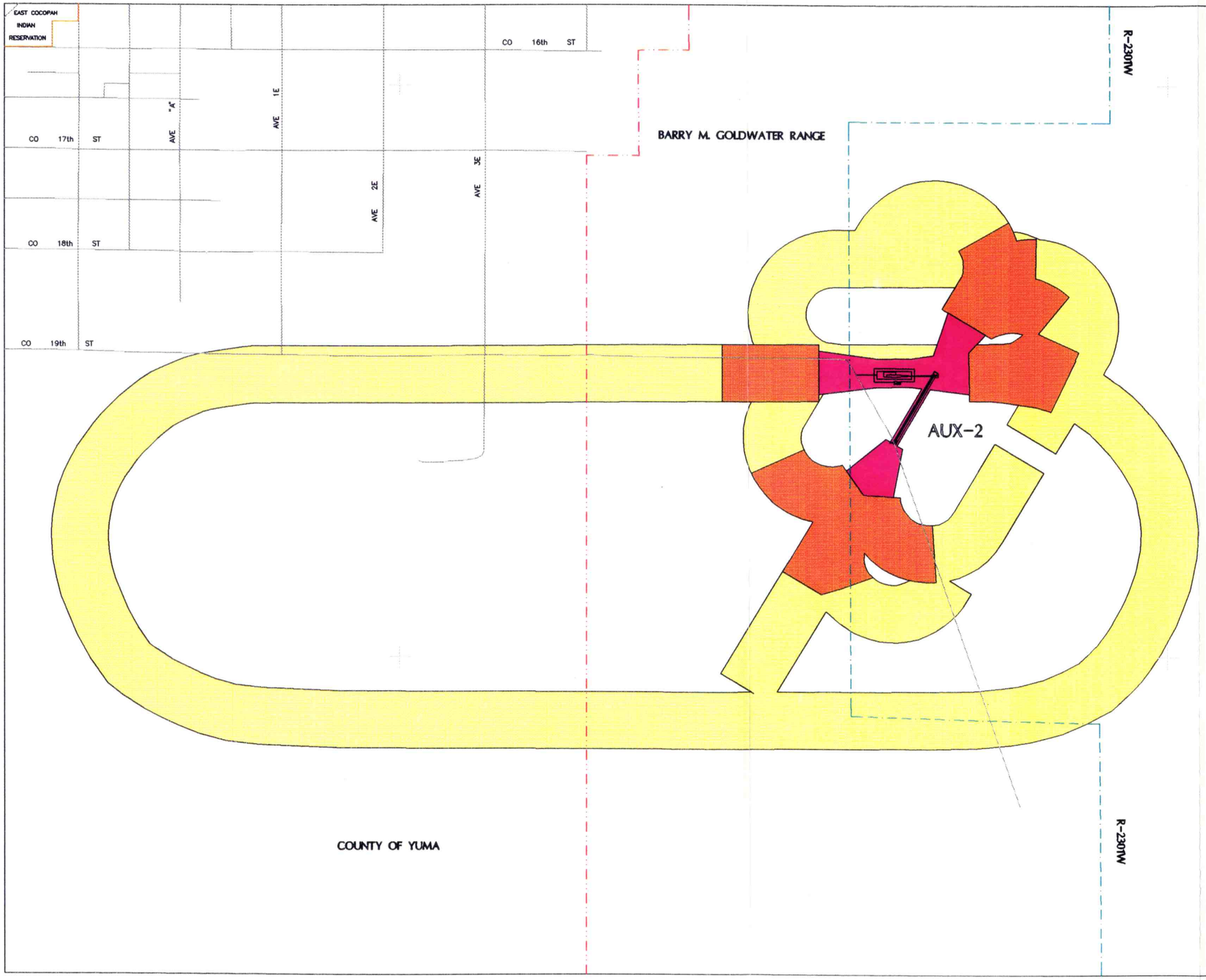
At AUX-2, the CZ for Runway 04 is atypical because it serves as the CZ for two flight tracks which separate approximately 1,500 feet from the end of the runway and one straight approach and departure. This results in the CZ having different dimensions than that outlined in the DOD guidelines in order to conform to the flight tracks. The APZ I and APZ II extend straight under the approach to Runway 09. All other APZ I and APZ II areas are curved to conform to the departing and arriving flight tracks.

Two AUX-2 flight tracks (09P1 and 09P2) support FCLP operations. Flight track 09P1 is a left-hand, one-mile abeam pattern used for daytime FCLP operations. Flight track 09P2 is a right-hand, three-mile abeam pattern used for nighttime FCLP operations. Because FCLP is typically an intense aircraft evolution, and because FCLP operations are usually conducted at night with several aircraft in the pattern at low altitude, DOD guidelines allow for the extension of APZ II to include the entire FCLP track beyond APZ I (OPNAVINST 11010.36A).

Aircraft Accident History

As part of the APZ development process, aircraft accident history is reviewed to determine whether adjustments to the APZs are warranted. There have been no accidents in the last five years as a result of operations at AUX-2; therefore, a modification of APZ criteria is unwarranted.

FIGURE 6
ACCIDENT POTENTIAL ZONES
11 X 17



MCAS YUMA
AUX-2 AICUZ

0 2000 4000 6000 8000 10000 feet

0 .5 1 2 miles

Accident Potential Zones (APZs)

Legend

- CLEAR ZONE AND SETBACK
- APZ I
- APZ II

Figure 6

IMAGINARY SURFACES

Another principal consideration in the discussion of safety at AUX-2 is the preservation of unobstructed runway approach surfaces.

Federal Aviation Regulations (FAR) Part 77 (Federal Aviation Administration, FAR, Part 77, Objects Affecting Navigable Air Space, January 1975) specifies a series of imaginary height restriction surfaces surrounding airports and airstrips. Any penetration of the terrain or manmade objects above these surfaces is considered an obstruction by the FAA. All such obstructions are reviewed by the FAA to determine if they constitute a hazard to air navigation. If an obstruction is allowed, it often must be appropriately marked and/or lighted. In all cases, however, penetrations to the imaginary surfaces are not advised and new development should stay beneath these surfaces if physically and economically feasible.

Different imaginary surfaces are used for civil airports and military airports. Part 77 criteria for military airports differ from civilian airport criteria because of the operating characteristics of certain military aircraft, the necessity for low altitude maneuvering and formation take offs, the more stringent training needs, and the ordnance-carrying requirements of the military. The FAR Part 77.28 specifies that at airports operated by the military, the military surfaces will apply. Thus the dimensions of the Part 77 imaginary surfaces utilized at AUX-2 are determined by the classification of the AUX-2 runways as established in NAVFAC P80.3 (Appendix B). Both runways are military Class B.

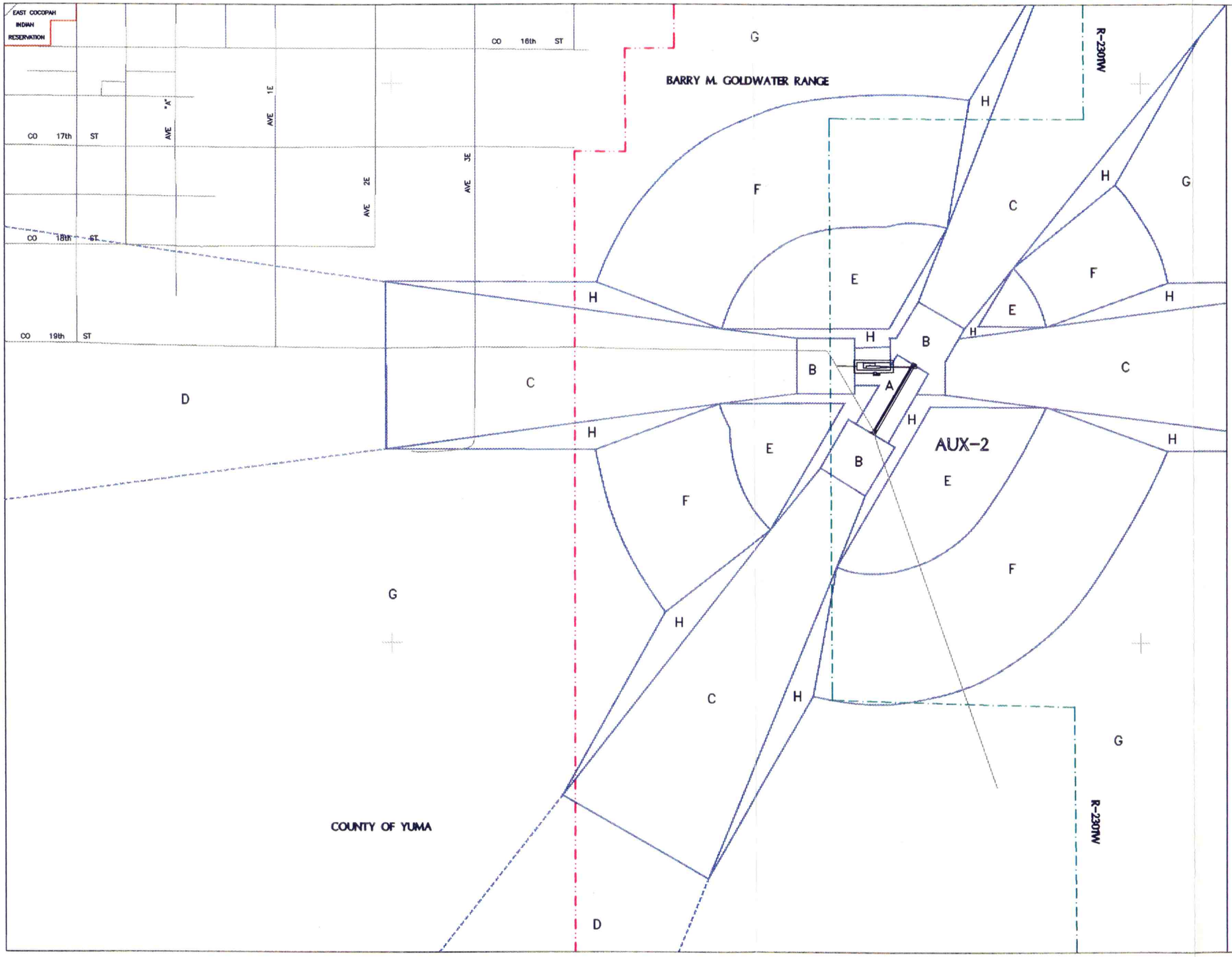
The elevation of AUX-2 is 266 feet above msl based on the Established Airfield Elevation. The primary surface is a surface on the ground centered lengthwise on the runway and extending 200 feet beyond each end of the runway. The primary surface for the runways at AUX-2 is 1,500 feet wide; 750 feet either side of runway centerline. A transitional surface (1,500 feet each side of the entire length of the runway) with a 7:1 slope connects the primary surface with the Inner Horizontal Surface, lying at an elevation of 150 feet above ground level (AGL) or 416 feet msl. The approach surfaces for each active runway extend outward from the primary surface 25,000 feet at a slope of 50:1. A conical surface connects the inner and outer horizontal surfaces and is inclined at a slope of 20:1. The outer horizontal surface extends 50,000 feet, or roughly 8 miles from the airfield, at an elevation of 500 feet AGL (766 feet MSL).

The location of these military imaginary surfaces provides adequate clearance between the imaginary surface and the aircraft on its normal flight path. Figure 7 depicts the application of Part 77 criteria to AUX-2. No penetrations occur in the airspace imaginary surfaces due to terrain or structures on the airfield, which are greater than 150 feet AGL.

THE AICUZ AREA

The AICUZ area is a combination of noise impact and APZs. At AUX-2, the superimposed Ldn noise contours and APZ boundaries create up to nine AICUZ subzones. These subzones contain various levels of accident potential and noise exposure, as follows:

FIGURE 7
IMAGINARY SURFACES
11 X 17



MCAS YUMA AUX-2 AICUZ

0 2000 4000 6000 8000 10000 feet

0 .5 1 2 miles

Imaginary Surfaces

Legend

A – PRIMARY SURFACE
B – CLEAR ZONE SURFACE
C – APPROACH–DEPARTURE CLEARANCE SURFACE (GLIDE ANGLE = 50:1)
D – APPROACH–DEPARTURE CLEARANCE SURFACE (HORIZONTAL)
E – INNER HORIZONTAL SURFACE (150 FEET ABOVE AIRFIELD ELEVATION)
F – CONICAL SURFACE (20:1)
G – OUTER HORIZONTAL SURFACE (500 FEET ABOVE AIRFIELD ELEVATION)
H – TRANSITIONAL SURFACE (7:1)

Figure 7

Subzone	Component Description
CZ	Runway Clear Zone and all Noise Zones
I3	APZ I and Noise Zone 3
I2	APZ I and Noise Zone 2
I1	APZ I and Noise Zone 1
II3	APZ II and Noise Zone 3
II2	APZ II and Noise Zone 2
II1	APZ II and Noise Zone 1
3	Noise Zone 3
2	Noise Zone 2

Figure 8 illustrates the noise zones and APZs for AUX-2 and highlights each of the subzones of the AICUZ. Table 7 quantifies the land area within the footprints of Noise Zones 3 and 2. Table 8 quantifies the land area within the footprints of CZ, APZ I, and APZ II.

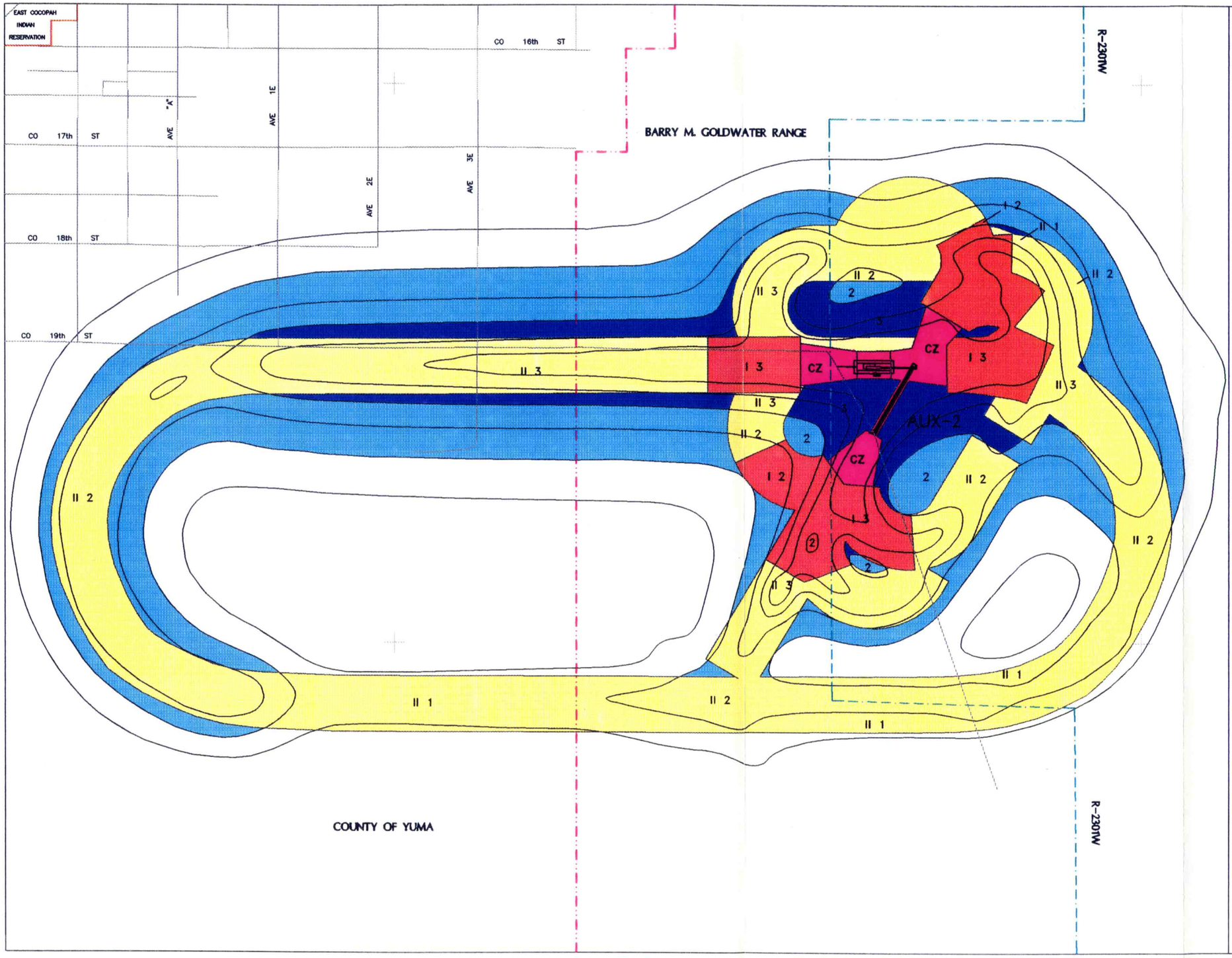
TABLE 7
NOISE FOOTPRINT (ACREAGE)

Noise Zone	Acreage On Range	Acreage Off Range
3	6,807	1,755
2	7,267	6,024
Total	**14,074**	**7,779**

TABLE 8
APZ FOOTPRINT (ACREAGE)

APZ Zone	Acreage On Range	Acreage Off Range
Clear Zone	560	--
APZ 1	1,203	--
APZ 2	7,157	4,341
Total	**8,920**	**4,341**

FIGURE 8
AICUZ
11 X 17



MCAS YUMA AUX-2 AICUZ

0 2000 4000 6000 8000 10000 feet

0 .5 1 2 miles

AICUZ

Legend

- CLEAR ZONE AND SETBACK
- APZ I
- APZ II
- 75+ Ldn
- 65–75 Ldn
- 65 Ldn AND BELOW

AICUZ SUBZONES

CZ – RUNWAY CLEAR ZONE, ALL NOISE ZONES
I 3 – APZ I, NOISE ZONE 3 (>75 Ldn)
I 2 – APZ I, NOISE ZONE 2 (65–75 Ldn)
I 1 – APZ I, NOISE ZONE 1 (<65 Ldn)
II 3 – APZ II, NOISE ZONE 3 (>75 Ldn)
II 2 – APZ II, NOISE ZONE 2 (65–75 Ldn)
II 1 – APZ II, NOISE ZONE 1 (<65 Ldn)
3 – NO APZ, NOISE ZONE 3 (>75 Ldn)
2 – NO APZ, NOISE ZONE 2 (65–75 Ldn)

Figure 8

V. LAND USE

LAND OWNERSHIP

AUX-2 is located within the western portion of the Goldwater Range on publicly owned land, managed by the federal government (BLM) (Figure 9). There are state-owned parcels on the military reservation within the AICUZ study area. The noise contours that define the AICUZ extend beyond boundaries of the military reservation on the west and impact federal, state, and privately owned lands. APZs extend beyond the boundary of the reservation and also include federal, state, and privately owned land.

EXISTING ZONING

In general, the majority of lands west of the Goldwater Range is zoned RA-10, allowing one residential unit every ten acres. Other zoning classifications in the study area include RA-5 (rural area, one residence per five acres), recreational vehicle park, suburban ranch, and mobile home subdivisions (Figure 10). Only those areas currently developed are zoned something other than RA-10; therefore, rezoning would be required on lands considered for more intense development.

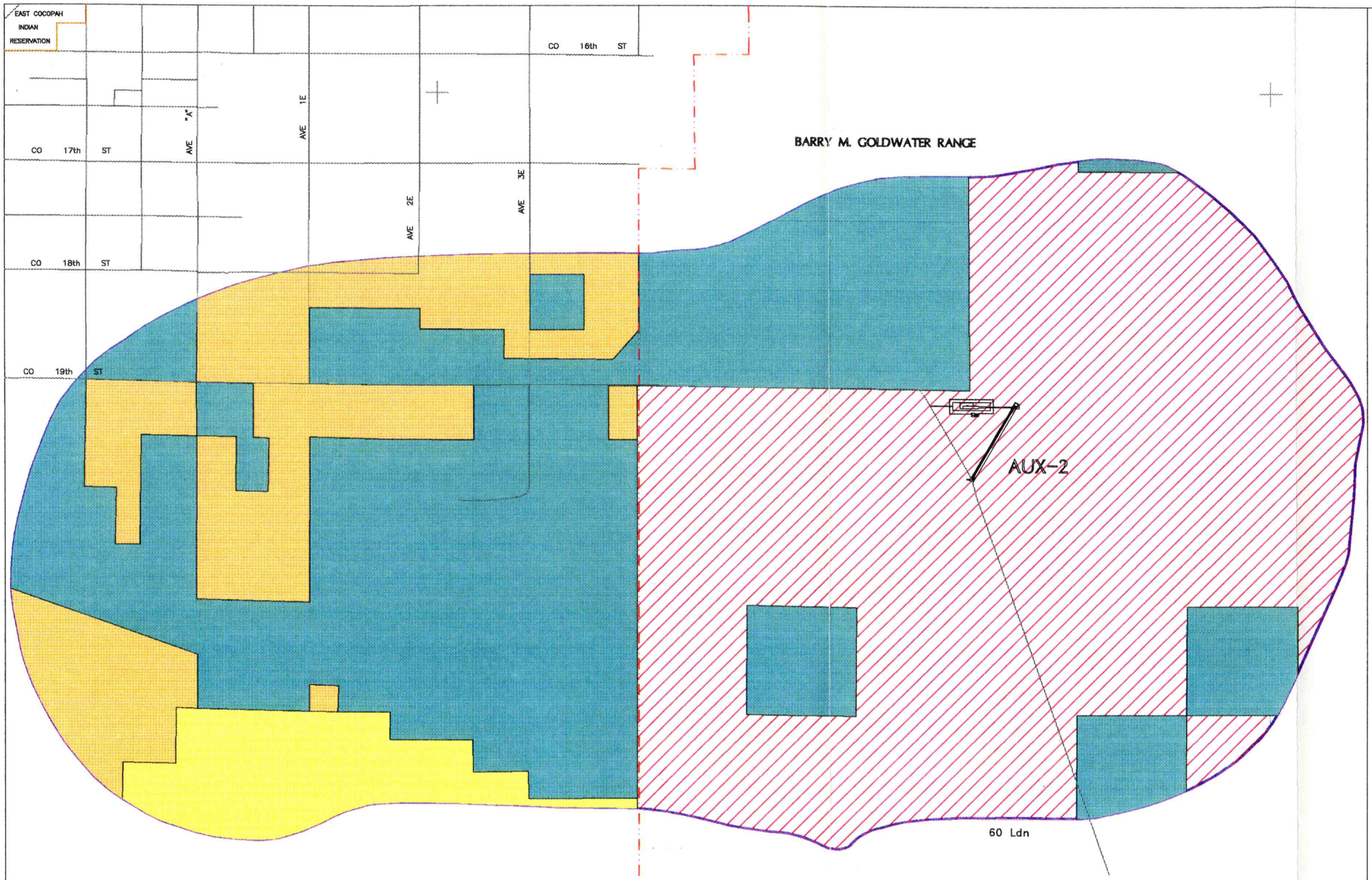
EXISTING LAND USE

Existing land use within the reservation, including state-owned parcels, is restricted by law to military operations only. The federal acreage is managed by the BLM but was withdrawn by Congress (Public Law 99-606) from entry under general public land laws. It is reserved for military training and other national defense purposes to the extent that these uses are compatible with other laws and regulations. All other land uses, including mining and mineral leasing, grazing, and crop productions, are prohibited. Public recreation uses are permitted only to the extent that they are compatible with the military mission and safety constraints.

Public Law 99-606 also permits DOD to secure exclusive rights of use to state and private lands within the military reservation by lease or, if required, by lease condemnation. All non-federal lands are secured on a five-year lease or lease condemnation and are automatically renewable at the option of the military. Withdrawal and reservation of the land for military use expires with Public Law 99-606 in the year 2001. Continued military use of this property past that date is subject to Congressional renewal.

Within the military reservation boundaries, a rifle range and a 69kV transmission line have been identified. The rifle range is associated with MCAS Yuma and is located just north of County 19th Street and just east of the reservation boundary. The Western transmission line is located in a 100-foot easement paralleling the reservation boundary.

FIGURE 9
LAND OWNERSHIP WITHIN 60 Ldn CONTOUR
11 X 17



MCAS YUMA AUX-2 AICUZ

0 2000 4000 6000 8000 10000 feet

0 .5 1 2 miles

Land Ownership within 60 Ldn Contour

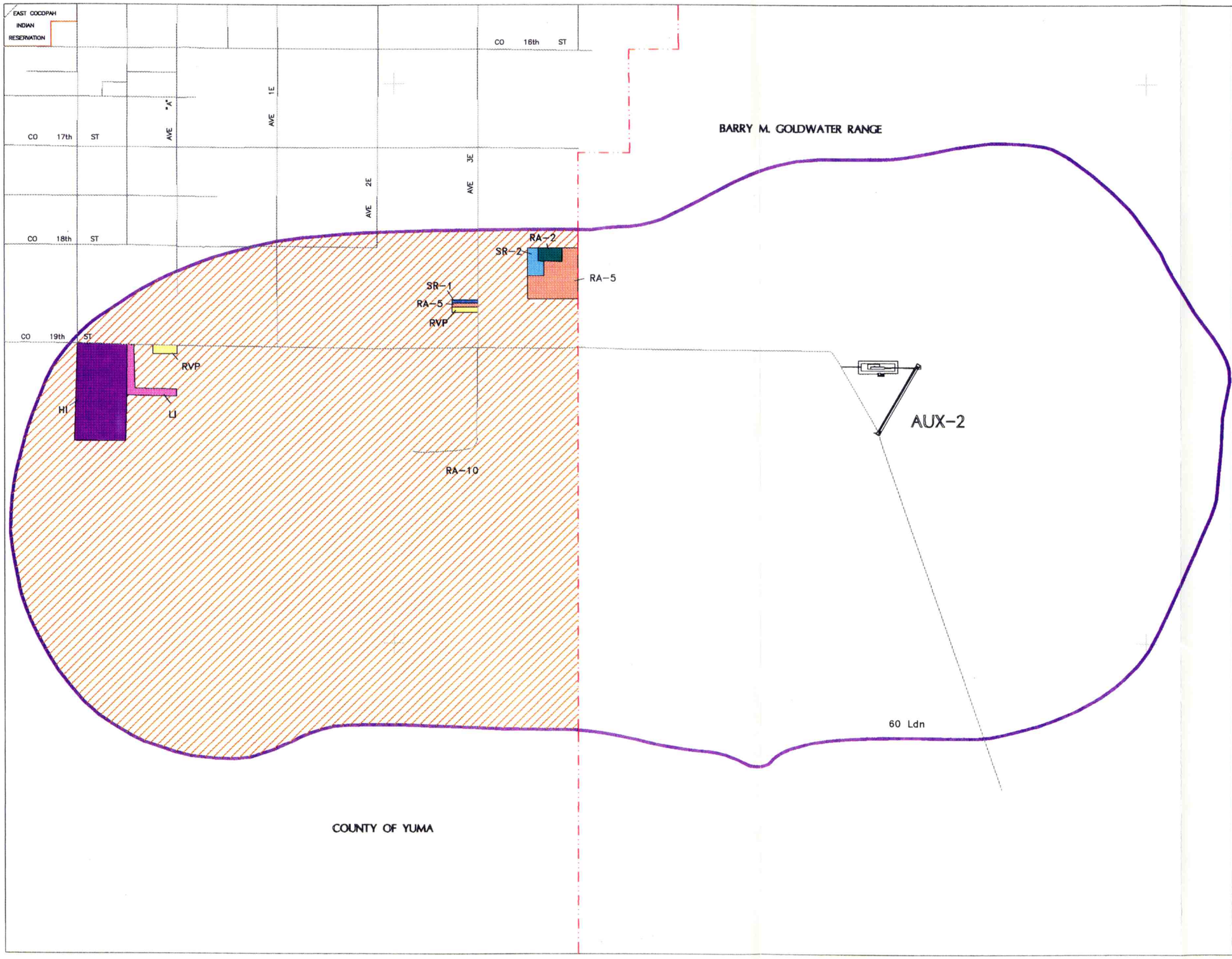
Legend

- BUREAU OF LAND MANAGEMENT (BLM)
- MILITARY RESERVATION (BLM)
- STATE OF ARIZONA
- PRIVATE/OTHER

Figure 9

FIGURE 10
EXISTING ZONING
11 X 17

MCAS YUMA
AUX-2 AICUZ



0 2000 4000 6000 8000 10000 feet

0 .5 1 2 miles

Existing Zoning within 60 Ldn Contour

Legend

- RVP – RECREATIONAL VEHICLE PARK
- SR–1 – SUBURBAN RANCH
- SR–2 – SUBURBAN RANCH
- RA–2 – RURAL AREA
- RA–5 – RURAL AREA
- RA–10 – RURAL AREA
- HI – HEAVY INDUSTRIAL
- LI – LIGHT INDUSTRIAL

Figure 10

Existing land uses for areas outside of the military reservation within or adjacent to the AICUZ study area are depicted in Figure 11. Although this area is predominantly undeveloped, developed land uses include the following:

- agricultural lands found throughout the study area
- the Southern Mesa Recreational Vehicle park (approximately 200 spaces) located west of Avenue 3E, between 19th Street and 18th Street
- two single-family dwelling units located along Avenue 3E just north of the Southern Mesa Recreational Vehicle park
- Pioneer Rancheros, a mobile home and single-family home subdivision, bordering the range, one-half mile north of 19th Street
- four single-family dwelling units located just south of Pioneer Rancheros
- three residences and a well drilling business located at the northeast corner of 19th Street and Avenue 3E
- three dwelling units and an agricultural equipment storage yard located south of 19th Street, one-half mile west of Avenue 3E
- a sand and gravel mining business located on leased State Trust land one mile south of County 19th Street (lease expires July 1995)
- a desalination sludge facility operated for the Bureau of Reclamation, located south of County 19th Street, east of Avenue B

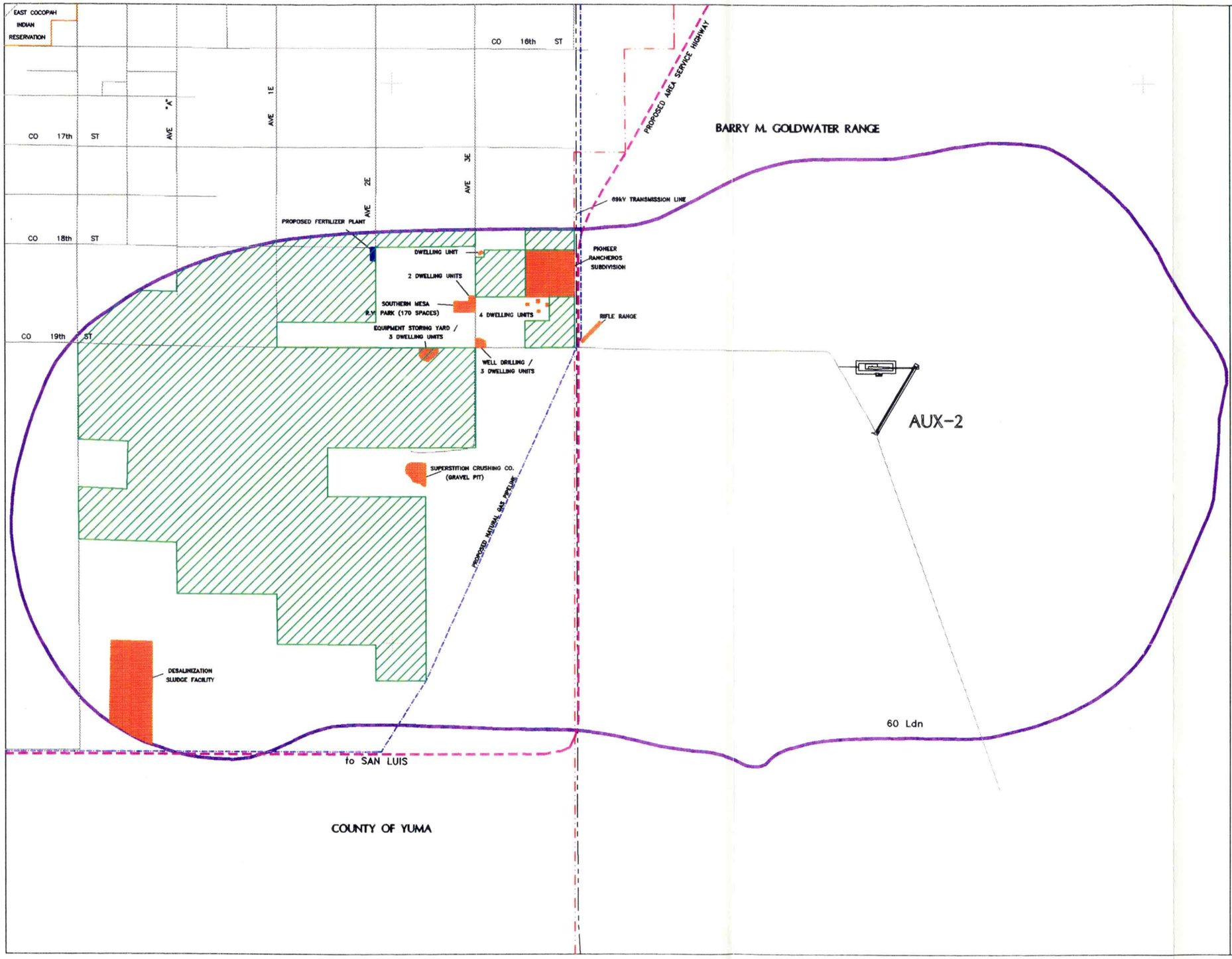
FUTURE LAND USE

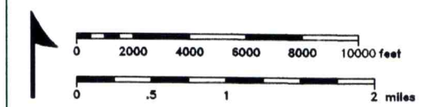
As indicated in the discussion of existing uses, the lands on the military reservation will continue to be exclusively related to the military missions. There is the potential for further development of facilities at AUX-2. The 1988 Master Plan Update for MCAS Yuma recommended the long-range development of the site an as outlying field (OLF) to relieve operational pressures at the main air station. All proposed uses as an OLF will be directly related to the military mission. No personnel support or housing facilities are recommended.

The Yuma County General Plan does not describe planned land uses within the AUX-2 study area. The Area 1 "Development Bands" map produced by the Yuma County Planning and Zoning Department includes the AUX-2 AICUZ study area but does not depict development occurring in this area through the year 2035. The land is currently zoned RA-10, which allows one residential unit

FIGURE 11
EXISTING AND FUTURE LAND USE WITHIN 60 Ldn CONTOUR
11 X 17

MCAS YUMA
AUX-2 AICUZ





Existing and Future Land Use within 60 Ldn Contour

Legend

Existing Land Use

- DEVELOPED AREAS
- AGRICULTURE

Future Land Use

- PROPOSED DEVELOPMENT AREAS
- AREA SERVICE HIGHWAY
- NATURAL GAS PIPELINE

Figure 11

per ten acres. According to personnel at the Yuma County Planning Department, the likely trend is for down-zonings to allow the development of one- to five-acre ranchettes and potential development of other recreational vehicle parks or mobile home subdivisions.

A proposed new highway leading from the Mexican border to Interstate 8 (I-8) and traversing along the western range boundary could drastically change land use patterns in the study area. This proposed highway would be located two to three miles west of AUX-2. Construction is expected to begin within two years. Construction of the highway could potentially lead to adjacent development of residential, industrial, and commercial areas, depending upon such factors as ingress and egress and final alignment of the roadway. Final highway alignment and location of interchanges are not complete. A fertilizer processing facility is proposed to be constructed on 11 acres southeast of County 18th Street and Avenue 2E. Lastly, a natural gas pipeline has been proposed by the El Paso Natural Gas Company that would extend through the AUX-2 study area paralleling the Goldwater Range boundary from I-8 to County 19th Street, at which point it would turn southwest.

ECONOMIC CONDITIONS AND TRENDS

Population

Yuma County population growth is concentrated around established population centers, including the city of Yuma. The city was founded in the mid-1850s and by the 1880 census, Yuma was the third largest town in the Arizona Territory. The city did not begin to experience significant population increases until after the construction of the Laguna Dam in 1909 that permitted widespread irrigation in the area. Growth of the area was then tied to its development as a major agricultural center, and since that time the city of Yuma has dominated Yuma County and the southwest corner of the state, both in population and economic activity. In the decade between 1950 and 1960, tremendous growth occurred with the greatest impetus coming from the expansion of military facilities in the area. From a 1950 population of 9,145 the city of Yuma grew to 23,974 in 1960, a growth of more than 250 percent. From the census of 1960 to the census of 1980, the city grew from 23,974 to 42,481, an increase of 77 percent. The population of Yuma in 1990 was 54,923, an increase of 29 percent from 1980.

Population increases from 1980 to 1990 resulted from the combined forces of natural increase and in-migration, and an aggressive program of annexation. The land base of the city in 1980 was approximately 12 square miles. In 1990, the land base had increased to approximately 22 square miles. The Arizona Department of Economic Security estimated Yuma's 1992 population at 56,925.

Table 9 depicts population estimates and projections to the year 2000 for the city and county of Yuma and the state of Arizona. The city of Yuma is projected to increase by up to 40 percent by the year 2000. The growth rate of the county is projected to be only slightly less, at approximately 39 percent.

TABLE 9 POPULATION ESTIMATES/PROJECTIONS 1990-2000			
	1990	**1995**	**2000**
City of Yuma	54,923	58,005	63,805
Yuma County	106,895	108,000	118,800
State of Arizona	3,665,228	4,209,000	4,800,700
Source: Arizona Department of Economic Security, March 1990			

It is important to note that the population of both the city and county of Yuma is highly variable by season. The area is a popular place for winter visitors whose residence may range from a day to several months. A study conducted by the Yuma County Chamber of Commerce in 1986 estimated 34,800 winter visitors annually. The median length of stay was five months and one week. Over 30 percent stayed 6 months or longer. These winter visitors contribute significantly to the regional economy and to the demand for housing and services.

Economic Characteristics

The leading industries in the city and county of Yuma include agriculture, government, and tourism, with an expanding economic base due primarily to manufacturing, warehousing, and distribution firms. Agriculture and agricultural-related activities are the principal economic activities in Yuma County. The area is dependent on irrigation, which makes possible the production of cotton, citrus fruit, and vegetables.

Tourism is also a major industry for Yuma County. The Yuma Chamber of Commerce estimates that tourism accounts for a $256 million (based on an economic multiplier of four) impact on the Yuma County economy. The services and trade industries are largely geared to the needs of tourists who play a vital role in the economy of the Yuma region. The tourist industry is made up of seasonal residents as well as cross-country travelers. Three factors have contributed to the growth and strength of the tourist industry: the favorable winter climate, the location between San Diego and Phoenix/Tucson, and the highway network.

The military is the leading employer in Yuma County, with both the MCAS Yuma and the Yuma Proving Ground contributing to the economy. In 1992, MCAS Yuma contributed over $166 million directly to the local economy. At the end of 1992, MCAS Yuma provided employment for 1,160 civilians, in addition to the military population of 5,293. There were 4,706 dependents of military personnel at the station (MCAS Statistical Summary for 1992). The total military and civilian personnel payroll, including personnel of non-tenant organizations, was $97,241,385 for the year.

Housing

The housing supply in Yuma and surrounding communities is estimated to be adequate for projected growth, although there can be seasonal shortages as a result of winter visitors. At the time of the 1990 census, 23.1 percent of available housing units were vacant. In 1992, there were 3,031 families of military personnel, 2,137 of whom occupied non-military housing in the community. The medium value of a single family dwelling in the city of Yuma was $70,000 in 1991.

The greatest increase in housing stock since 1980 has been in the construction of low to upper income rental apartment units. Single detached residences have increased at a slower pace. Other major elements of the housing in the Yuma area are the mobile home and recreational vehicle parks and subdivisions. There are marked seasonal differences in the utilization of recreation vehicle parks in the area.

Land Use Trends

Based on historical land use changes that have occurred in the AUX-2 study area and discussions with city and county planners, issues and assumptions concerning land development trends within or adjacent to the AUX-2 AICUZ include:

- lands within the military reservation will continue to be restricted to military training and other national defense uses
- State Trust lands in the Yuma area are being leased or sold at an increasing rate
- agriculture will continue to be the predominant land use west of the military reservation
- residential development in the Yuma area will occur primarily in the east valley and foothills
- continued mobile home and recreational vehicle park development pressure in Yuma County due to expected increases in winter visitors and short-term visitors
- requests for rezoning of RA-10 land near AUX-2 to smaller one- to five-acre ranchettes or to recreation vehicle and mobile home parks and subdivision will increase
- construction of the area service highway bordering the Goldwater Range on the west could potentially cause increased residential, commercial, and industrial development to areas west of AUX-2, although limited ingress/egress from highway may confine growth; the current proposed alignment of the highway is within the Goldwater Range and there are no planned interchanges in the AUX-2 study area

VI. LAND USE COMPATIBILITY

Compatible land use objectives are derived from the land use suitability matrix for noise and APZs (Appendix A). To find the suggested suitability of a particular land use in any of the AICUZ subzones, it is necessary to locate that use on both the noise and APZ Suggested Land Use Compatibility portions of the matrix. Both portions apply, and where conflicting uses appear, the most restrictive land use takes precedence.

LAND USE COMPATIBILITY IN NOISE ZONES

Guidelines for the types of land uses that are acceptable within noise-impacted areas have been developed by the federal government. These guidelines are described in the Federal Interagency Committee on Urban Noise Guidelines for Considering Noise in Land Use Planning and Control (June 1980). Standard Federal Guidelines (OPNAVINST 11010.36A) for Suggested Land Use Compatibility in Noise Zones are shown in Appendix A.

Noise Zone 3 - Noise Zone 3 for AUX-2 represents the area where noise exceeds 75 Ldn. Residential uses are unacceptable in this zone, with most other land uses requiring sound attenuation measures to reduce the noise level by at least 25 dB.

Noise Zone 2 - Noise Zone 2 depicts the area where noise is between 65 and 75 Ldn. City and county of Yuma standards allow low-density single-family residential development within the 65 to 70 Ldn contours with a noise level reduction at least 25 dB. The county also requires an avigation disclosure statement for new development in this 65 to 70 Ldn zone. No new residential development is allowed within the 70 Ldn noise contour. Recreational vehicle parks are not acceptable in Noise Zone 2 because they are difficult to sound attenuate. Most other land uses are acceptable within Noise Zone 2, although sound attenuation is often required.

Noise Zone 1 - Noise Zone 1 represents the area where noise is below 65 Ldn. All land uses are generally considered acceptable in this noise zone and sound attenuation is not required.

LAND USE COMPATIBILITY IN APZs

Suggested land use compatibility standards in APZ are also shown in Appendix A. Like the noise compatibility standards, these APZ compatibility standards are from OPNAVINST 11010.36A. In general, accident potential land use guidelines are more conservative than those for noise impact.

Land uses that could potentially contribute to the cause of an accident (such as those producing dust or glare or those that attract birds) and land uses that could intensify the damage from an accident (such as industries dealing with explosives) are determinants of land use compatibility. Other primary determinants include population density and the intensity of land uses.

CZ - The CZ represents the highest potential for loss of life and property damage caused by accidents and precludes most land uses in this area. Only open space, vacant, and agricultural uses are permitted; no buildings intended for human occupancy are permitted in the CZ. NAVFAC P-80.3 subdivides the CZ into Types I, II, and III to define the degree of restrictive use. Types I and II CZs are located immediately at the end of a runway and must be cleared and graded to standard ground level. Type III CZs are in the flared area located adjacent to Type II where certain agricultural activities can take place.

APZ I - APZ I defines a zone of lesser potential for loss of life and property damage, requiring some degree of restriction of density and intensity of use. All forms of residential development are unacceptable, and commercial and industrial uses are limited by the density of development and concentration of people. In general, all forms of agricultural and recreational uses involving low densities of people are acceptable in APZ I. Not more than 25 persons should be assembled in any one area or structure capable of being demolished by the crash impact of a single aircraft. Average population densities should not be greater than 10 people per acre.

APZ II Zones - APZ II zones encompass areas of the least potential for loss of life or property damage, but that possess a sufficient level of risk to require density and use restrictions. Most forms of agriculture, open space, recreation, industrial, business, and commercial uses are acceptable providing they meet the requirements for density of development and concentrations of people. Churches, hospitals, and schools are unacceptable in APZ II, as is all residential development except for low density single detached units. Not more than 50 persons should be assembled in any one area or structure capable of being demolished by the crash impact of a single aircraft. Average population densities should not exceed 25 people per acre.

Appendix A presents the OPNAVINST 11010.36A guidelines of compatible land uses for the different APZs and the varying levels of noise exposure. This matrix has been adapted for this analysis in order to more accurately describe generalized land uses.

AICUZ IMPACT ANALYSIS

Summary of Findings

The inventory and analysis associated with the AUX-2 AICUZ identified several findings of importance for existing and continued utilization of the airfield. The major findings, which focus on land ownership and land use, are summarized below:

- The majority of the AICUZ is located within the Goldwater Range which is restricted for various military activities, and is administered by the BLM.

- Ownership of land outside the Goldwater Range boundary is owned or administered by the BLM, the state of Arizona, or by private interests. State Trust lands make up the majority of these lands.

- All undeveloped land within the AUX-2 study area is zoned RA-10, a low intensity zone allowing for one dwelling unit for every ten acres of land.

- Other zoning classifications include rural and low density residential, recreational vehicle park, and heavy and light industry.

- Existing land uses in the AUX-2 study area within the Goldwater Range include a rifle range and a 69kV transmission line.

- Existing land use within the AUX-2 study area outside of the Goldwater Range is primarily agriculture. Other uses include the Southern Mesa Recreational Vehicle park, the Pioneer Rancheros residential subdivision, 13 dwelling units, a well-drilling company, an equipment storage yard, a sand and gravel operation, and a desalinization sludge facility.

- Planned or proposed land uses within the AUX-2 study area include the Area Service Highway, a fertilizer processing facility, and a natural gas pipeline.

- There are no planned or proposed residential or commercial developments in the study area.

Land Use Compatibility

By applying the compatibility guidelines to the existing and future land uses, zoning, and land ownership, several incompatibilities or areas of concern were identified (Figure 12). Within the military reservation boundaries, no land uses were identified as being incompatible. A portion of the rifle range and the 69kV transmission line are located within APZ II for Runway 09 and Noise Zone 3, but both uses are considered acceptable.

West of the Goldwater Range, existing land uses that are compatible based on the OPNAVINST 11010.36A guidelines include the sand and gravel operation and the desalinization sludge facility Both of these uses are heavy industries that are acceptable in all noise zones and in APZ I and APZ II. The planned fertilizer processing facility is also considered an acceptable land use based on the noise and accident potential guidelines.

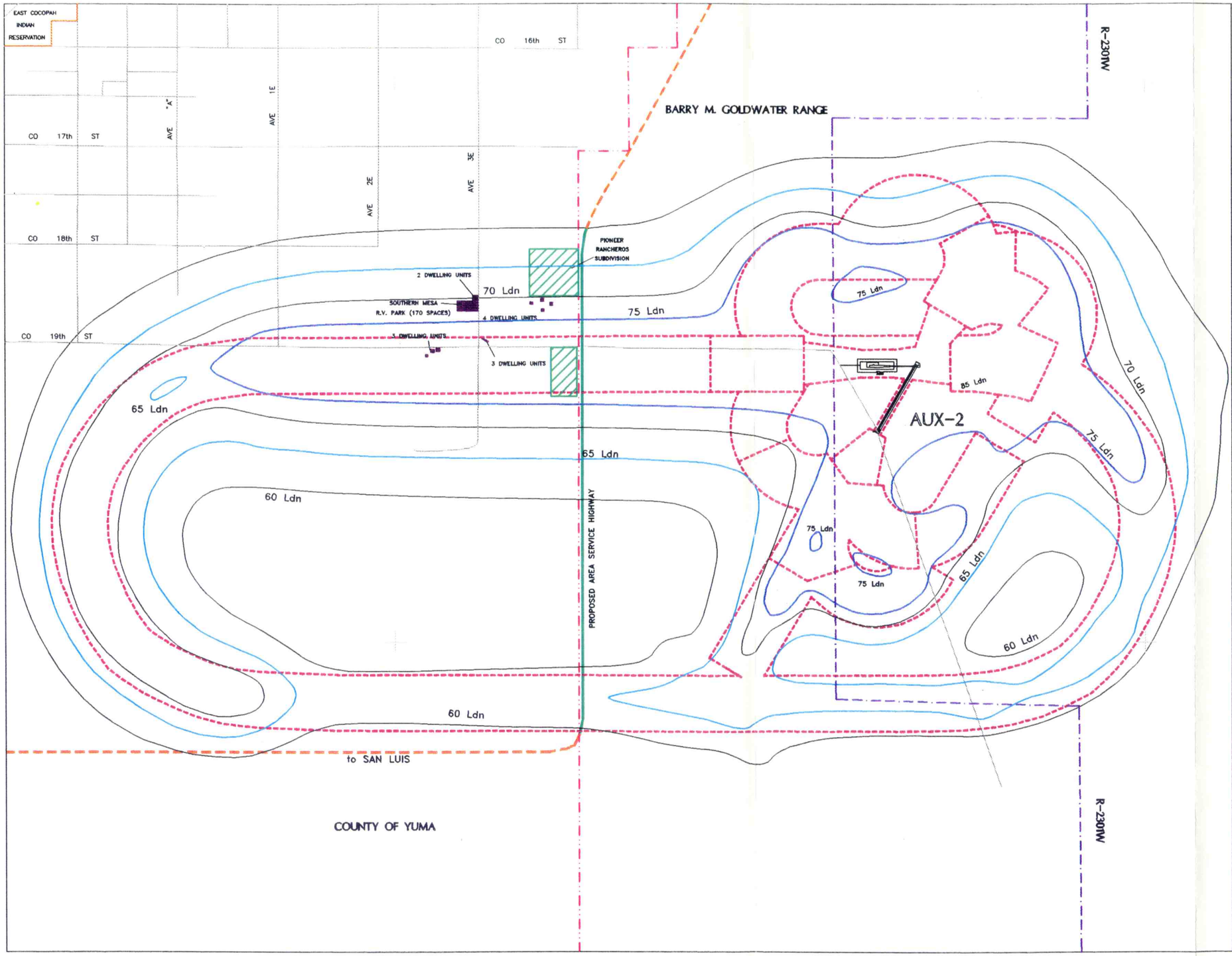
Incompatibilities on land located west of the military reservation include:

- The Southern Mesa Recreational Vehicle park is located within the 70 Ldn contour and is therefore considered as incompatible based on federal and local guidelines for recreational vehicle parks.

- Two single-family dwelling units located just north of the Southern Mesa Recreational Vehicle park are also incompatible because they are within the 70 Ldn contour, unless significant noise level reduction measures have been applied to each residence.

FIGURE 12
INCOMPATIBILITIES AND AREAS OF CONCERN WITHIN
60 Ldn CONTOUR
11 X 17

MCAS YUMA
AUX-2 AICUZ



0 2000 4000 6000 8000 10000 feet

0 .5 1 2 miles

Incompatibilities and Areas of Concern within 60 Ldn Contour

Legend

- INCOMPATIBILITIES
- AREAS OF CONCERN
- CLEAR ZONE, SETBACK AND APZS

Figure 12

- Four dwelling units located south of the Pioneer Rancheros subdivision are also located within the 70 Ldn noise contour, and are incompatible unless significant noise level reduction measures have been applied to each residence.

- Three dwelling units associated with the equipment storage yard south of County 19th Street are within the Noise Zone 3 and also within APZ II. These residences are incompatible based on the Noise Zone 3 guidelines which state that residential uses are unacceptable in areas above 75 Ldn, but are compatible with the APZ II because the regional density is less than the prescribed limits.

- Three dwelling units associated with the well drilling business located at the intersection of County 19th Street and Avenue 3E are also within the Noise Zone 3 and APZ II. These residences are incompatible based on the Noise Zone 3 guidelines, but are compatible with the APZ II because the regional density is less than the prescribed limits.

Areas of concern within the AICUZ footprint include Pioneer Rancheros, the proposed Area Service Highway, and the parcel of private land located immediately west of the Goldwater Range. Pioneer Rancheros, although technically compatible based on federal and local guidelines, is a concern because of the proximity of the developed subdivision to the 70 Ldn noise contour and to the APZ II associated with the FCLP pattern. Any change in the level of operations or in the flight tracks could potentially cause portions of the subdivision to be incompatible with the activities at AUX-2. Pioneer Rancheros is also an area of concern because most residents live in the subdivision full-time and the potential exists for an increased number of noise complaints due to projected operation levels at AUX-2.

The proposed Area Service Highway, leading from the Mexican border to I-8 and traversing the AUX-2 AICUZ study area just inside the Goldwater Range boundary, is an area of concern because the highway could potentially change land use patterns on the non-military lands immediately west of the Goldwater Range boundary. Although no interchanges are being proposed within the AUX-2 AICUZ study area and the proposed alignment is within the Goldwater Range, proximity to highways is often a catalyst to industrial and commercial development.

A parcel of privately owned land is located immediately west of the Goldwater Range boundary and is within both Noise Zone 3 and APZ II. The property is currently undeveloped and is zoned RA-10, but because of available access from Avenue 3E and County 19th Street and the proposed development of the Area Service Highway, the owners of the property could potentially attempt to rezone and develop the land.

Arizona's statehood enabling legislation designated portions of each township as State Trust Land. The State's Urban Lands Act passed in 1981 has enabled the Trust to capitalize on the large increase that planning and zoning adds to raw land values. Most State Trust lands in the vicinity of Yuma would be considered as urban lands and are thus available for lease or sale. Once the land is leased or sold to private interests, the potential increases for rezoning or variance requests which may not be compatible with the AUX-2 AICUZ.

Likewise, all privately owned lands which now exist in the AUX-2 AICUZ are areas of concern because of their development potential. According to the Yuma County Planning Division, requests for rezonings from RA-10 to one- to five-acre ranchettes or to recreation vehicle and mobile home parks are likely to increase in frequency. Low-density residential development that may occur as a result of a change in zoning may be compatible with the AUX-2 AICUZ, depending on building type and sound attenuation measures, but recreation vehicle parks and mobile home subdivisions are not compatible within the 65 Ldn noise contour.

VII. RECOMMENDATIONS

A wide variety of land use strategies oriented toward the federal, state, and local levels are available in an attempt to implement compatible land use within the AUX-2 AICUZ. The purpose of the following discussion is not simply to provide a general list of available implementation strategies, but to provide implementation programs and techniques for AUX-2 in particular.

Although the majority of the AUX-2 AICUZ is located within the Goldwater Range, the following implementation program provides guidelines for future land use compatibility issues on lands west of the military reservation.

The relevant land use issues can be complex because of the number of agencies involved on local, state, and federal levels and because these agencies have control over the disposition of land uses which could potentially conflict with that of the Marine Corps.

MILITARY STRATEGIES

Land Exchange

Land exchange involves the trading of government property for private property of equal value.

Easement Acquisition

Easements may be acquired by the Marine Corps to restrict use of property to compatible development. They usually take the form of flight clearance easements, restrictive use easements, or leaseholds. Flight clearance easements are acquired to limit the height of objects under the flight path in order to prevent obstructions which could degrade the safety of aircraft operations and authorize flight under 500 feet (landing/take-off). Restrictive use easements are acquired to guarantee the development and use of properties and are limited to activities and structures which are consistent with individual requirements of each AICUZ zone.

Leaseholds

Leaseholds are acquired to obtain exclusive property rights for a specified period of time. AUX-2 is somewhat unique in that the majority of land within the AICUZ is on military reservation land and is, therefore, restricted for military purposes.

Fee Title Acquisition

Fee title acquisition results in full property ownership and guarantees the Marine Corps with full and perpetual rights to property control. Fee title acquisition is considered for properties which are essential for safe operations and only if all other means of protection fail.

STATE LEVEL STRATEGIES

The state of Arizona, through Senate Bill 1011 (adopted May 1986), has made it mandatory that "any political subdivision having territory in the vicinity of a military airport shall adopt land use plans and adopt and enforce zoning regulations to assure development compatible with the high noise and accident potential generated by military operations which have or may have an adverse effect on public health and safety." The state law, however, does not specify the content of the plans and regulations, leaving that to the local jurisdiction. The county of Yuma has adopted zoning regulations concerning compatible land uses within the AICUZ. Generally, these regulations closely resemble the federal guidelines with the exception of some regulations concerning residential land uses.

LOCAL LEVEL STRATEGIES

County Planning and Zoning

Coordinated planning and implementation of the AICUZ could all but eliminate future incompatible development, thus reducing the need for other strategies. The County of Yuma Zoning Ordinance provides a tool for assuring existing land use and future development as compatible with the AICUZ. The zoning ordinance dictates what type of land uses are able to be developed within the AUX-2 AICUZ. Undeveloped land within the AICUZ is currently zoned as RA-10, which allows one residence per ten acres. Any plan or zoning changes in the AUX-2 environs should adhere to the Land Use Compatibility Guidelines described in Appendix A. It is recommended that the AICUZ and its guidelines for compatible use be incorporated into the County of Yuma Zoning Ordinance to serve as the basis for approval of future land use requests. The county should incorporate the AICUZ objectives and guidelines in an updated County of Yuma General Plan. Agricultural uses, open space uses, and other low intensity uses are recommended for lands within the AICUZ. High intensity uses, such as subdivisions and trailer parks, should be discouraged. Capital improvements, which may increase the pressure for development to take place, should also be discouraged.

County Public Works

The County Public Works Department must be made aware of the goals and objectives of the AUX-2 AICUZ in regards to the proposed Area Service Highway alignment and interchanges. Interchanges located within the AUX-2 study area would likely promote development in the area adjacent to the range near AUX-2, thereby causing incompatibilities.

County Building Codes

The county of Yuma has a separate building code which specifies floor spaces, materials, sizes, and layout of interior spaces and other standards which affect population densities and sound attenuation. The building code of the county of Yuma should specify adequate sound attenuation for the different types of construction in the different noise zones.

Truth-in-Sales and Rental Ordinance

The truth-in-sales and rental ordinance would require the developer or seller of a residence to disclose that the site would be subject to overflight and accompanying noise associated with operations at AUX-2.

Buffer Ordinance

This ordinance would grant buffer status to appropriate lands on the peripheries of the Goldwater Range, so that further residential development with densities greater than one unit per ten acres would occur well outside of the AICUZ boundaries. Recent development trends in Yuma County have been in the direction of the range. As part of this ordinance, infrastructure improvements could be limited, thereby reducing development pressure. This buffer ordinance would prevent future conflicts with AUX-2 or other range operations.

Public Relations and Education Programs

Programs informing the public are extremely important in achieving the AICUZ objectives. The programs can utilize a number of techniques such as community information meetings, distribution or printed materials, media releases, noise complaint response programs, and community liaison programs.

Community Information Programs

Community information programs are recommended as a specific implementation strategy in order to provide individuals with factual information regarding the impacts of air station operations. The programs should be designed to allow individuals the opportunity to express concerns and receive explanation. Techniques for AUX-2 which can be used include:

- Public Presentation - Public presentations offer an excellent opportunity for direct communication with the community. The final AICUZ slide presentation can be used as a vehicle to promote community dialogue. The presentation can be given to various community organizations including Chambers of Commerce, service clubs, community groups, etc.

- Written Materials/Handouts - Handouts such as summary reports, newsletters, guidelines, etc. offer an effective means of informing the community of important information. Copies of appropriate technical reports (i.e., AICUZ reports, AICUZ handouts) should also be made available. If copies are in short supply, a limited number of copies should be made available at local libraries.

- Media Materials - Press releases or short presentations on television and radio also provide an effective means of keeping the community informed.

Noise Complaint Response Program

MCAS Yuma currently has a system in which noise complaints are received, recorded, and entered into a database. Responsiveness is a key to community good will and may alleviate further noise complaints.

Marine Corps Monitoring Programs

Internal procedures should be established to ensure that a methodical and disciplined approach is taken to monitor events concerning the preservation of AICUZ compatibility. The AICUZ officer and/or his appropriate representative should be assigned the task of monitoring and reporting monthly on the following areas within the AICUZ boundaries:

- county zoning changes
- county general plan updates and amendments, especially the land use element, noise element, and safety element
- county capital improvements plans
- county building code changes
- land sales
- proposed development plans
- EIS applications

APPENDIX A
LAND USE COMPATIBILITY

APPENDIX A
LAND USE COMPATIBILITY

Land Use	Accident Potential			Noise Zones in Ldn			
				1	2		3
	Clear Zone	APZ I	APZ II	60-65	65-70	70-75	75+
Residential							
Low Density	N	N	Y(1)	Y*	25(11)	30(11)	N
Medium/Low Density	N	N	N	Y*	25(11)	30(11)	N
High Density	N	N	N	Y*	25(11)	30(11)	N
Recreation Vehicle Parks	N	N	N	Y*	N	N	N
Transient Lodgings	N	N	N	Y*	25(11)	30(11)	35(11)
Group Quarters	N	N	N	Y*	25(11)	30(11)	N
Commercial							
Local	N	N(2)	Y(2)	Y	Y	25	30
Community	N	N(2)	Y(2)	Y	Y	25	30
Regional	N	N(2)	Y	Y	Y	25	30
Industrial							
Industrial Park	N	Y(2)	Y	Y	Y	Y(12)	Y(13)
Light Industry	N	Y(2)	Y	Y	Y	Y(12)	Y(13)
Heavy Industrial	N	N(2)	Y	Y	Y	Y(12)	Y(13)
Business							
Office Park	N	N	Y(6)	Y	Y	25	30
Administrative	N	N	Y(6)	Y	Y	25	30

Appendix A (continued)
Land Use Compatibility

Land Use	Accident Potential			Noise Zones in Ldn			
				1	2		3
	Clear Zone	APZ I	APZ II	60-65	65-70	70-75	75+
Public Facilities							
Educational Facilities	N	N	N	Y*	25*	30*	N
Churches	N	N	N(2)	Y*	25*	30*	N
Hospitals	N	N	N	Y*	25*	30*	N
Governmental Services	N	N	Y(6)	Y*	Y*	25*	30*
Open Space/Recreation							
Natural Resources	N	Y(8)	Y(8)	Y*	Y*	Y*	N
Recreational Activities (including golf courses, riding stables, water recreation)	N	Y(8,9,10)	Y	Y*	Y*	25*	30*
Outdoor Sports Arenas, Spectator Sports	N	N	N	Y	Y(18)	Y(18)	N
Tourist Recreation/Commercial	N	N	N	Y	Y	Y	N
Other	N	Y(9)	Y(9)	Y*	Y*	Y*	N
Highway and Street Right-of-Way	N(3)	Y	Y	Y	Y	Y(12)	Y(13)
Agriculture							
General	Y	Y	Y	Y	Y(14)	Y(15)	Y(16)
Related Activities	N	Y(5)	Y	Y	Y(14)	Y(15)	Y(16)

Adapted from NAVFACINST 11010.36A and NAVFAC P-80.3

Appendix A (continued)
Land Use Compatibility

ACCIDENT POTENTIAL ZONES

Key

Y (Yes)	Exposure to accident potential is such that the activities associated with the land use may be carried out with essentially no interference or substantial loss of life and property.
N (No)	The exposure to accident potential at the site is so severe, due to potential loss of life and property, that performance of these land use activities is not advisable.
APZ	Accident Potential Zone

NOISE ZONES

Key

Y (Yes)	Land use and related structures compatible without restrictions.
N (No)	Land use and related structures are not compatible and should be prohibited.
*	The designation of these uses as "compatible" in this zone reflects consideration of general cost and past community experiences and program objectives. Localities may have different concerns or goals to consider (Guidelines for Considering Noise in Land Use Planning and Control, June 1980).
NLR (Noise Level Reduction)	Noise level reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.
DNL	Day-Night Average Sound Level

Appendix A (continued)
Land Use Compatibility

Noise Zones (continued)

Ldn	Mathematical symbol for DNL
Y (x) (Yes with Restrictions)	Land use and related structures are generally compatible; see notes 12 through 14.
25, 30, or 35	Land use and related structures are generally compatible; measures to achieve NLR of 25, 30, or 35 decibels must be incorporated into design and construction of the structure.
25*, 30*, or 35*	Land use generally compatible with NLR; however, measures to achieve an overall noise reduction do not necessarily solve noise difficulties and additional evaluation is warranted.

Notes to Table

(1) For single detached units, suggested maximum density 1 to 2 dwelling units per acre, possibly increased under Planned Unit Development (PUD) where maximum lot coverage is less than 20 percent.
(2) Within each land use category, uses exist where further evaluation may be needed due to the variation of densities of people and structures. For example, where a small neighborhood retail store may be compatible with APZ II, a shopping center or strip shopping mall would be incompatible due to the density of development and concentration of people.
(3) The placing of structures, building, or above-ground utility lines in the clear zone is subject to severe restrictions. In a majority of the clear zones, these items are prohibited. See NAVFAC P-80.3, Facility Planing Criteria for Navy and Marine Corps Shore Installations - Airfield Safety Clearances for specific guidance.
(4) No passenger terminals and no major above-ground transmission lines in APZ I.
(5) Factors to be considered: labor intensity, structural coverage, explosive characteristics, air pollution.
(6) Low-intensity office uses only. Meeting places, auditoriums, etc. not recommended.

Appendix A (continued)
Land Use Compatibility

Notes to Table (continued)

(7) Excludes chapels.
(8) Facilities must be low (occupancy) intensity.
(9) Clubhouse not recommended.
(10) Large classes not recommended.
(11) a) Although local conditions may require residential use in these zones, residential use is discouraged in DNL 65-70, and strongly discouraged in DNL 70-75. The absence of viable alternative development options should be determined and an evaluation should be conducted prior to approvals indicating that a demonstrated community need for residential use would not be met if development were prohibited in these zones.
b) Where the community determines that residential uses must be allowed, measures to achieve an outdoor-to-indoor Noise Level Reduction (NLR) of at least 25 dB (DNL 65-70), and 30 dB (DNL 70-75), should be incorporated into the building codes and be considered in individual approvals. Normal construction can be expected to provide a NLR of 20 dB, thus the reduction requirements are often stated as 5, 10, or 15 dB over standard construction, and normally assume mechanical ventilation and closed windows all year. Additional consideration should be given to modifying NLR levels based on peak noise levels or vibrations.
c) NLR criteria will not eliminate outdoor noise problems. However, building location and site planning, design, and use of berms and barriers can help mitigate outdoor noise exposure, particularly from ground level sources. Measures that reduce noise at a site should be used whenever practical in preference to measures which only protect interior spaces.
(12) Measures to achieve NLR of 25 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.
(13) Measures to achieve NLR of 30 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.
(14) Residential buildings require a NLR of 25 dB.
(15) Residential buildings require a NLR of 30 dB.
(16) Residential buildings are not permitted.
(17) Land use is not recommended, but if the community decides that the use is necessary, hearing protection devices should be worn by personnel.
(18) Land use is compatible provided special sound reinforcement systems are installed.

APPENDIX B
HEIGHT AND OBSTRUCTION CRITERIA

APPENDIX B
HEIGHT AND OBSTRUCTION CRITERIA

GENERAL

This appendix establishes criteria for determining whether an object or structure is an obstruction to air navigation. Obstructions to air navigation are considered to be:

- natural objects or manmade structures that protrude above the planes or surfaces as defined in the following paragraphs
- manmade objects that extend more than 500 feet above the ground at the site of the structure

EXPLANATION OF TERMS

In interpreting Figure 7, the following guidelines will apply:

- Where surfaces or planes within the height and obstruction criteria overlap, the governing elevation is that of the lowest surface or plane.
- MCAS Yuma AUX-2 has two runways, Runway 04/22 and Runway 09/27.
- The airfield elevation for MCAS Yuma AUX-2 is 266 feet above msl.
- All dimensions are measured horizontally unless otherwise noted.

The height and obstruction criteria terminology in Figure 7 are defined as follows.

Primary Surface: This surface defines the limits of the obstruction clearance requirements in the immediate vicinity of the landing area. The primary surface comprises surfaces of the runways, runway shoulders, and lateral safety zones. The length of the primary surface extends 200 feet beyond the end of the runway. The width of the primary surface is 1,500 feet; 750 feet on each side of the runway centerline.

Clear Zone (CZ) Surface: This surface defines the limits of the obstruction clearance requirements in the vicinity contiguous to the end of the primary surface. The dimensions of the CZ surface are 3,000 feet long and 1,500 feet wide at the end of the primary surface to 2,284 feet wide at its widest point.

Approach-Departure Clearance Surface: This surface is symmetrical about the runway centerline extended, begins as an inclined plane (glide angle) 200 feet beyond each end of the primary surface at the centerline elevation of the runway end, and extends for 50,000 feet. The slope of the approach-departure clearance surface is 50:1 along the runway centerline extended (glide angle) until it reaches

an elevation of 500 feet above the established airfield elevation. It then continues horizontally at this elevation to a point 50,000 feet from the start of the glide angle. The width of this surface at the runway end is 1,500 feet; it flares uniformly, and the width at 50,000 is 16,000 feet.

Inner Horizontal Surface (150 Feet Above Airfield Elevation): This surface is a plane, oval in shape at a height of 150 feet above the established airfield elevation. It is constructed by scribing an arc with a radius of 7,500 feet about the centerline at the end of the runway and interconnecting these arcs with tangents.

Conical Surface (20:1): This is an inclined surface extending outward and upward from the outer periphery of the inner horizontal surface for a horizontal distance of 7,000 feet to a height of 500 feet above the established airfield elevation. The slope of the conical surface is 20:1.

Outer Horizontal Surface (500 Feet Above Airfield Elevation): This surface is a plane located 500 feet above the established airfield elevation. It extends for a horizontal distance of 30,000 feet from the outer periphery of the conical surface.

Transitional Surfaces (7:1): These surfaces connect the primary surfaces, CZ surfaces, and approach-departure clearance surfaces to the inner horizontal surface, conical surface, outer horizontal surface, or other transitional surfaces. The slope of the transitional surface is 7:1 outward and upward at right angles to the runway centerline. To determine the elevation for the beginning of the transitional surface slope at any point along the lateral boundary of the primary surface, including the CZ, draw a line from this point to the runway centerline. This line will be at right angles to the runway axis. The elevation at the runway centerline is the elevation for the beginning of the 7 to 1 slope.

APPENDIX C
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APPENDIX C
BIBLIOGRAPHY

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